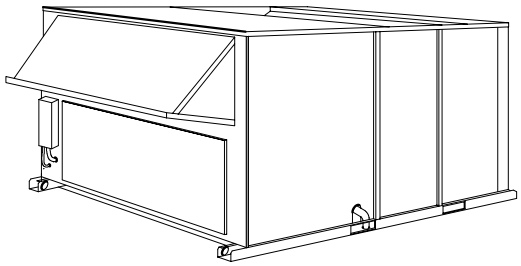
Installation Instructions

- Safety Labeling & Rules
- Installation Requirements
- Location / Clearances
- Wiring
- Air Distribution
- Ductwork Connections
- Start-Up
- Maintenance
- Hoisting / Rigging



Models

Three Phase
208-230, 460 Volt

PHE156H000A	**PHE180H000A**
PHE156L000A	**PHE180L000A**

PACKAGE HEAT PUMP UNITS

Printed in Mexico

516 01 1502 00 8/3/05

Table of Contents

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.

Signal Words

DANGER – Immediate hazards which **WILL** result in severe personal injury or death.

WARNING – Hazards or unsafe practices which **COULD** result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which **COULD** result in minor personal injury or product or property damage.

Signal Words in Manuals

The signal word **WARNING** is used throughout this manual in the following manner:

WARNING

The signal word **CAUTION** is used throughout this manual in the following manner:

CAUTION

Product Labeling

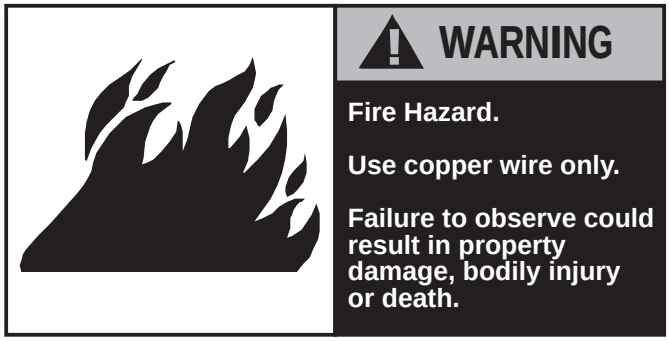
Signal words are used in combination with colors and/or pictures on product labels. Following are examples of product labels with explanations of the colors used.

Danger Label

White lettering on a black background except the word **DANGER** which is white with a red background.

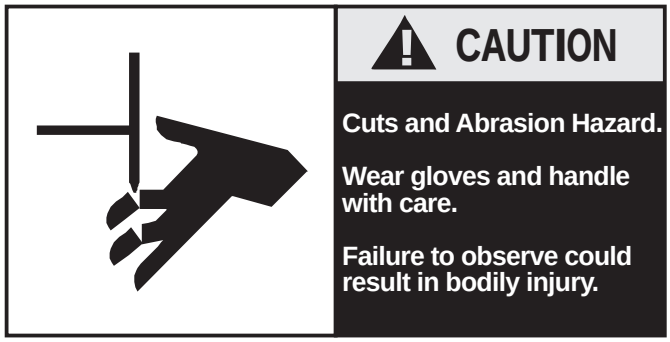
Warning Label

White lettering on a black background except the word **WARNING** which is black with an orange background.



Caution Label

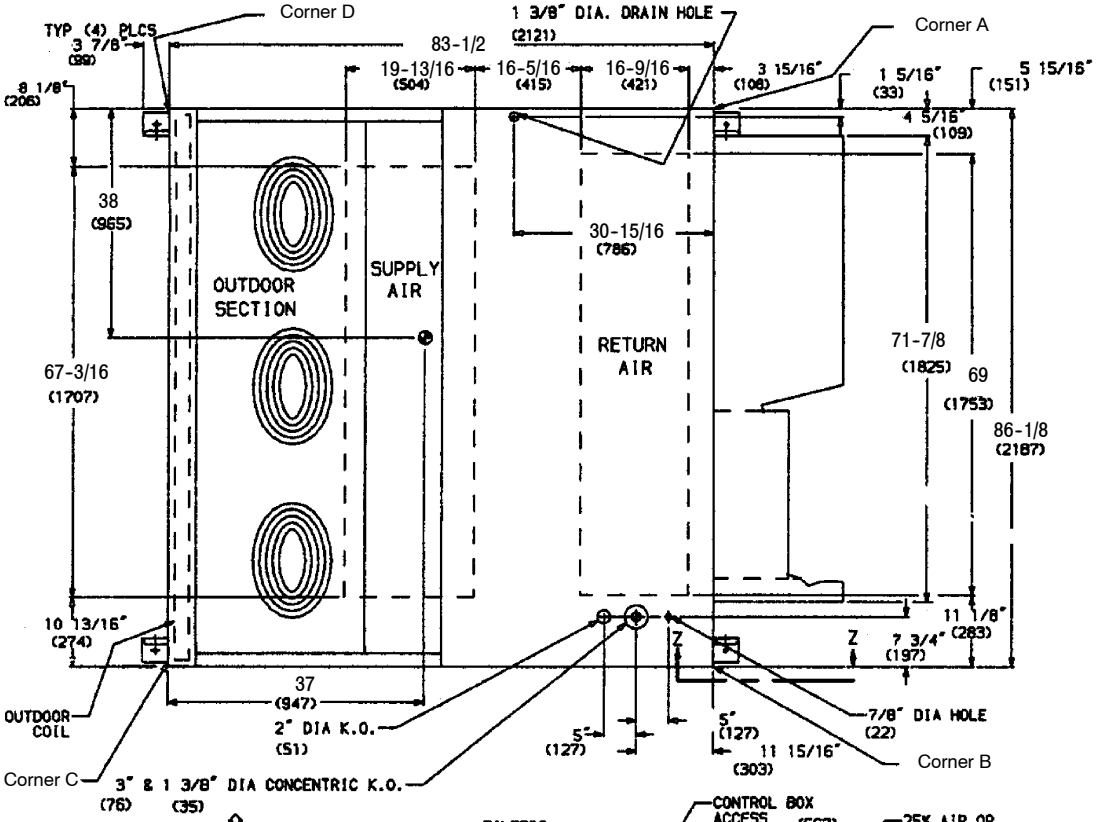
White lettering on a black background except the word **CAUTION** which is black with a yellow background.

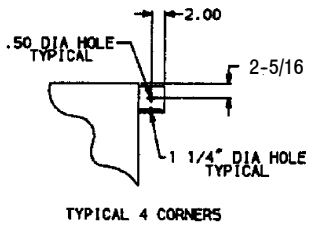


BASE UNIT DIMENSIONS - PHE156

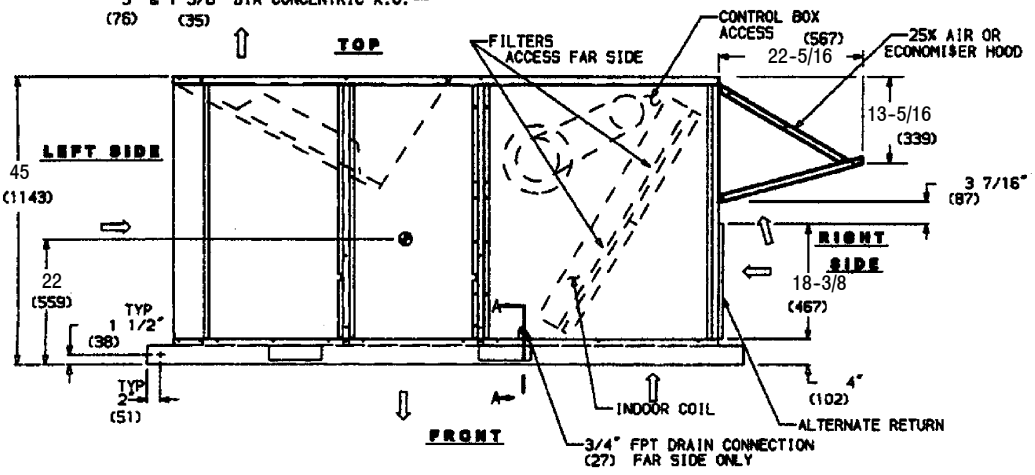
Unit Size	Total Weight		Corner A		Corner B		Corner C		Corner D	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
PHE156	1615	733	366	166	356	161	360	163	534	242

NOTES:
1. Dimensions in () are in millimeters.
2. Center of Gravity.
3. Direction of Airflow





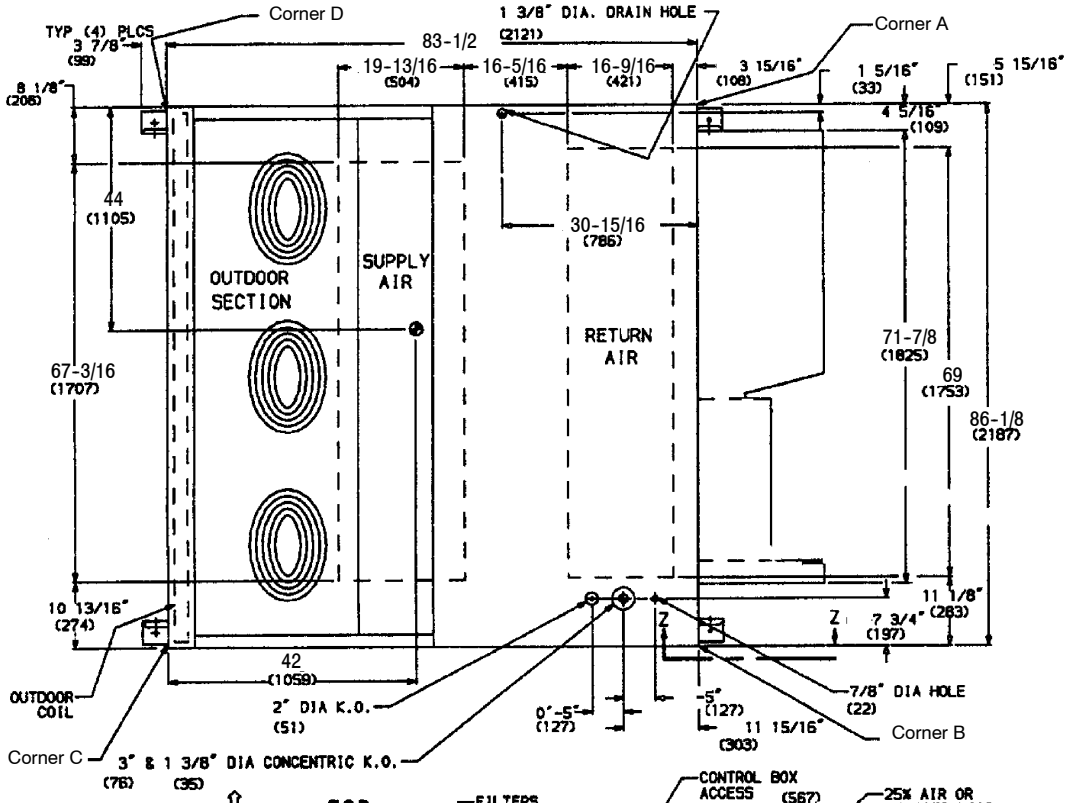
TYPICAL 4 CORNERS

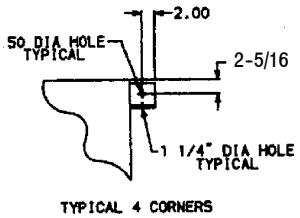


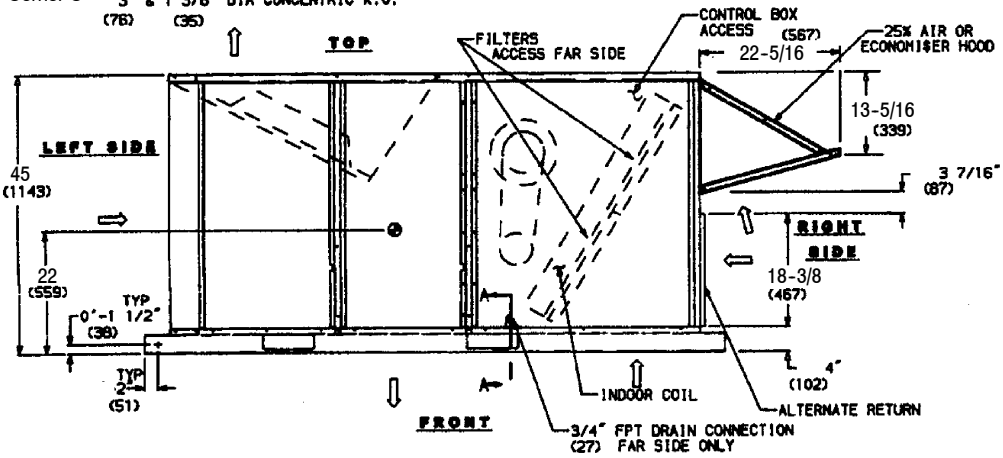
BASE UNIT DIMENSIONS - PHE180

Unit Size	Total Weight		Corner A		Corner B		Corner C		Corner D	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
PHE180	1925	874	464	211	496	225	477	217	487	221

NOTES:
1. Dimensions in () are in millimeters.
2. Center of Gravity.
3. Direction of Airflow







Safe Installation Requirements

⚠ WARNING

FIRE AND EXPLOSION HAZARD

Improper adjustment, alteration, service, maintance or installation could cause serious injury, death and/or property damage.

Installation or repairs made by unqualified persons could result in hazards to you and others. Installation MUST conform with local codes or, in the absence of local codes, with codes of all governmental authorities having jurisdiction.

The information contained in this manual is intended for use by a qualified service agency that is experienced in such work, is familiar with all precautions and safety procedures required in such work, and is equipped with the proper tools and test instruments.

- Installation **MUST** conform to the most current version of the following standards or a superseding standard.

  In the United States:

  - National Electrical Code ANSI/NFPA 70

  In Canada:

  - CSA C.22.1 – Canadian Electrical Code Part 1.
- Seal supply and return air ducts.

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.

Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

Location And Set-up

The unit is designed for outdoor installation **ONLY**. The unit may be installed on a level concrete mounting base (or other adequate platform) at ground level or on a flat rooftop with an adequate platform. If using as a downflow model, use a roof curb. Typical installations are shown in **Figure 2**.

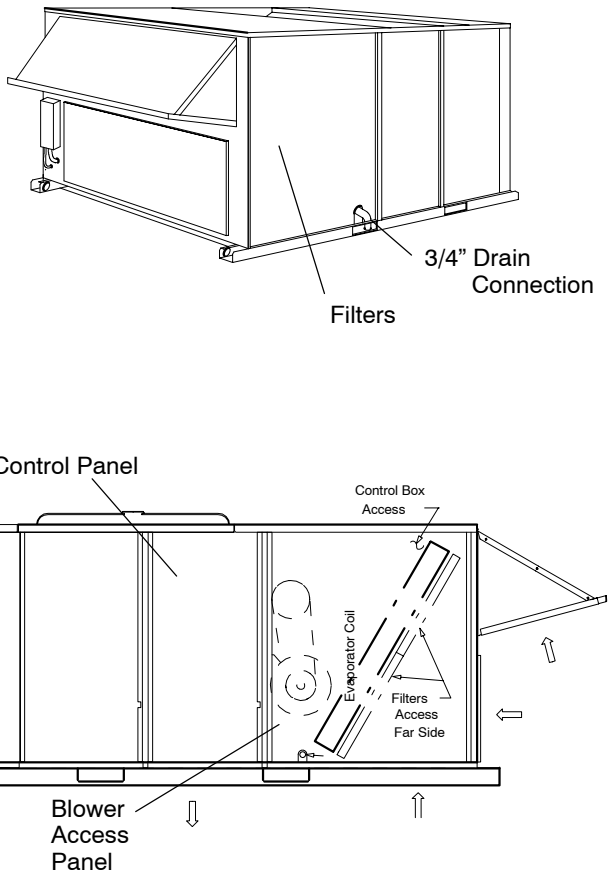
Access Panels

CAUTION

Unit will NOT operate properly without all access panels in place. Access panels are shown in Figure 1.

Unit MUST NOT be moved unless all access panels are in place.

Figure 1 **Access Panels**



Clearances

The location **MUST** allow for minimum clearances and should not be adjacent to an area where the unit's operating sound level might be objectionable.

Minimum clearances, as specified in Figure 2, **MUST** be maintained to provide adequate fire protection and room for service personnel. In addition, local codes **MUST** be observed.

Do **NOT** install the unit in a location that will permit discharged air from the condenser to recirculate to the condenser inlet.

CAUTION

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

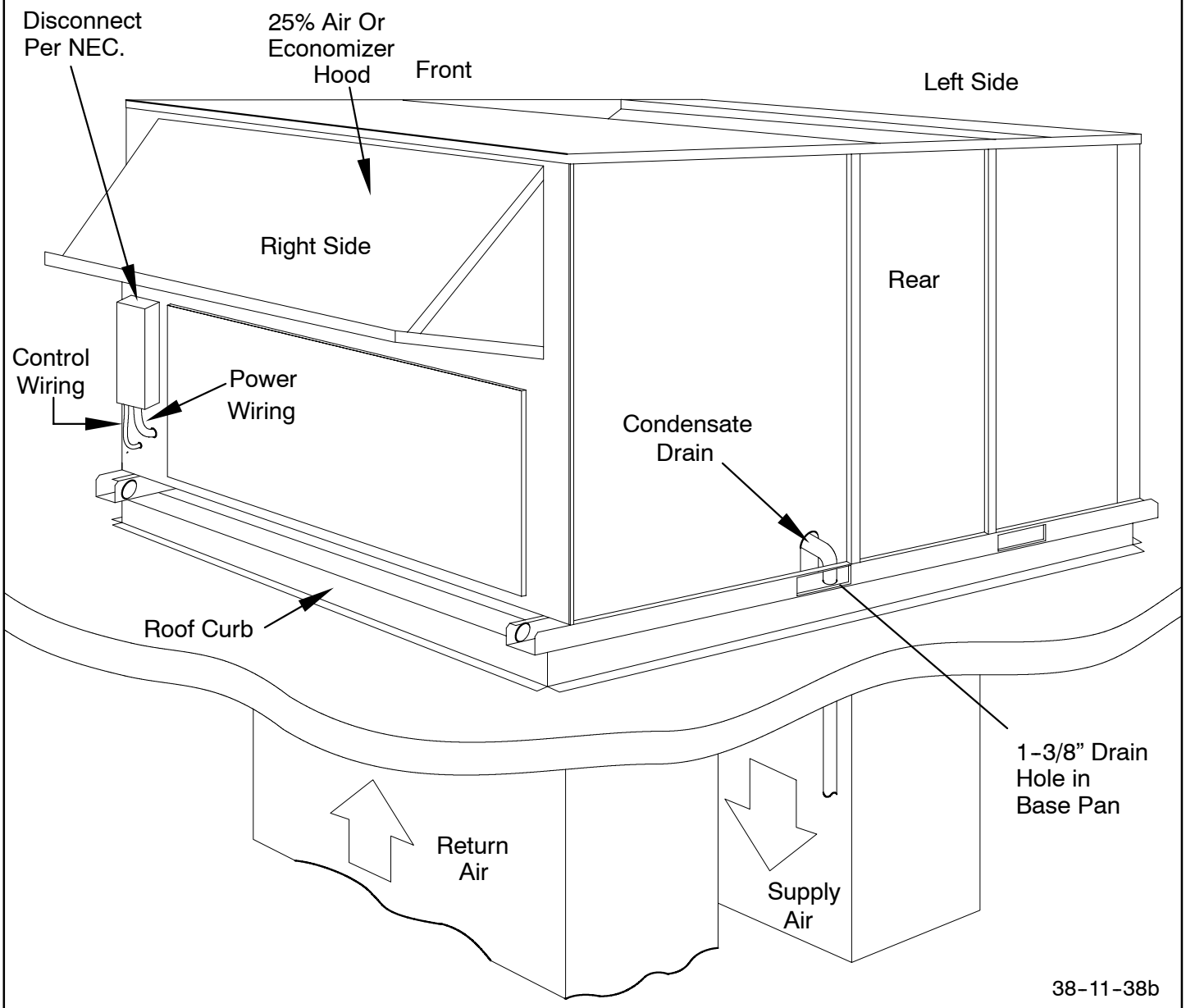
⚠ WARNING

DEATH, PERSONAL INJURY AND/OR PROPERTY DAMAGE HAZARD.

Failure to follow safety warnings could result in serious injury, death, or property damage.

For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install a 90 degree turn in the return ductwork between the unit and the conditioned space. If a 90 degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Due to electric heater, supply duct will require 90 degree elbow.

Figure 2 | **TYPICAL INSTALLATIONS & CLEARANCES**



CLEARANCES

1. Ductwork to be attached to accessory roof curb only.
2. Minimum clearance:
   Rear: 7'-0" (2134) for coil removal. This dimension can be reduced to 4'-0" (1219) if conditions permit coil removal from the top.
   Left side: 4'-0" (1219) for proper condenser coil airflow.
   Front: 4'-0" (1219) for control box access.
   Right Side: 4'-0" (1219) for proper operation of damper and power exhaust if so equipped.
   Top: 6'-0" (1829) to assure proper condenser fan operation.
   Local Codes jurisdiction may prevail.
3. With the exception of clearance for the condenser coil and the damper/power exhaust as stated in Note #2, a removeable fence or barricade requires no clearance.
4. Dimensions are from outside of corner post. Allow 0-5/16" (8) on each side for top cover drip edge.
5. Units with electric heat require a 1 inch clearance for the first 24 inches of ductwork.
6. Outlet grilles must not lie directly below unit discharge.

Installation

⚠ CAUTION

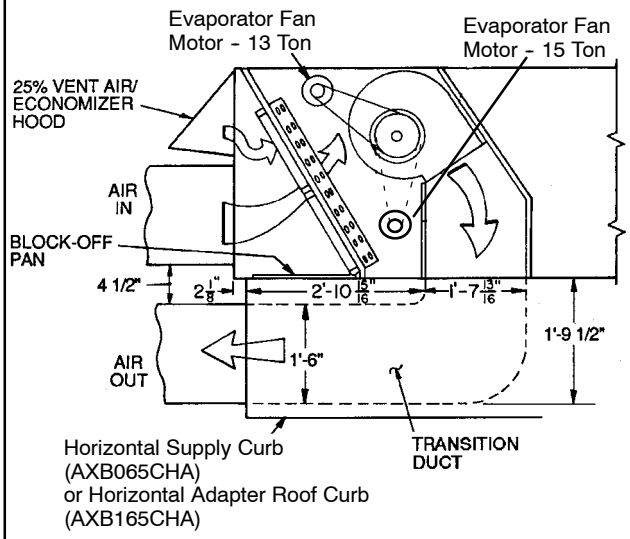
Unit will NOT operate properly unless it is installed level front to rear and side to side.

The slope MUST NOT be greater than $^{1}/_{16}$″ per foot (10mm per meter). For side to side leveling, the control box side MUST always be higher.

Ground Level Installation

ROOF CURB: Assemble and install accessory horizontal adapter roof curb in accordance with instructions shipped with accessory. See Figure 3. Ductwork can be installed to horizontal adapter roof curb before unit is set in place. Adapter roof curb should be level. This is necessary to permit unit drain to function properly. Unit leveling tolerance is +/- 1/16" per linear foot in any direction. Refer to Accessory Horizontal Adapter Roof Curb Installation Instructions for additional information as required. When accessory horizontal adapter roof curb is used, unit may be installed on class A, B, or C roof covering material.

Figure 3 **Horizontal Adapter Roof Curbs and Roof Curbs**



NOTE: For preassembled horizontal adapter roof curb part no. (AXB165CHA), the accessory kit includes a factory-designed, high-static, transition duct. For horizontal curb part no., (AXB065CHA), a field supplied transition duct is required.

IMPORTANT: The gasketing of the unit to the roof curb or adapter roof curb is critical for a watertight seal. Improperly applied gasket can also result in air leaks and poor unit performance.

ALTERNATE UNIT SUPPORT: When the curb or adapter cannot be used, install unit on a noncombustible surface. Support unit with sleepers, using unit curb support area. If sleepers cannot be used, support long sides of unit with a minimum of 3 equally spaced 4-in. x 4-in. pads on each side.

Rooftop Installation

- The unit **MUST** be situated to provide safe access for servicing.
- The existing roof structure **MUST** be adequate to support the weight of the unit or the roof **MUST** be reinforced.

  Check the weight of the unit in relation to the roof structure and local building codes or ordinances and reinforce roof structure if necessary. See product specification sheet for unit weights and corner weights.
- Support for the unit **MUST** be level and strong enough to carry unit weight. The support may consist of a platform or a combination of platform and roof beams or curb.

  The platform may be constructed of pressure treated wood and may be covered with Class A, B or C roof covering.
- Platform **MUST** allow for proper condensate trap installation and drainage. See associated text for more information about condensate drainage.

NOTE: MAKE SURE DOWNFLOW SUPPLY AND RETURN AIR DUCTS ARE FREE OF OBSTRUCTIONS BEFORE INSTALLING UNIT ON ROOF CURB OR ANY DOWNFLOW APPLICATION. Remove all forklift supports, covers, cardboard, etc., from the downflow return and supply air ducts.

Hoisting

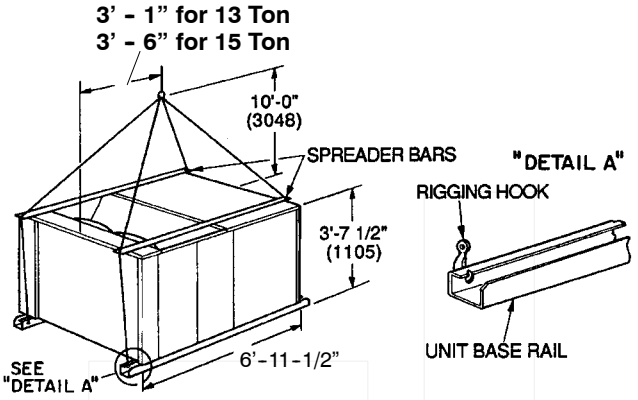
NOTE: All access panels **MUST** be secured in place before hoisting.

The unit should be hoisted with two lifting slings. Attach the slings to rigging shackles that have been hooked through holes in the base rail. See **Figure 4**.

Two spreader bars **MUST** be placed on top of the unit to protect the unit from damage from the pressure exerted by the slings. Make sure that all equipment is adequate to handle the weight of the unit and that the slings will not allow the unit to shift. See **Figure 4**.

Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit.

Figure 4 **Rigging and Hoisting**



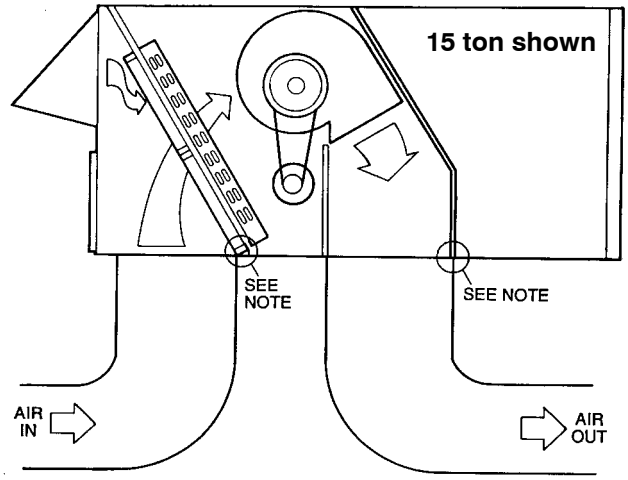
Notes: Remove boards at ends of unit and runners prior to rigging. Rig by inserting hooks into unit base rails as shown. Use corner post from packaging to protect coil from damage. Use bumper boards for spreader bars on all units.

Unit Duct Connections

These units are shipped ready for downflow operation but are adaptable to horizontal use. To convert to horizontal operation, refer to Ground Level Installation Section of this manual.

Attach all ductwork to roofcurb and roofcurb basepans. Refer to installation instructions shipped with accessory roof curb for more information.

Figure 5 **Air Distribution - Thru the Bottom**



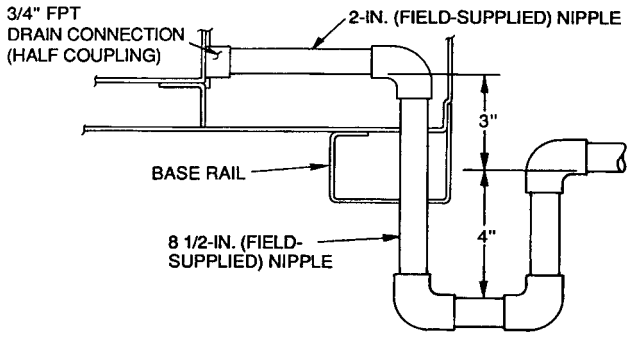
NOTE: Do not drill in this area; damage to basepan may result in water leak.

Condensate Drain

The condensate drain outlet is a 3/4 –in. threaded female connection located inside the evaporator section.

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 4" **MUST** be installed. Bottom of outlet from trap **MUST** be at least 3" below bottom of outlet from unit. An 8–1/2" x 3/4" diameter and 2" x 3/4" pipe nipple, couple to standard 3/4" diameter elbows, provide a straight path down through hole in unit base rails. **See Figure 6.** A 3/4" 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.

Figure 6 **Condensate Drain Information**



Electrical Wiring

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

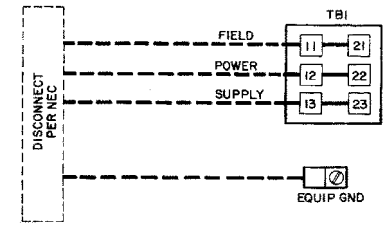
Failure to follow this warning could result in property damage, personal injury, and/or death.

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

Unit MUST be grounded to electrical service panel.

NOTE: All electrical work **MUST** conform with the requirements of local codes and ordinances and in the United States the National Electrical Code ANSI/NFPA70-1990 (or current edition) and in Canada CSA C.22.1 - Canadian Electrical Code Part 1 (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, wire, fuse and disconnect switch sizes **MUST** conform with specifications on the unit rating plate.

Figure 7 **Typical Wiring Connections**

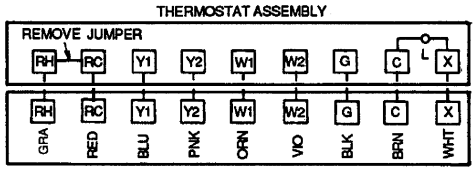


NOTE: The maximum wire size for TB1 is 2/0.

LEGEND

EQUIP — Equipment
GND — Ground
NEC — National Electrical Code
TB — Terminal Block

Field Power Wiring Connections



Field Control Thermostat Wiring

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.

Field Power Supply - Unit is factory wired for voltage shown on nameplate.
When installing units, provide a disconnect per NEC (National Electrical code) of adequate size.

For access to high and low voltage connections, remove the control box access panel. (see **Figure 1**).

Line Voltage Wiring

Route power ground lines through control box end panel or unit basepan and to connections as shown on unit wiring diagram.

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.

⚠ CAUTION

RISK OF REDUCED COMPRESSOR LIFE

Failure to follow these Caution could result in permature compressor failure.

The correct power phasing is critical in the operation of the scroll compressors. An incorrect phasing will cause the compressor to rotate in the wrong direction

Converting 230V Units to 208V

Field wiring must confirm to temperature limitations for type 'T' wire. All field wiring must comply with NEC and local requirements.

Transformer # 1 is wired for 230–v unit. IF 208/230–v unit is to be run with 208–v power supply, the transformer must be rewired as follows:

1. Remove cap from red (208 v) wire.
2. Remove cap from orange (230 v) spliced wire.
3. Replace orange wire with red wire.
4. Recap both wires.

IMPORTANT: BE CERTAIN UNUSED WIRES ARE CAPPED. Failure to do so may damage the transformers.

Operating voltage to compressor must be within voltage range indicated on unit nameplate. On 3 phase units, voltages between phases must be balanced within 2%.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

Field Installed Equipment

All wiring done in the field between the unit and other devices, or between separate devices that 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.

Low Voltage Wiring

Route thermostat cable or equivalent single leads of colored wire from subbase terminals through conduit in unit to low–voltage connections as shown on unit label wiring diagram.

NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum), for 50–75 ft. runs, use no. 16 AWG insulated wire (35 C minimum), for over 75 ft, use no. 14 AWG insulated wire (35 C minimum). All wire larger than no. 18 AWG cannot be directly connected at the thermostat and will require a junction box and splice at the thermostat.

Low Voltage Wiring With Economizer Option

The economizer electrical harness taps into **Y1** and **Y2** on the low voltage terminal board. Low voltage wires from the thermostat are connected to **Y1** and **Y2** with or without an economizer.

Thermostat

The thermostat **MUST** be a field supplied 2 stage cooling, 2 stage heating thermostat.

The location of the thermostat has an important effect on the operation of the unit. **FOLLOW THE INSTRUCTIONS INCLUDED WITH THE THERMOSTAT FOR CORRECT LOCATION, MOUNTING AND WIRING.**

Heat Anticipator

Unit	Unit Voltages	kW*	Stage 1	Stage 2
PHE156	208/230-3-60	26 / 34	.40	.66
		42 / 56	.66	.40
	460-3-60	32	.40	.40
		55	.40	.66
PHE180	208/230-3-60	26 / 34	.40	.66
		42 / 56	.66	.40
	460-3-60	32	.40	.40
		55	.40	.66
* Heater kW is based on heater voltage of 240v, and 480v.				

Settings may be changed slightly to provide a greater degree of comfort for a particular installation.

Final Check

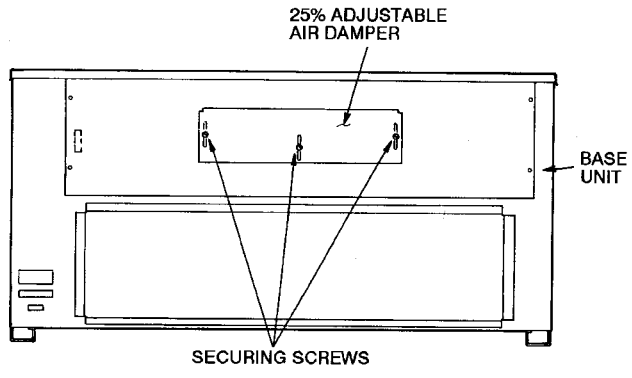
Make a final wiring check to be sure system is correctly wired. Inspect field installed wiring and the routing to ensure that rubbing or chafing due to vibration will not occur.

Make Outdoor–Air Inlet Adjustments

All units have a manual outdoor–air damper to provide ventilation air.

Damper can be reset to admit up to 25% outdoor air into return–air compartment. To adjust, loosen securing screws and move damper to desired setting, then retighten screws to secure damper. **See Figure 8.**

Figure 8 **Standard 25% Outdoor–Air Section**



Install Outdoor-Air Hood

NOTE: The hood top panel, upper and lower filter retainers, hood drain pan, baffle and filter support bracket are secured opposite the condenser end of the unit. The screens, hood side panels, remaining section of filter support bracket, seal strip, and hardware are in a package located inside the return-air filter access panel. **See Figure 9.**

1. Attach seal strip to upper filter retainer. **See Figure 10.**
2. Assemble hood top panel, side panels, upper filter retainer, and drain pan. **See Figure 11.**

Figure 9 Outdoor-Air Hood Compartment

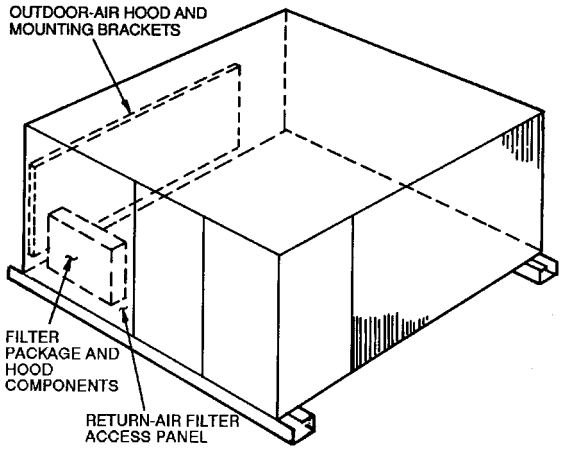


Figure 10 Seal Strip

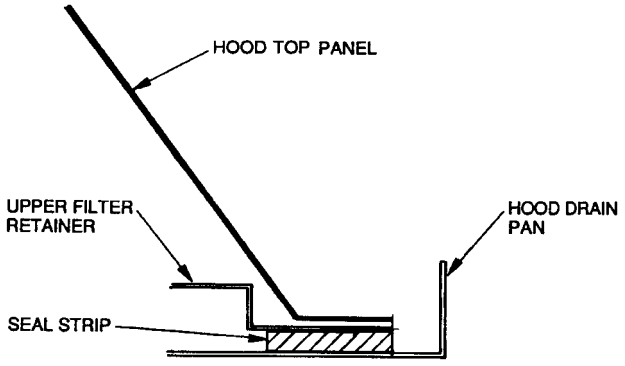
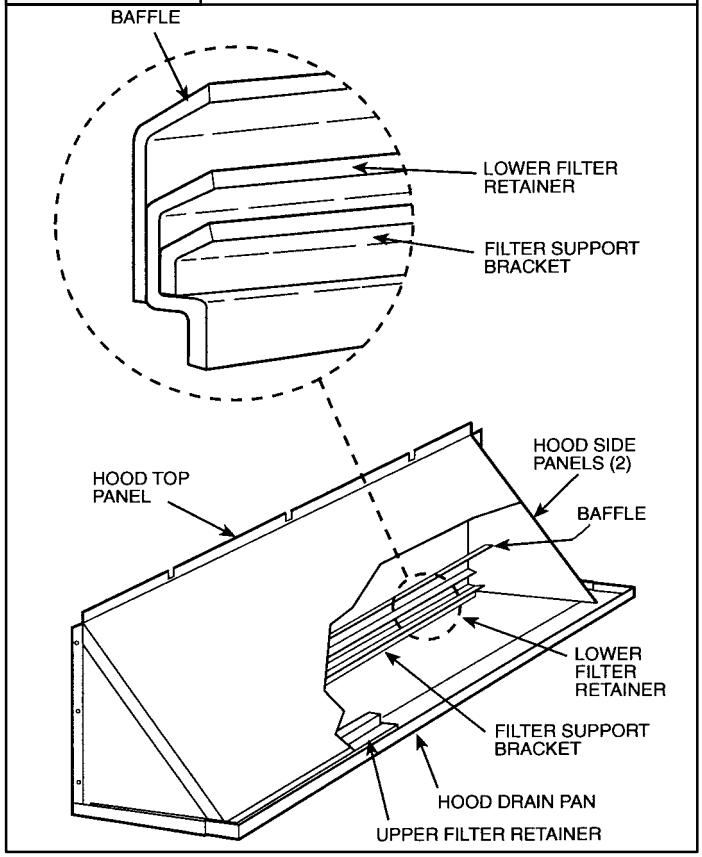


Figure 11 Outdoor-Air Hood Details



3. Secure lower filter retainer and support bracket to unit. **See Figure 11.** Leave screws loose on 13 & 15 ton units.
4. For 13 & 15 ton units only, slide baffle behind lower filter retainer and tighten screws.
5. Loosen sheet metal screws for top panel of base unit located above outdoor-air inlet opening, and remove screws for hood side panels located on the sides of the outdoor-air inlet opening.
6. Match notches in hood top panel to unit top panel screws. Insert hood flange between top panel flange and unit. Tighten screws.
7. Hold hood side panel flanges flat against unit, and install screws removed in Step 5.
8. Insert outdoor-air inlet screens and spacer in channel created by lower filter retainer and filter support bracket.
9. Attach remaining section of filter support bracket.

Ductwork

NOTE: The total heat loss from the structure as expressed in total Btu/hr **MUST** be calculated by manufacturer's method or in accordance with "A.S.H.R.A.E. Guide" or "Manual N – Load Calculations" published by the Air Conditioning Contractors of America or in Canada H.R.A.I. "Manual N". The total heat loss calculated should be equal to or less than the heating 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 greater of the units heating or 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. **Use only non-combustible type insulation on supply plenum or supply ductwork within 6 feet of unit.**

Maximum recommended velocity in trunk ducts is 1000 feet per minute (5.08 m/s). Velocity in branches should not exceed 800 feet per minute (4.06 m/s).

Ductwork installed outdoors should have a minimum of 2″ (50.8mm) of fiberglass insulation and a weatherproof vapor barrier. It should also be protected against damage. Caulk and flashing, or other means adequate to provide a permanent weather seal should be used.

Ductwork installed in attics or other areas exposed to outside temperatures should be installed with a minimum of 2″ (50.8mm) 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 . Attach all ductwork to roof curb and roof curb basepans.

Field Fabricate Ductwork

Secure all ducts to roof curb and building structure on vertical units. Do not connect ductwork to unit. For horizontal applications, field supplied flanges should be attached to horizontal discharge openings and all ductwork secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed –.45 in. wg without an economizer.

Filters

NOTE:

Do NOT operate the unit without all filters in place.

All air **MUST** pass through a filter before entering the unit. Electronic air cleaner, optional filter racks, or other accessible filter arrangements **MUST** be installed in the return air ductwork.

NOTE: If the unit has an economizer or any other type of outdoor air damper, disposable filters **MUST** be used in the internal filter racks.

For replacement filter sizes and instructions, see specification sheet.

Circulating Blower

Determining Blower Speed

1. From the system design, determine the external static pressure (ESP) for the supply ducts, return ducts and registers, diffusers, grilles, dampers, heaters and special filters (if any).
2. If unit is to be set up in cooling mode, add .08″ W.C. (20 Pa) for wet coil operation to the total ESP determined in Step 1.
3. For static additions due to installation of an economizer or manual air dampers, add .05 inches to ESP.
4. From the system design, determine the desired airflow in CFM (L/s). See **Figure 12** for CFM to L/s conversion table.
5. To determine the blower speed necessary to obtain the desired CFM (L/s), see the Circulating Blower Performance Data for the unit located on the pages that immediately follow.
6. Determine the blower RPM's needed to obtain the desired CFM (L/s).
7. Compare required RPM to unit's factory setting for blower RPM (see Blower Performance Tables). If different from the RPM your installation requires, the blower speed will need to be changed.
8. Following the circulating Blower Performance Data table is a table that shows how many turns open the adjustable blower motor pulley needs to be to obtain the required RPM.
9. To change the blower speed, see pages 15 and 16 .

Figure 12 **Metric Conversions: Cubic Feet per Minute (CFM) to Liters per Second (L/s); Inches of Water Column (In. W.C.) to Pascals (Pa)**

CFM	L/s	CFM	L/s	CFM	L/s	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa
50	24	2550	1203	5050	2383	0.01	2	0.51	127	1.01	251	1.51	376	2.01	501
100	47	2600	1227	5100	2407	0.02	5	0.52	130	1.02	254	1.52	379	2.02	503
150	71	2650	1251	5150	2430	0.03	7	0.53	132	1.03	257	1.53	381	2.03	506
200	94	2700	1274	5200	2454	0.04	10	0.54	135	1.04	259	1.54	384	2.04	508
250	118	2750	1298	5250	2477	0.05	12	0.55	137	1.05	262	1.55	386	2.05	511
300	142	2800	1321	5300	2501	0.06	15	0.56	139	1.06	264	1.56	389	2.06	513
350	165	2850	1345	5350	2525	0.07	17	0.57	142	1.07	267	1.57	391	2.07	516
400	189	2900	1369	5400	2548	0.08	20	0.58	144	1.08	269	1.58	394	2.08	518
450	212	2950	1392	5450	2572	0.09	22	0.59	147	1.09	271	1.59	396	2.09	521
500	236	3000	1416	5500	2595	0.10	25	0.60	149	1.10	274	1.60	399	2.10	523
550	260	3050	1439	5550	2619	0.11	27	0.61	152	1.11	276	1.61	401	2.11	526
600	283	3100	1463	5600	2643	0.12	30	0.62	154	1.12	279	1.62	404	2.12	528
650	307	3150	1486	5650	2666	0.13	32	0.63	157	1.13	281	1.63	406	2.13	531
700	330	3200	1510	5700	2690	0.14	35	0.64	159	1.14	284	1.64	408	2.14	533
750	354	3250	1534	5750	2713	0.15	37	0.65	162	1.15	286	1.65	411	2.15	536
800	378	3300	1557	5800	2737	0.16	40	0.66	164	1.16	289	1.66	413	2.16	538
850	401	3350	1581	5850	2761	0.17	42	0.67	167	1.17	291	1.67	416	2.17	541
900	425	3400	1604	5900	2784	0.18	45	0.68	169	1.18	294	1.68	418	2.18	543
950	448	3450	1628	5950	2808	0.19	47	0.69	172	1.19	296	1.69	421	2.19	545
1000	472	3500	1652	6000	2831	0.20	50	0.70	174	1.20	299	1.70	423	2.20	548
1050	495	3550	1675	6050	2855	0.21	52	0.71	177	1.21	301	1.71	426	2.21	550
1100	519	3600	1699	6100	2879	0.22	55	0.72	179	1.22	304	1.72	428	2.22	553
1150	543	3650	1722	6150	2902	0.23	57	0.73	182	1.23	306	1.73	431	2.23	555
1200	566	3700	1746	6200	2926	0.24	60	0.74	184	1.24	309	1.74	433	2.24	558
1250	590	3750	1770	6250	2949	0.25	62	0.75	187	1.25	311	1.75	436	2.25	560
1300	613	3800	1793	6300	2973	0.26	65	0.76	189	1.26	314	1.76	438	2.26	563
1350	637	3850	1817	6350	2997	0.27	67	0.77	192	1.27	316	1.77	441	2.27	565
1400	661	3900	1840	6400	3020	0.28	70	0.78	194	1.28	319	1.78	443	2.28	568
1450	684	3950	1864	6450	3044	0.29	72	0.79	197	1.29	321	1.79	446	2.29	570
1500	708	4000	1888	6500	3067	0.30	75	0.80	199	1.30	324	1.80	448	2.30	573
1550	731	4050	1911	6550	3091	0.31	77	0.81	202	1.31	326	1.81	451	2.31	575
1600	755	4100	1935	6600	3115	0.32	80	0.82	204	1.32	329	1.82	453	2.32	578
1650	779	4150	1958	6650	3138	0.33	82	0.83	207	1.33	331	1.83	456	2.33	580
1700	802	4200	1982	6700	3162	0.34	85	0.84	209	1.34	334	1.84	458	2.34	583
1750	826	4250	2006	6750	3185	0.35	87	0.85	212	1.35	336	1.85	461	2.35	585
1800	849	4300	2029	6800	3209	0.36	90	0.86	214	1.36	339	1.86	463	2.36	588
1850	873	4350	2053	6850	3233	0.37	92	0.87	217	1.37	341	1.87	466	2.37	590
1900	897	4400	2076	6900	3256	0.38	95	0.88	219	1.38	344	1.88	468	2.38	593
1950	920	4450	2100	6950	3280	0.39	97	0.89	222	1.39	346	1.89	471	2.39	595
2000	944	4500	2124	7000	3303	0.40	100	0.90	224	1.40	349	1.90	473	2.40	598
2050	967	4550	2147	7050	3327	0.41	102	0.91	227	1.41	351	1.91	476	2.41	600
2100	991	4600	2171	7100	3350	0.42	105	0.92	229	1.42	354	1.92	478	2.42	603
2150	1015	4650	2194	7150	3374	0.43	107	0.93	232	1.43	356	1.93	481	2.43	605
2200	1038	4700	2218	7200	3398	0.44	110	0.94	234	1.44	359	1.94	483	2.44	608
2250	1062	4750	2242	7250	3421	0.45	112	0.95	237	1.45	361	1.95	486	2.45	610
2300	1085	4800	2265	7300	3445	0.46	115	0.96	239	1.46	364	1.96	488	2.46	613
2350	1109	4850	2289	7350	3468	0.47	117	0.97	242	1.47	366	1.97	491	2.47	615
2400	1133	4900	2312	7400	3492	0.48	120	0.98	244	1.48	369	1.98	493	2.48	618
2450	1156	4950	2336	7450	3516	0.49	122	0.99	247	1.49	371	1.99	496	2.49	620
2500	1180	5000	2360	7500	3539	0.50	125	1.00	249	1.50	374	2.00	498	2.50	623

CIRCULATING BLOWER PERFORMANCE - 13 TON UNITS (STANDARD MOTOR)

	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
CFM	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
3750	**724**	**481**	**838**	**685**	937	889	1028	1097	1111	1309	**1190**	**1526**	**1265**	**1746**	**1337**	**1972**	1405	**2199**	**1471**	**2431**
4000	**754**	**613**	865	824	962	1034	1050	1247	1131	1463	**1208**	**1684**	**1281**	**1908**	**1351**	**2136**	1418	**2368**	**1483**	**2603**
4250	**786**	**757**	893	975	987	1191	1073	1408	**1152**	**1629**	**1227**	**1853**	**1299**	**2082**	**1367**	**2313**	**1433**	**2548**	**1496**	**2787**
4500	**818**	**914**	922	1138	1013	1360	1097	1583	**1174**	**1808**	**1247**	**2036**	**1317**	**2268**	**1384**	**2503**	**1448**	**2742**	**1510**	**2983**
4750	**850**	**1084**	951	1313	1040	1541	1122	1770	**1197**	**2000**	**1269**	**2232**	**1337**	**2468**	**1403**	**2707**	**1465**	**2948**	**1526**	**3194**
5000	883	1267	980	1501	1068	1736	**1147**	**1969**	**1221**	**2204**	**1291**	**2441**	**1358**	**2680**	**1422**	**2923**	**1484**	**3168**	**1544**	**3418**
5250	917	1464	1011	1703	1096	1943	**1174**	**2183**	**1246**	**2423**	**1315**	**2664**	**1380**	**2907**	**1443**	**3154**	**1503**	**3403**	**1562**	**3655**
5500	950	1675	1041	1918	1124	2165	**1201**	**2409**	**1272**	**2655**	**1339**	**2900**	**1403**	**3148**	**1464**	**3398**	**1524**	**3651**	-	-
5750	985	1901	1072	2147	**1153**	**2400**	**1228**	**2650**	**1298**	**2901**	**1364**	**3151**	**1426**	**3403**	**1486**	**3657**	1545	**3914**	-	-
6000	1020	2142	1103	2391	**1183**	**2649**	**1256**	**2905**	**1324**	**3160**	**1389**	**3416**	**1450**	**3672**	**1510**	**3930**	-	-	-	-
6250	1055	2398	**1135**	**2650**	**1213**	**2912**	**1284**	**3175**	**1352**	**3435**	**1415**	**3695**	**1476**	**3957**	**1534**	**4219**	-	-	-	-

NOTES:
1) **Boldface** indicates field-supplied drive required.
2) indicates field-supplied motor and drive required.
3) Factory-shipped motor drive range is 862 to 1132 rpm. Other rpms may require a field-supplied drive.
4) Maximum continuous bhp is 4.25 maximum continuous watts are 3775. Do not adjust motor rpm such that motor maximum watts is exceeded at the maximum operating cfm.
5) Interpolation is permissible. Do not extrapolate.
6) Fan performance is based on wet coils, clean filters, and casing losses.
7) Factory-shipped motor drive range is 862 to 1132 rpm. Other rpms may require a field-supplied drive. Extensive motor and drive testing on these units ensures that the full horsepower and watts range of the motor can be utilized with confidence. Using your fan motors up to the watts shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

CIRCULATING BLOWER PERFORMANCE - 15 TON UNITS (STANDARD MOTOR)

	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
CFM	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
4500	**584**	**717**	**695**	**952**	**798**	**1205**	893	1483	984	1786	**1070**	**2113**	**1151**	**2459**	**1229**	**2819**	**1302**	**3194**	**1371**	**3578**
4800	**609**	**839**	**717**	**1085**	815	1346	907	1630	994	1938	**1078**	**2269**	**1157**	**2620**	**1233**	**2990**	**1306**	**3374**	**1375**	**3769**
5100	**634**	**971**	**738**	**1229**	833	1500	921	1791	1006	2104	**1086**	**2439**	**1164**	**2795**	**1238**	**3170**	**1310**	**356**	**1378**	**3965**
5400	**660**	**1118**	**760**	**1389**	852	1669	937	1968	**1019**	**2286**	**1097**	**2626**	**1172**	**2986**	**1245**	**3366**	**1315**	**3763**	**1382**	**4174**
5700	**687**	**1284**	**783**	**1566**	873	1858	956	2165	**1034**	**2490**	**1110**	**2835**	**1183**	**3200**	**1253**	**3584**	**1322**	**3986**	**1388**	**4404**
6000	**712**	**1458**	805	1752	892	2055	973	2371	**1049**	**2703**	**1122**	**3053**	**1193**	**3422**	**1262**	**3810**	**1329**	**4216**	**1393**	**4638**
6300	**736**	**1644**	826	1952	911	2265	990	2591	**1064**	**2930**	**1135**	**3286**	**1204**	**3660**	**1271**	**4052**	**1336**	**4461**	**1399**	**4887**
6600	**763**	**185**	851	2176	933	2502	1010	2837	**1082**	**2186**	**1151**	**3549**	**1218**	**3928**	**1283**	**4325**	**1347**	**4739**	**1409**	**5169**
6900	**788**	**2078**	873	2410	954	2747	**1029**	**3093**	**1099**	**3451**	**1167**	**3821**	**1232**	**4207**	**1295**	**4608**	**1357**	**5026**	**1417**	**5460**
7200	813	2316	896	2662	975	3011	**1048**	**3367**	**1117**	**3734**	**1183**	**4113**	**1246**	**4505**	**1308**	**4912**	**1368**	**5335**	**1437**	**5773**
7500	841	2584	921	2943	998	3304	**1070**	**3672**	**1137**	**4049**	**1202**	**4437**	**1264**	**4837**	**1324**	**5251**	**1383**	**5679**	**1440**	**6122**

NOTES:
1) **Boldface** indicates field-supplied drive required.
2) indicates field-supplied motor and drive required.
3) Factory-shipped motor drive range is 799 to 1010 rpm. Other rpms may require a field-supplied drive.
4) Maximum continuous bhp is 5.90 maximum continuous watts are 5180. Do not adjust motor rpm such that motor maximum watts is exceeded at the maximum operating cfm.
5) Interpolation is permissible. Do not extrapolate.
6) Fan performance is based on wet coils, clean filters, and casing losses.
7) Factory-shipped motor drive range is 862 to 1132 rpm. Other rpms may require a field-supplied drive. Extensive motor and drive testing on these units ensures that the full horsepower and watts range of the motor can be utilized with confidence. Using your fan motors up to the watts shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

Air Quantity Limits		
UNIT SIZE	**MINIMUM CFM**	**MAXIMUM CFM**
13 Ton	3,000	6,250
15 Ton	4,500	7,500

Evaporator-Fan Motor Efficiency	
Unit Size	**Motor Efficiency (%)**
13 Ton	85.8
15 ton	87.5

13 TON - FAN RPM AT MOTOR PULLEY SETTINGS													
	MOTOR PULLEY TURNS OPEN												
Unit Size	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
13 Ton	N/A	N/A	1132	1105	1078	1051	1024	997	970	943	916	889	862
15 TON - FAN RPM AT MOTOR PULLEY SETTINGS													
	MOTOR PULLEY TURNS OPEN												
Unit Size	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
15 Ton	N/A	N/A	1010	989	968	947	926	905	883	862	841	820	799

* Approximate fan rpm sown.

Evaporator Fan Motor Performance				
Unit Size	**Unit Voltage**	**Max. Acceptable Continuous BHP***	**Max. Acceptable Operating Watts**	**Max. AMP Draw**
13 Ton	208/230	4.25	3775	10.5
	460	4.25	3775	4.9
15 Ton	208/230	5.90	5180	15.8
	460	5.90	5180	7.9

Bhp - Brake Horsepower.

* Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with confidence. Using your fan motors up to the horsepower ratings show n in this table w ill not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

Adjustable Belt Drive Blower

⚠ WARNING

PERSONAL INJURY HAZARD.

Failure to do so could result in personal injury.

Use extreme care during the following procedures and obey Safety Information.

The following safety rules **MUST** always be followed when working near belt drive.

Always Turn The Power Off

Turn electric power to the unit **OFF** before you begin working on it.

Always Wear Protective Clothing

NEVER wear loose or bulky clothes, such as neckties, exposed shirttails, loose sleeves, or lab coats around belt drives. Wear gloves while inspecting sheaves to avoid nicks, burrs, or sharply worn pulley edges.

The blower speed is changed by adjusting the variable speed pulley mounted on the blower motor.

If the blower speed needed is different than the speed of the blower as shipped, follow the steps below to change the blower speed. Before changing the blower speed, read the above safety rules first.

1. Turn electric power **OFF.**
2. Remove the side blower access panel (see **Figure 1**).
3. 13 Ton Only - Loosen belt by loosening carriage nuts holding motor mount assembly to fan scroll side plates (A and B).

   15 Ton Only - Loosen nuts on the 2 carriage bolts in the motor mounting base. Install jacking bolt and plate under motor base (bolt and plate are shipped in installer's packet). Using bolt and plate, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
4. Loosen movable-pulley flange setscrew. See page 16 for air quanity limits.
5. Screw movable flange toward fixed flange to increases speed and away from fixed flange to decrease speed. Increasing fan speed increases load load on motor. Do not exceed maximum speed specified in the performance data listed in this instruction.
6. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table on page 16 for speed change for each full turn of pulley flange.)
7. Replace and tighten belts. See Belt Tension Adjustment section on page 18.

Figure 13 13 TON - Evaporator Fan Motor Adjustment

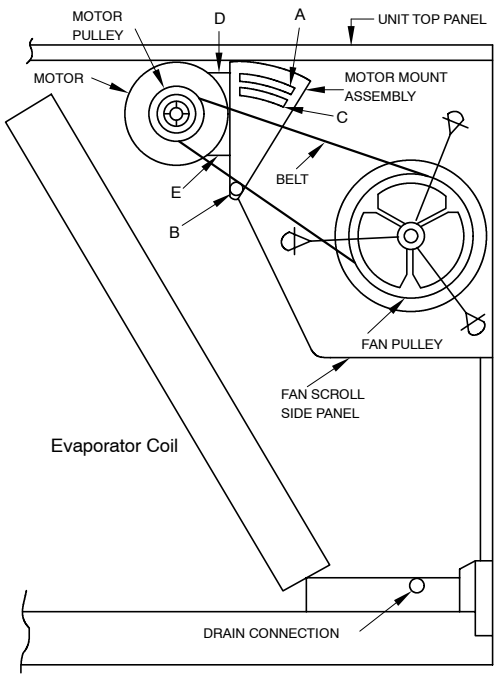
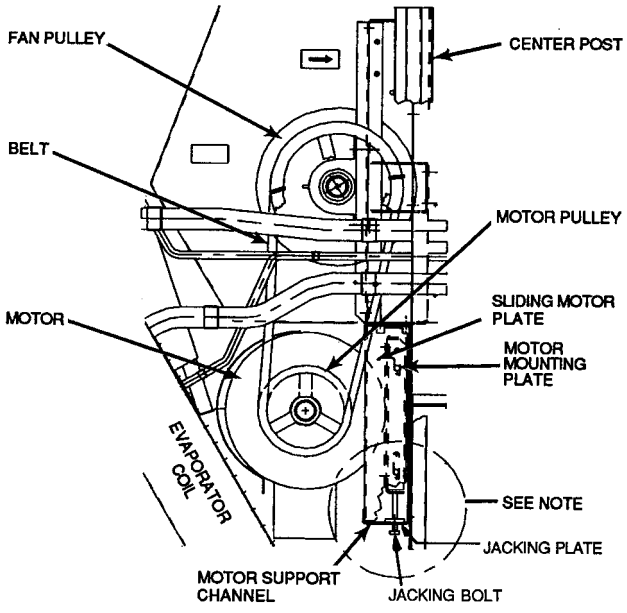


Figure 14 15 Ton Evaporator Fan Motor Adjustment

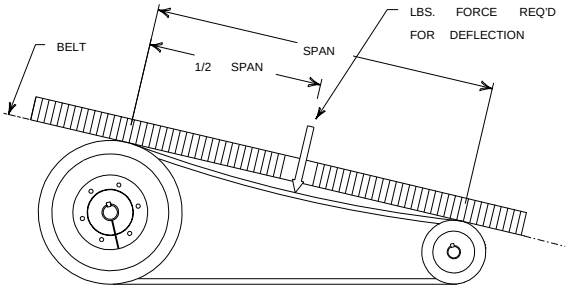


NOTE: A 3-1/2" jacking bolt (1171103) and threaded jacking plate (1171400) are included in the unit's base pan. They should be added to the motor support channel below the motor mounting plate to aid in raising the motor.

Belt Tension Adjustment

Figure 15	Checking Tension and Deflection

PHS156/180 – 3/8" deflection with 8–10 lbs. of force.



1. Turn motor adjustment bolt clockwise until the belt has enough tension at the proper deflection. Use one of the commercially available belt tension gauges to set the correct tension at the proper deflection (see **Figure 15 & 16).**

2. Use a straight–edge (angle iron, straight piece of board or anything with a good straight surface or edge) to check the alignment of the blower pulley with blower motor pulley (see **Figure 16**).

   It may be necessary to back the tension off the belt temporarily and tighten one of the motor mount bolts before it is possible to adjust the angle of the blower motor.

3. Tighten all blower motor mount bolts.

4. Ensure that all bolts, nuts and screws are tightened and ensure that all tools, gloves, etc. are removed from unit.

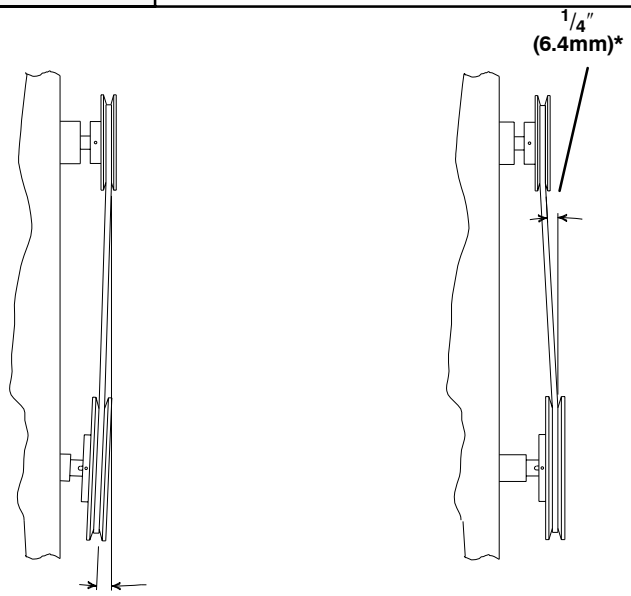
5. Replace side blower access panel before Start–up.

6. During Start–up, listen for any unusual noises or vibrations.

7. Shut down the unit after it runs for a while and check the bearings and motor. If they feel hot, the belt tension may be too tight, bearings may be misaligned or not lubricated correctly, etc.

8. It is a good idea to retension a new belt after a run–in period of about 24 hours. A run–in period of overnight or during a lunch break is better than no run–in period at all.

Figure 16	Checking Pulley Alignment



Start–up Procedure

⚠ WARNING

ELECTRICAL SHOCK, FIRE AND/OR EXPLOSION HAZARD.

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

Use extreme care during all of the following checks and procedures.
Make sure Electric Power is turned OFF as instructed in appropriate steps.

Check the unit's operation as outlined in the following instructions.

Blower and Phasing Check

1. Shut **OFF** electric power at unit disconnect.
2. Check to see that clean, properly sized air filters are installed.
3. Check to see that everything inside the unit is clear and ready to operate safely. Ensure that there are no objects in, on or around the motor, belt or blower wheel.
4. Set thermostat Heat–Cool selector to **OFF**.
5. Set thermostat fan switch to **AUTO**.

⚠ WARNING

MOVING PARTS HAZARD.

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

Do NOT put hands or any other object in, on or around the motor, belt or blower wheel. Ensure that there are no objects in, on or around the motor, belt or blower wheel before turning electric power on.

6. Turn **ON** electric power. Nothing should start running. If any unusual arcing, odors or noises are encountered, shut **OFF** electric power immediately and check for wiring errors.

NOTE: The circulation blower motor and compressor(s) are three phase and are factory synchronized for proper rotation. *Even if the circulation blower motor comes on and air seems to be circulating, it is possible that the blower motor rotation is incorrect due to improper phasing.* The scroll compressor(s) (if equipped) will run backwards under this condition and be damaged. It is therefore necessary to check for proper rotation.

NOTE:

Do NOT operate the unit with the compressor(s) running until proper blower rotation has been confirmed by running the following test.

7. Set thermostat fan switch to **ON**. The circulating air blower should come **ON.**
8. Shut **OFF** electric power at unit disconnect and visually observe the direction of the blower rotation as it slows down. Do **NOT** put hands or any other object in, on or around the belt, motor or blower wheel.

⚠ CAUTION

RISK OF REDUCED EQUIPMENT LIFE

Failure to follow this Caution could result in premature equipment failure.

If blower rotation is incorrect, shut electric power OFF at unit disconnect and reverse any two supply wires at field connections ONLY. Do NOT reverse the blower and/or compressor leads or rewire any internal wiring. After rewiring is done, repeat blower rotation check to ensure that blower rotation is now correct.

9. If blower rotation is correct, reset thermostat fan switch to **AUTO**. The circulating air blower should go **OFF**. Nothing should be running.
10. Shut **OFF** electric power at unit disconnect.

⚠ CAUTION

RISK OF REDUCED EQUIPMENT LIFE

Failure to follow this Caution could result in premature equipment failure.

Do NOT operate the unit with the compressor(s) running until proper blower rotation has been confirmed during the Blower and Phasing Check in the previous section. If the phasing is incorrect, the scroll compressor(s) (if equipped) will run backwards and they will be damaged.

Cooling Checks

1. Be sure that electric power is **OFF**.
2. To check cooling Stage 1, place jumper wires across low voltage terminal board terminals **R** to **G, R** to **Y1**.
3. Turn electric power **ON**. Check to see that the following occurs:
   a. Compressor 1 – **ON**
   b. Condenser fan motor(s) – **ON**
   c. Circulation air blower – **ON** with correct rotation and adequate airflow from ductwork.
4. Shut **OFF** electric power at unit disconnect.
5. To check cooling Stage 2, remove jumper wires from **Y1** and place it on **Y2**.

NOTE: Allow 5 minutes between Steps 4 and 6.

6. Turn **ON** electric power. Check to see that the following occurs:
   a. Compressors 1 & 2 – **ON**
   b. Condenser fan motor(s) – **ON**
   c. Circulation air blower – **ON**
7. Shut **OFF** electric power at unit disconnect**.**

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

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

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

Heating

1. Be sure that electric power is OFF.
2. To check heating Stage 1, place jumper wires across low voltage terminal board terminals R to G, R to W1.
3. Turn electric power ON. Check to see that the following occurs:
   a. Compressor 1 – ON
   b. Condenser fan motor(s) – ON
   c. Circulation air blower – ON with correct rotation and adequate airflow from ductwork.
4. Shut OFF electric power at unit disconnect.
5. To check heating Stage 2, remove jumper wires from W1 and place it on W2.
6. Turn ON electric power. Check to see that the following occurs:
   a. Compressor 1 & 2 – ON
   b. Condenser fan motor(s) – ON
   c. Circulation air blower – ON
7. Shut OFF electric power at unit disconnect.
8. Remove jumpers from low voltage terminal board.
9. Replace all service access panels.

Starting the Unit After Shutdown

Cooling / Heating

⚠ CAUTION

RISK OF REDUCED EQUIPMENT LIFE

Failure to follow this Caution could result in premature component failure.

To prevent possible damage to the compressor(s), do NOT operate on cooling when outdoor temperature is below 35°F (2°C).

1. Turn **ON** electric power.
2. Set thermostat to desired temperature and set system switch to **COOL or Heating**. The unit will come on and operate automatically under control of the thermostat.

   Close all doors and windows. The unit may run continuously for several hours or longer on the initial run because of residual heat and moisture in the building. This is normal for any air conditioning system.

Thermostat Fan Switch Operation

The circulating air blower will run continuously with the fan selector switch in the **ON** position . When the fan selector switch is in the **AUTO** position, the blower will run during each heating or cooling cycle.

Monthly Maintenance and Inspection Checks

Air Filters (Factory Installed)

NOTE:

Do NOT operate unit without all air filters installed in the unit.

Dirty filters are the most common cause of compressor failures and inadequate heating and cooling performance.
Inspect filters at least monthly and replace or clean as required.
Install filters so that the arrows on the side point in the direction of air flow.

Filter racks are accessible through the filter access panel.

Disposable Replacement Filters

For all units: 4 filters 20″ x 20″ x 2″
4 filters 16″ x 20″ x 2″

Condenser Coil

Keep the condenser inlet and outlet area clean and free of leaves, grass clippings and other debris. Grass should be kept short in front of the condenser inlet. Shrubbery **MUST** be trimmed back so it is no closer than 30 inches (762 mm) to condenser coil.

Condensate Drain

Check for condensate drainage. Clean as required.

Annual Maintenance and Inspection

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

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

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

The annual inspection should include cleaning as required to ensure efficient operation of the unit.

The condenser and evaporator fan motors have permanently sealed bearings, so no field lubrication is necessary.

Evaporator-fan motor protection - A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

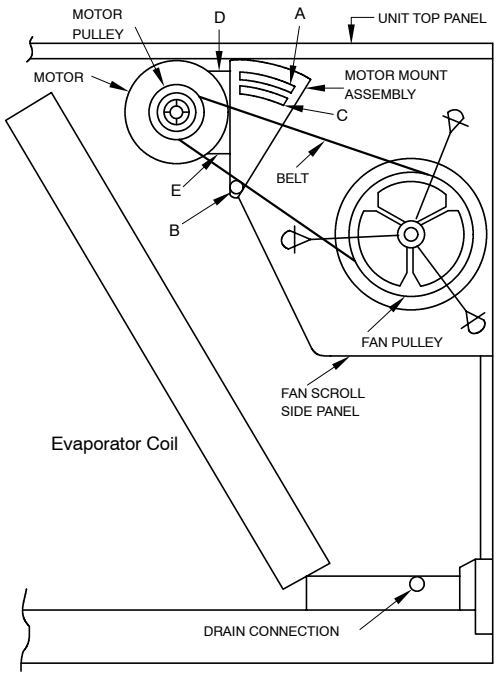
Circulating Air Blower

Visually inspect the blower wheel for accumulations of dirt or lint. Clean the compartment and the blower wheel. If accumulation is excessive on blower wheel or does not remove easily, it will be necessary to remove the blower assembly.

Evaporator Fan Service and Replacements - 13 Ton - Figure 17

1. Remove filter and supply-air section panels.
2. Remove unit top panel.
3. Loosen screws A and B on both sides of motor mount assembly.
4. Loosen screw C.
5. Rotate motor mount assembly(with motor attached) as far as possible away from indoor coil.
6. Remove belt.
7. Rotate motor mount assembly back past original position toward indoor coil.
8. Remove motor mounting nut D and E (both sides).
9. Lift motor up through top of unit.
10. Reverse Steps 1-9 to install new motor.
11. Check and adjust blet tension as necessary.

Figure 17 | **13 Ton Evaporator Fan Motor Adjustment**



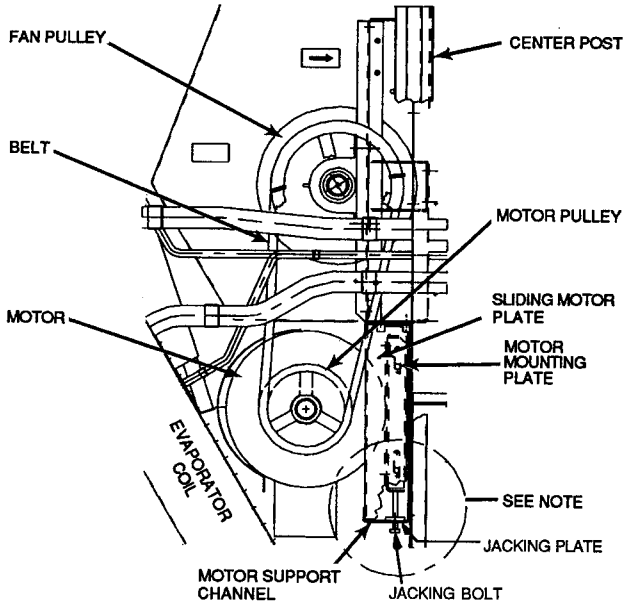
Evaporator Fan Service and Replacements - 15 Ton - Figure 18

The 15 ton units use a fan motor mounting system that features a slide-out motor mounting plate. To replace or service the motor, slide out the bracket.

1. Remove the indoor-fan access panel and the heating control access panel.
2. Remove the center post (located between the indoor fan and heating control access panels) and all screws securing it.
3. Loosen nuts on the two carriage bolts in the motor mounting base.
4. Using jacking bolt under motor base, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
5. Remove the belt drive.
6. Remove jacking bolt and tapped jacking bolt plate.
7. Remove the 2 screws that secure the motor mounting plate to the motor support channel.
8. Remove the 3 screws from the end of the motor support channel that interfere with the motor slide path.
9. Slide out the motor and motor mounting plate.
10. Disconnect wiring connections and remove the 4 mounting bolts.
11. Remove the motor.

12. To install the new motor, reverse Steps 1–11.
13. Check and adjust belt tension as necessary.

Figure 18 **15 Ton Evaporator Fan Motor Adjustment**



NOTE: A 3–1/2" jacking bolt (1171103) and threaded jacking plate (1171400) are included in the unit's base pan. They should be added to the motor support channel below the motor mounting plate to aid in raising the motor.

Heating Checks When Accessory Electric Heater is installed

1. To start unit, turn on main power supply.
2. Set thermostat at HEAT position and a setting above room termperature, and set fan at AUTO position. Upon a call for heating through terminal W1, IFC and heater contactor no. 1 (HC1) are energized. On units equipped for 2 stages of heat, when additional heat is needed HC2 is energized through W2.
3. If unit does not energize, reset limit switch (located on evaporator–fan scroll) by pressing button located between terminals on the switch.

Turning Off the Unit

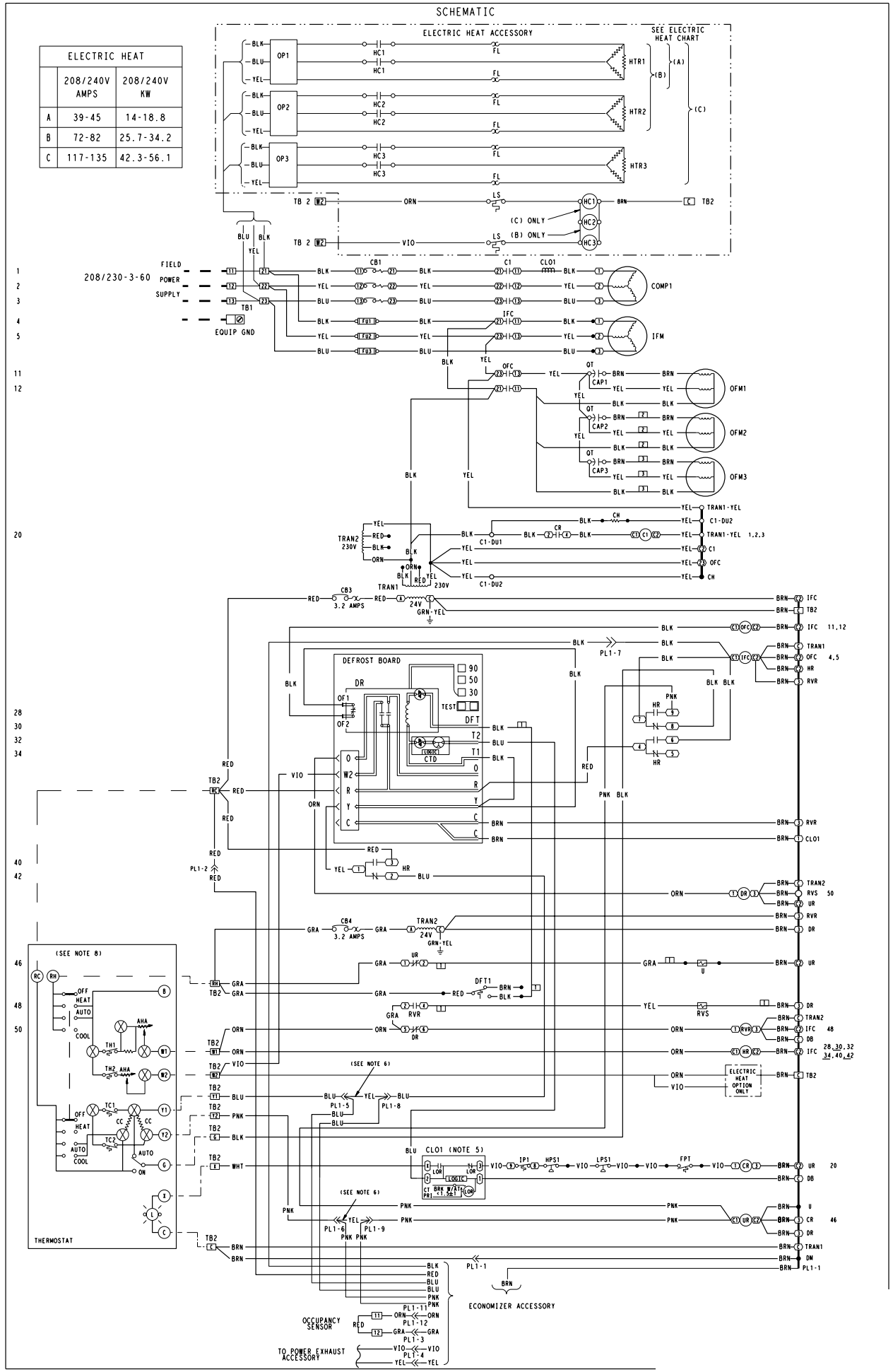
Heating

1. Set system selector switch at OFF position. Resetting heating selector lever below room temperature will shut unit off temporarily until space termperature falls below thermostat setting.

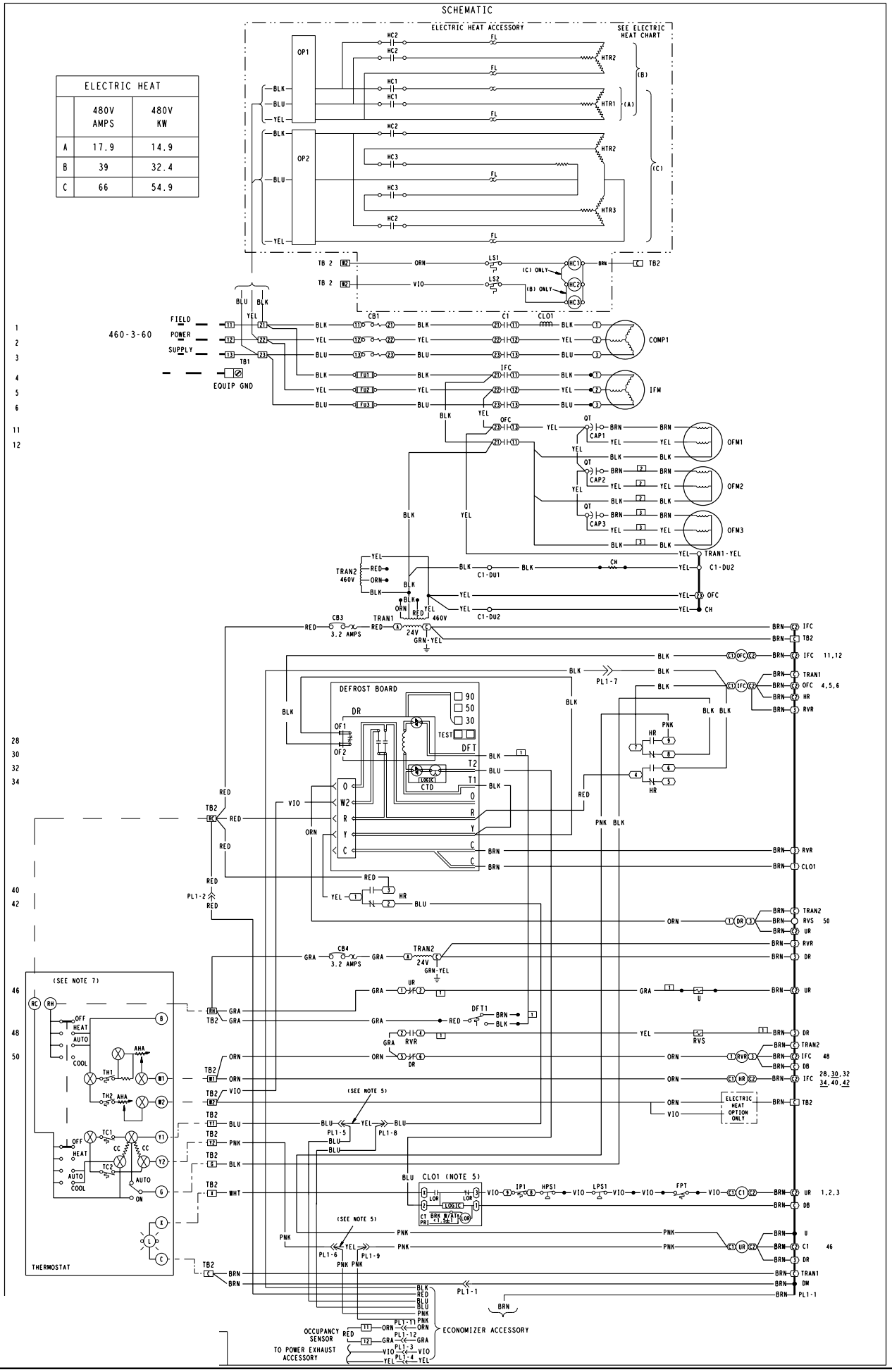
Cooling

1. Set thermostat selector to **OFF** and fan switch to **AUTO**.
2. To shut the unit down completely, shut **OFF** electric power supply at disconnect switch or service panel.

ELECTRIC HEAT		
	208/240V AMPS	208/240V KW
A	39-45	14-18.8
B	72-82	25.7-34.2
C	117-135	42.3-56.1

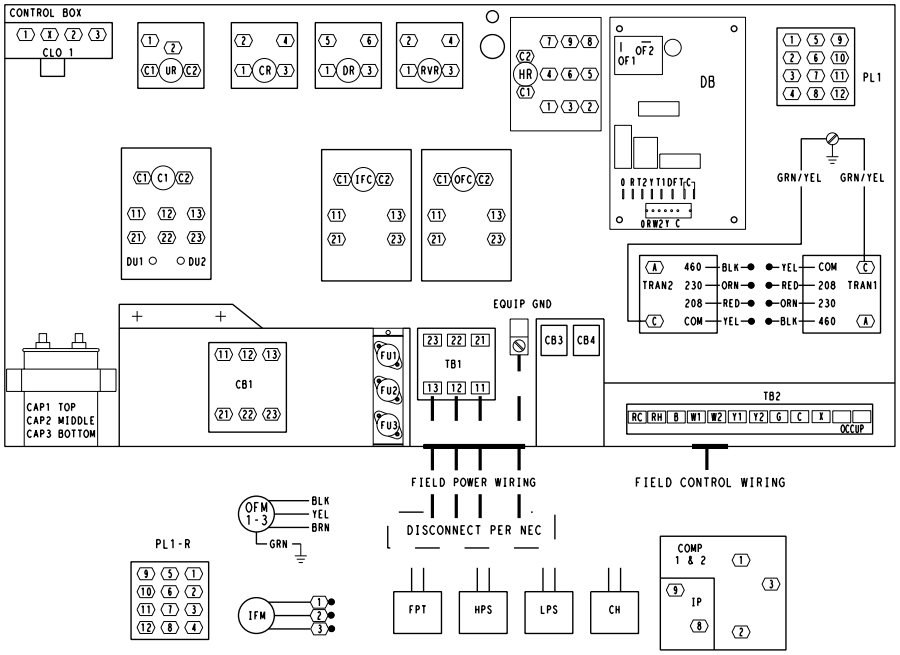


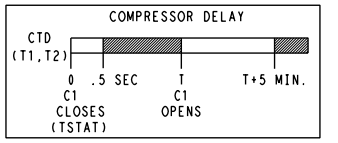
ELECTRIC HEAT		
	480V AMPS	480V KW
A	17.9	14.9
B	39	32.4
C	66	54.9

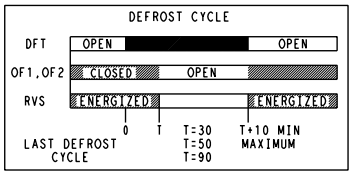


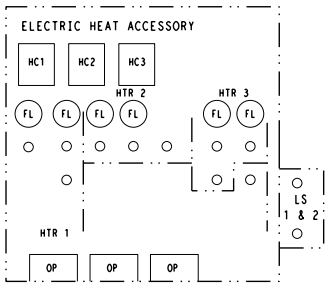
PHE156 Component Layout (All)

COMPONENT ARRANGEMENT









LEGEND

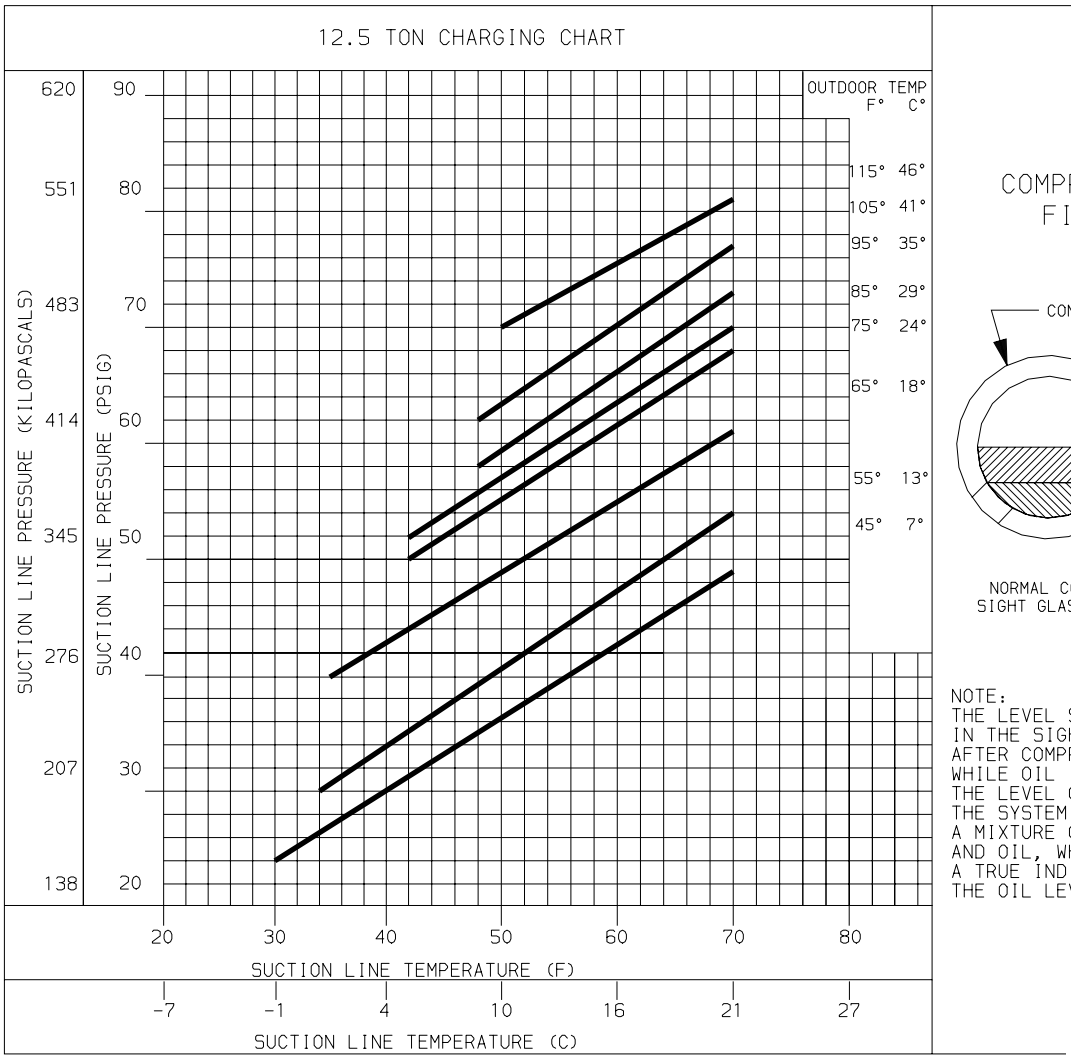
- TERMINAL (MARKED)
- TERMINAL (UNMARKED)
- TERMINAL BLOCK
- SPLICE
- FACTORY WIRING
- FIELD WIRING
- OPTION/ACCESSORY WIRING
- TO INDICATE COMMON POTENTIAL ONLY: NOT TO REPRESENT WIRING

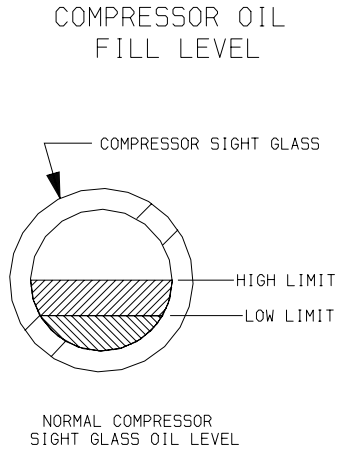
NOTES

1. COMPRESSOR AND/OR FAN MOTOR(S) THERMALLY PROTECTED THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASING CONDITIONS.
2. IF ANY OF THE ORIGINAL WIRE FURNISHED MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE 90°C WIRE OR ITS EQUIVALENT.
3. TRAN1 IS WIRED FOR 230V OPERATION. IF UNIT IS 208V,DISCONNECT THE BLACK WIRES FROM THE ORN TRAN WIRE AND RECONNECT TO THE RED TRAN WIRE,APPLY WIRENUTS TO WIRES.
4. CB1,2 MUST TRIP AMPS ARE EQUAL TO OR LESS THAN 156% FLA,IFCB 140%.
5. THE CLO LOCKS OUT THE COMPRESSOR TO PREVENT SHORT CYCLING ON COMPRESSOR OVERLOAD AND SAFETY DEVICES; BEFORE REPLACING CLO, CHECK THESE DEVICES.
6. JUMPERS ARE OMITTED WHEN UNIT IS EQUIPPED WITH ECONOMIZER.
7. NUMBER(S) INDICATES THE LINE LOCATION OF USED CONTACTS. A BRACKET OVER (2) NUMBERS SIGNIFIES A SINGLE POLE,DOUBLE THROW CONTACT.AN UNDERLINED NUMBER SIGNIFIES A NORMALLY CLOSED CONTACT.PLAIN (NO LINE) NUMBER SIGNIFIES A NORMALLY OPEN CONTACT.
8. REMOVE JUMPER BETWEEN RC & RH.

AHA	ADJUSTABLE HEAT ANTICIPATOR
BRK W/AT	BREAKS WITH AMP TURNS
C	CONTACTOR,COMPRESSOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CC	COOLING COMPENSATOR
CH	CRANKCASE HEATER
CLO	COMPRESSOR LOCKOUT
CLS	COOLING LOCKOUT SWITCH
COMP	COMPRESSOR MOTOR
CTD	COMPRESSOR TIME DELAY
DAT	DISCHARGE AIR THERMISTOR
DB	DEFROST BOARD
DFT	DEFROST THERMOSTAT
DM	DAMPER MOTOR
DR	DEFROST RELAY
DU	DUMMY TERMINAL
EQUIP	EQUIPMENT
FL	FUSE LINK
FPT	FREEZE PROTECTION THERMOSTAT
FU	FUSE
GND	GROUND
HC	HEATER CONTACTOR
HPS	HIGH PRESSURE SWITCH
HR	HEAT RELAY
HTR	HEATER
IFC	INDOOR FAN CONTACTOR
IFCB	INDOOR FAN CIRCUIT BREAKER
IFM	INDOOR FAN MOTOR
IFR	INDOOR FAN RELAY
IP	INTERNAL PROTECTOR
L	LIGHT
LPS	LOW PRESSURE SWITCH
LS	LIMIT SWITCH
OCCUP	OCCUPANCY SENSOR
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
OP	OVERCURRENT PROTECTOR
PL	PLUG ASSEMBLY
RVR	REVERSING VALVE RELAY
RVS	REVERSING VALVE SOLENOID
TB	TERMINAL BLOCK
TC	THERMOSTAT COOLING
TH	THERMOSTAT HEATING
TRAN	TRANSFORMER

PHE156 Charging Chart (All)

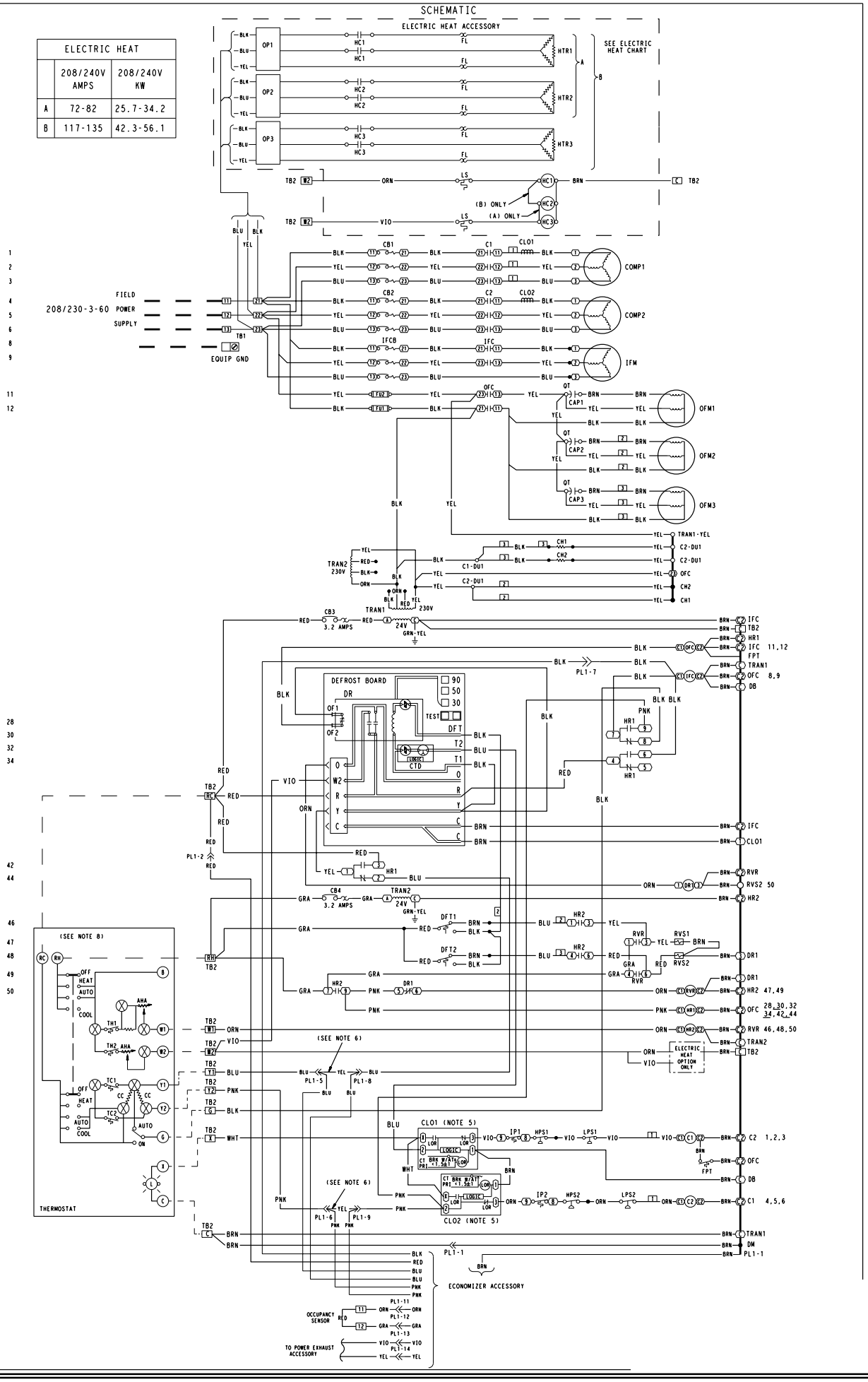




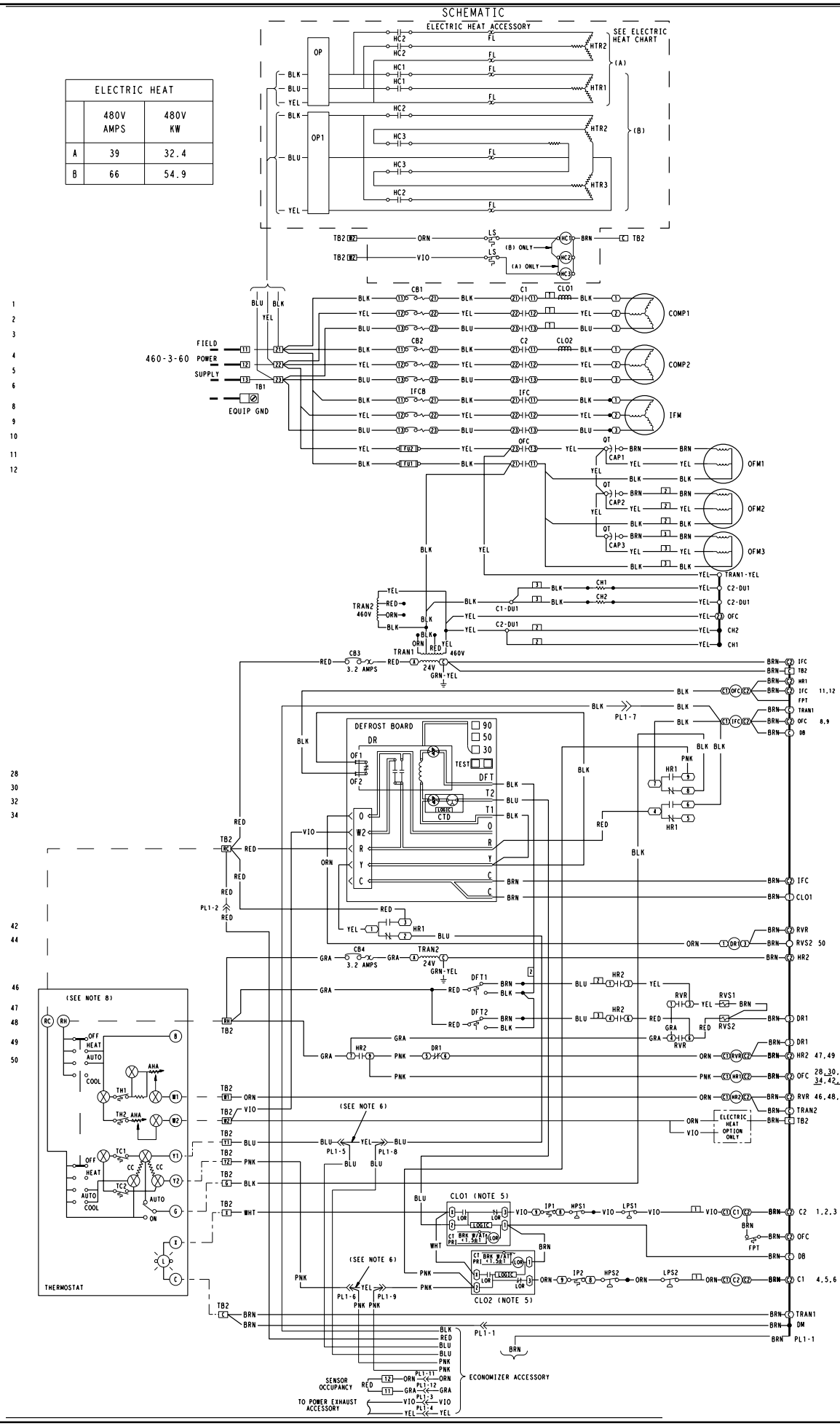
NOTE:
THE LEVEL SHOULD BE OBSERVED IN THE SIGHTGLASS IMMEDIATELY AFTER COMPRESSOR SHUTDOWN WHILE OIL IS STILL WARM. THE LEVEL OBSERVED WHEN THE SYSTEM IS COLD MAY BE A MIXTURE OF REFRIGERANT AND OIL, WHICH WOULD NOT BE A TRUE INDICATION OF THE OIL LEVEL.

SCHEMATIC

ELECTRIC HEAT		
	208/240V AMPS	208/240V KW
A	72-82	25.7-34.2
B	117-135	42.3-56.1

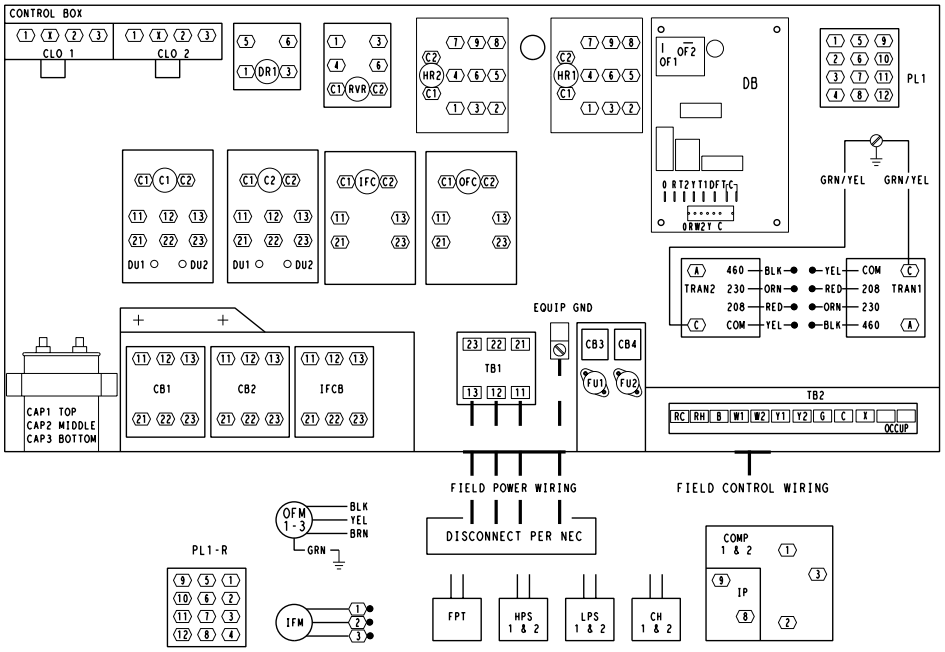


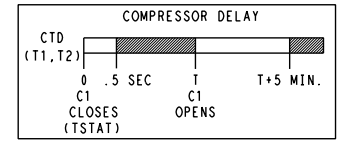
ELECTRIC HEAT		
	480V AMPS	480V KW
A	39	32.4
B	66	54.9

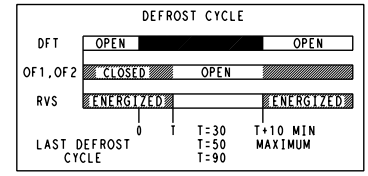


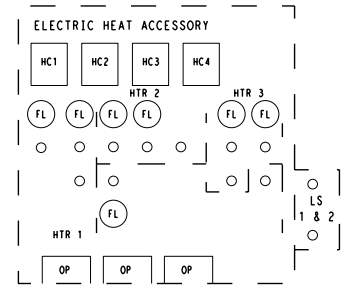
PHE180 Component Layout (All)

COMPONENT ARRANGEMENT









LEGEND

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- TERMINAL (UNMARKED)
- TERMINAL BLOCK
- SPLICE
- FACTORY WIRING
- FIELD WIRING
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BRK W/AT	BREAKS WITH AMP TURNS
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CAP	CAPACITOR
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CH	CRANKCASE HEATER
CLO	COMPRESSOR LOCKOUT
CLS	COOLING LOCKOUT SWITCH
COMP	COMPRESSOR MOTOR
CTD	COMPRESSOR TIME DELAY
DAT	DISCHARGE AIR THERMISTOR
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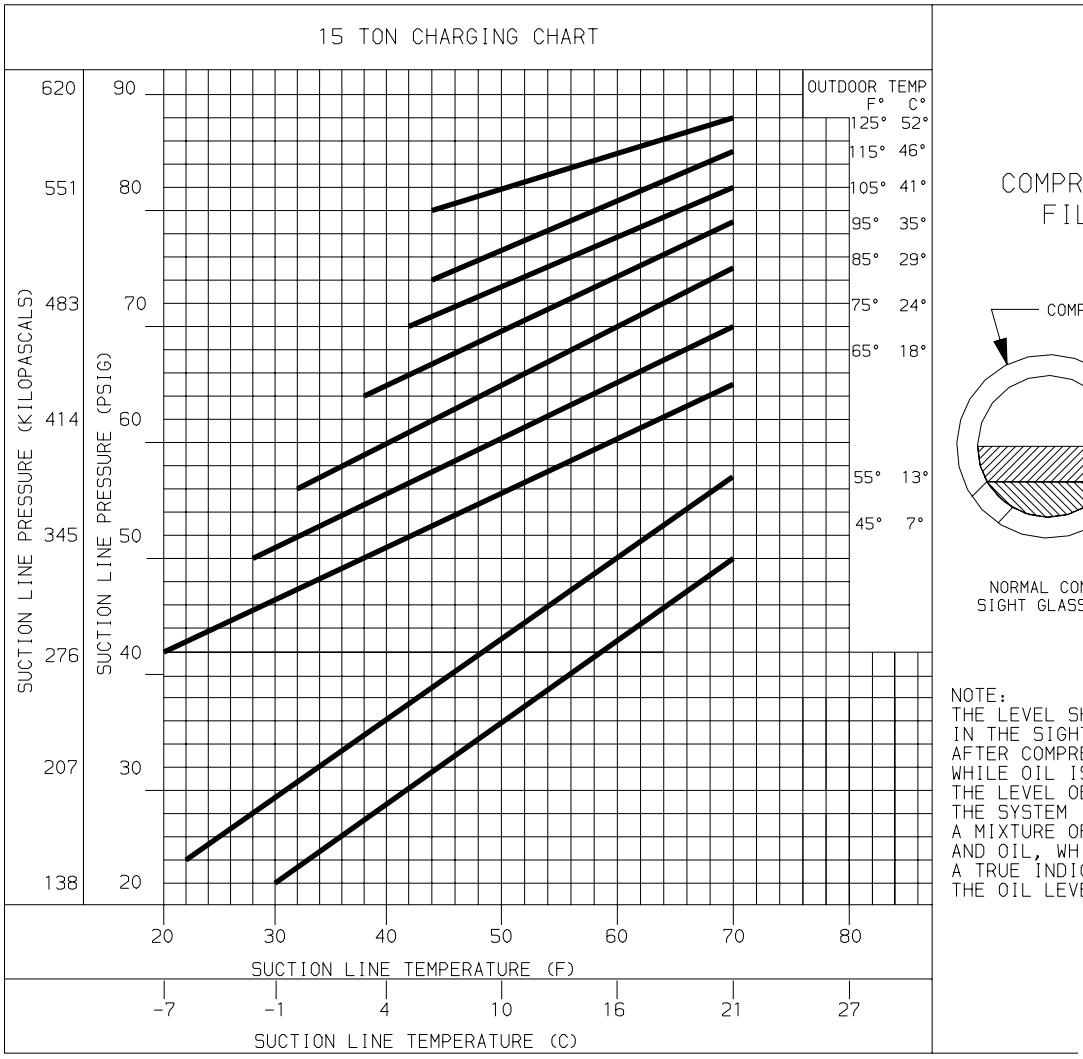
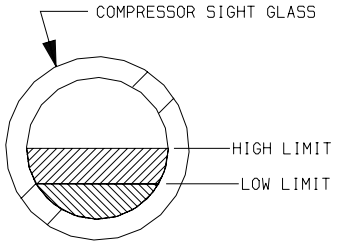
DFT	DEFROST THERMOSTAT
DM	DAMPER MOTOR
DR	DEFROST RELAY
DU	DUMMY TERMINAL
EQUIP	EQUIPMENT
FL	FUSE LINK
FPT	FREEZE PROTECTION THERMOSTAT
FU	FUSE
GND	GROUND
HC	HEATER CONTACTOR
HPS	HIGH PRESSURE SWITCH
HR	HEAT RELAY
HTR	HEATER
IFC	INDOOR FAN CONTACTOR
IFCB	INDOOR FAN CIRCUIT BREAKER
IFM	INDOOR FAN MOTOR
IFR	INDOOR FAN RELAY
IP	INTERNAL PROTECTOR
L	LIGHT
LPS	LOW PRESSURE SWITCH
LS	LIMIT SWITCH
OCCUP	OCCUPANCY SENSOR
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
OP	OVERCURRENT PROTECTOR
PL	PLUG ASSEMBLY
RVR	REVERSING VALVE RELAY
RVS	REVERSING VALVE SOLENOID
TB	TERMINAL BLOCK
TC	THERMOSTAT COOLING
TH	THERMOSTAT HEATING
TRAN	TRANSFORMER

PHE180 Charging Chart (All)



COMPRESSOR OIL FILL LEVEL



NORMAL COMPRESSOR SIGHT GLASS OIL LEVEL

NOTE:
THE LEVEL SHOULD BE OBSERVED IN THE SIGHTGLASS IMMEDIATELY AFTER COMPRESSOR SHUTDOWN WHILE OIL IS STILL WARM. THE LEVEL OBSERVED WHEN THE SYSTEM IS COLD MAY BE A MIXTURE OF REFRIGERANT AND OIL, WHICH WOULD NOT BE A TRUE INDICATION OF THE OIL LEVEL.

PROBLEM	CAUSE	REMEDY
Compressor and condenser fans will not start.	Power failure	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer, or control relay.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
Compressor will not start but condenser fans run.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective run/start capacitor, overload, or start relay.	Determine cause and replace.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker.
Compressor cycles(other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective run/start capacitor, overload, or startrelay.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor or capacitor	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor makes excessive noise (Scroll only)	Compressor rotating in wrong direction	Reverse the 3-phase power leads as described in Start-Up section
Compressor operates continuously.	Dirty air filter	Replace filter.
	Unit undersized for load	Decrease load or increase unit size
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Leaking valves in compressor.	Replace compressor.
	Air in system	Recover refrigerant, evacuate system, and recharge.
	Condesor coil dirty or restricted.	Clean coil or remove restriction.
Excessive head pressure.	Dirty air filter	Replace filter.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharged.	Remove excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
Head pressure too low.	Low refrigerant charge	Check for leaks, repair, and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive suction pressure.	High heat load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Insufficient evaporator airflow	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.
Compressor no. 2 will not run.	Unit in economizer mode.	Proper operation; no remedy necessary.

START-UP CHECKLIST

I. START-UP CHECKLIST (Remove and store in job file)	
Model No:	Serial No:
Date:	Technician:
Unit No:	Job Location:
	Job Name:

II. PRE-START-UP (Insert Checkmark in box as each item is completed)	
☐	Verify that all packing materials have been removed from unit.
☐	Verify installation of indoor fan motor adjustment bolt and plate. (20 ton only)
☐	Verify that condensate connection is installed per installation instructions.
☐	Check all electrical connections and terminals for tightness.
☐	Check that indoor-air filters are clean and in place.
☐	Verify that unit installation is level.
☐	Check fan wheels and propellers for location in housing/orifice and setscrew tightness.
☐	Ensure belt tension is correct and blower pulleys are properly aligned.

III. START-UP			
ELECTRICAL			
Supply Voltage	L1-L2	L2-L3	L3-L1
Compressor AMPS	L1	L2	L3
Compressor AMPS	L1	L2	L3
Indoor-Fan AMPS	L1	L2	L3

TEMPERATURES and PRESSURES		
Outdoor-Air Temperature	°DB	
Return-Air Temperature	°DB	°WB
Cooling Supply air	°DB	°WB
Refrigerant Suction Pressure	PSIG-Circuit # 1	PSIG-Circuit # 2
Refrigerant Temp. (Suction) Pressure	Circuit # 1	Circuit # 2
Refrigerant Discharge	PSIG-Circuit # 1	PSIG-Circuit # 2
Discharge Temperature	°F/C-Circuit # 1	°F/C-Circuit # 2

☐	Verify that 3-phase scroll compressor rotating in correct direction on select models.