

Installation, Start-Up and Service Instructions

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SAFETY CONSIDERATIONS

Installing and servicing air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install or service air conditioning equipment.

Untrained personnel can perform basic maintenance functions such as cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in the literature and on tags and labels attached to unit.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available.

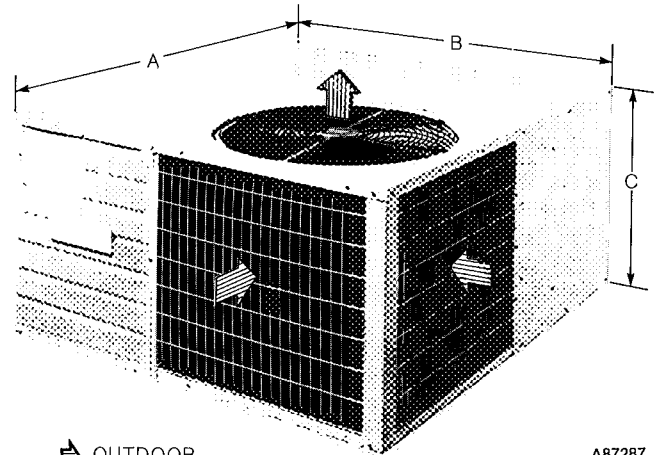
▲ WARNING

Before performing service or maintenance operations on system, turn off main power switches to unit. Turn off accessory heater power switch if applicable. Electric shock can cause personal injury.

INSTALLATION

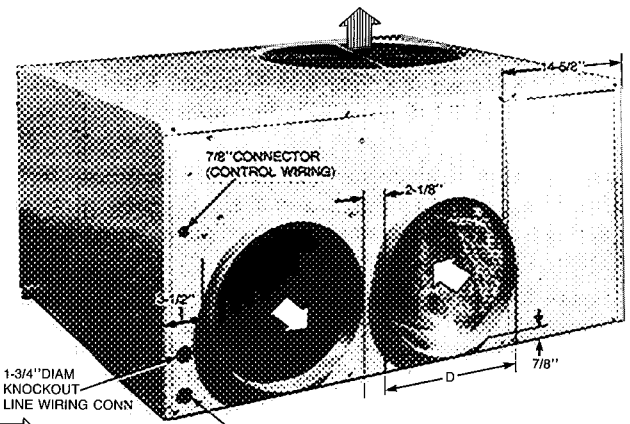
Step 1—Check Equipment and Jobsite

UNPACK UNIT—Move unit to final location. Lift off carton taking special care not to damage unit.



OUTDOOR AIRFLOW

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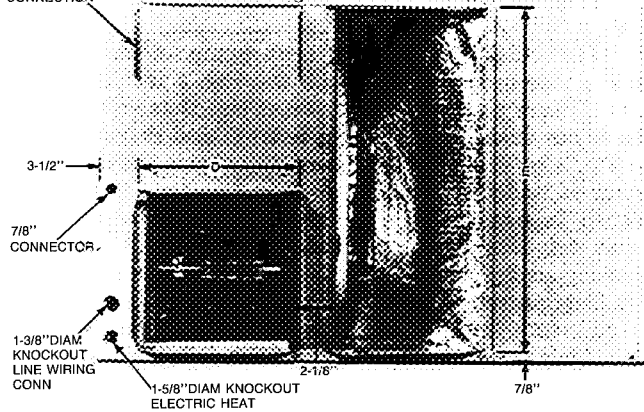
INDOOR AIRFLOW

OUTDOOR AIRFLOW

RIGHT-SIDE VIEW - MODEL 018 048(TYPICAL)

A88061

DUCT FLANGE FOR 14\"/>



3-1/2\"/>

7/8\"/>

1-3/8\"/>

RIGHT - SIDE VIEW - MODEL 060

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Fig. 1—Dimensions and Connections

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Table 1—Physical Data and Dimensions

MODEL 50QQ	018	024	030	036	042	048	060	
REFRIGERANT (R-22) Operating Charge (lb) Refrigerant Control	7 lbs 4 oz	6 lbs 8 oz	8 lbs 0 oz	7 lbs 4 oz Piston	8 lbs 2 oz	9 lbs 0 oz	9 lbs 0 oz	
SHIPPING WEIGHT (lb)	323	329	346	357	402	445	484	
DIMENSIONS (in.)	A B C*		48 42 ¹ / ₈ 24 ¹ / ₂		29 ³ / ₈		32 ⁷ / ₈	
DUCT CONNECTIONS (in.)	D E						Side-By-Side Round† 14	Side-By-Side Rectangular 13 ¹ / ₁₆ x 13 ¹ / ₁₆ 13 ¹ / ₁₆ x 27 ⁷ / ₈
FILTER SIZE (in.)‡ Disposable	20 x 25	20 x 25	(2) 15 x 20	15 x 20 20 x 20	(2) 20 x 20	20 x 25 20 x 20	25 x 25 20 x 25	
Permanent	15 x 20	15 x 20	20 x 20	20 x 25	20 x 25	(2) 15 x 20	(2) 20 x 20	

*Dimension C includes 3/4-in built-in base support channels
 †Optional square duct flanges are available as an accessory for 14-in x 14-in duct.
 ‡Recommended field-supplied filters are one-in. thick.

INSPECT EQUIPMENT—File claim with shipping company if shipment is damaged or incomplete.

COMPLETE SYSTEM REQUIREMENTS before installing.

Consult local building codes and National Electrical Code (NEC) ANSI/NFPA 70-1987 for special installation requirements.

Provide sufficient space for coil airflow clearance, wiring, and servicing unit. See Fig. 1 and 2. Locate unit where supply and return air ducts can be conveniently brought out to unit duct connections.

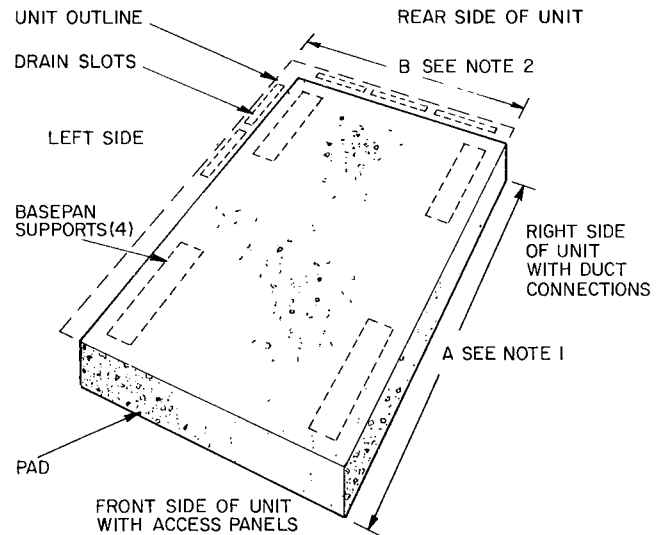
Unit may be placed with duct side as close to building as top removal, duct connections and power connections permit. Position unit so water or ice from roof does not drop directly on top of unit or in front of coil. Make provisions for condensate drainage and defrost water disposal. Maintain a 4-ft clearance above unit for vertical air discharge.

Roof installation method for 50QQ depends on building construction and special requirements of local building codes. Ensure that roof can support unit weight. Protect unit from prevailing winds to ensure adequate defrost.

Step 2—Mount Unit

ON THE GROUND—Mount heat pump on an elevated frame positioned on a level pad. See Fig. 2 for pad dimensions. Ensure pad does not obstruct coil slots in unit basepan. (Slots drain water during heating and defrost cycles. See Fig. 2 for drain slot locations.) Construct pad to provide clearance under basepan coil slots for drainage and ice buildup. In areas where prolonged subfreezing temperatures or snowfall occur, increase clearance to 12 to 18-in. by constructing an angle-iron frame to support unit 12 to 18-in. off base. Design cross angle of frame so as not to obstruct basepan coil slots. See Fig. 3 for recommended frame construction. Alternate construction should follow dimensions. Extend a 24-in. gravel apron around pad for condensate and defrost water drainage field.

ON THE ROOF—Mount unit on a level platform or frame. Elevate unit for proper clearance as described under ground installation above. Design roof and plan water runoff so as to prevent unit and its duct flashing from sitting in water, in accordance with all applicable codes.



- NOTES:
 1 In areas of snowfall or subfreezing temperatures when elevated frame is used Dimension A is 48-in., Dimension B is 42-in. In areas where elevated frame is not used Dimension A is 45-in., Dimension B is 39-in.
 2 Allow a 3-ft service clearance at front and rear sides of unit

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Fig. 2—Pad Dimensions

Step 3—Make Ductwork Connections

CONNECT RETURN AND SUPPLY AIR DUCTWORK—Connect ductwork to unit supply and return air duct connections. Refer to Fig. 1 and Table 1 for unit supply and return air connection sizes and locations.

Flanges are provided on Models 018-048 for round duct connections, on Model 060 for rectangular duct connections. Accessory duct flange kit is available for square or rectangular connections on 018-048 units. Refer to accessory Installation Instructions on page 5 for connections to ductwork.

Fig. 4 shows a typical duct system with 50QQ installed. Do not operate unit longer than 5 minutes without ductwork or damage to blower motor may result.

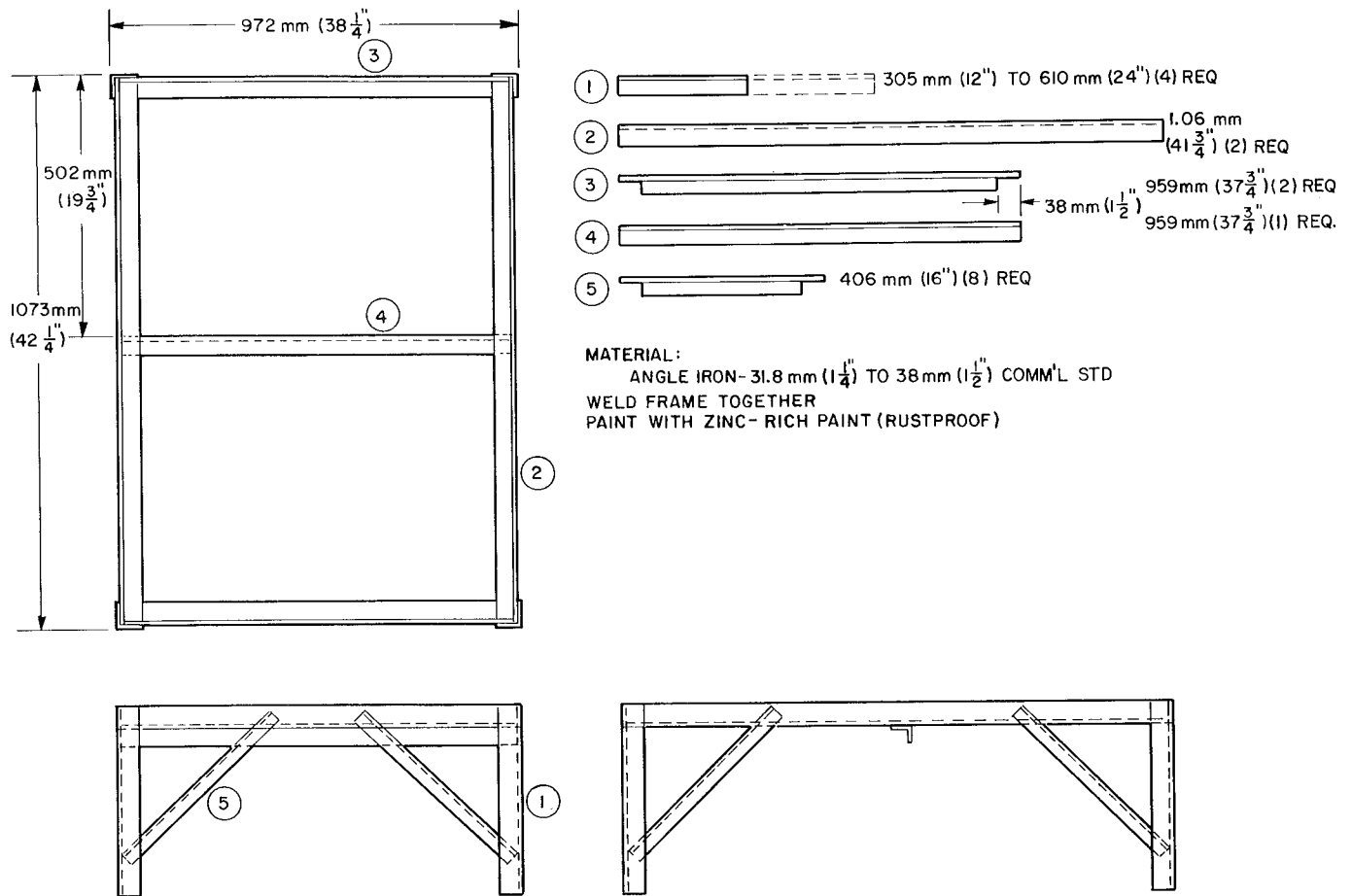
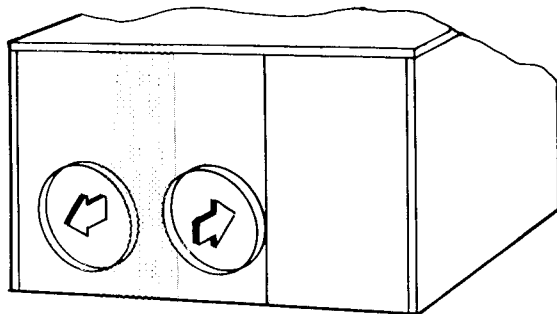


Fig. 3—Heat Pump Mounting Frame

When designing and installing ductwork, consider the following:

1. When connecting ductwork to 042, 048 and 060 units, do not drill deeper than one inch in shaded area shown below. Coil may be damaged.



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2. Install field-supplied filters in return air ductwork. Recommended sizes for filters are shown in Table 1.
3. Avoid abrupt duct size increases and reductions. Abrupt change in duct size adversely affects air performance.
4. Use flexible connectors between ductwork and unit to prevent transmission of vibration. When electric heater is installed, use fireproof canvas (or similar heat resistant material) connector between ductwork and unit

discharge connection. If flexible duct is used, insert a sheet metal sleeve inside duct. Heat resistant duct connector (or sheet metal sleeve) must extend 24-in. from electric heat element.

5. Size ductwork for cooling air quantity (cfm). The minimum air quantity for proper electric heater operation is listed below. Heater limit switches may trip at air quantities below those recommended.

MODEL	INDOOR FAN SPEED SETTING	MIN CFM
50QQ		
018		675
024		875
030		875
036	Low	1400
042		1400
048		1700
060		1800

6. Insulate and weatherproof all external ductwork. Insulate and cover with a vapor barrier all ductwork passing through unconditioned spaces. Follow latest SMACNA (Sheet Metal and Air Conditioning Contractors National Association) minimum installation standards for residential heating and air conditioning systems.
7. Secure all ducts to building structure. Weatherproof duct openings in wall or roof according to good construction practices.

Table 2—Accessories

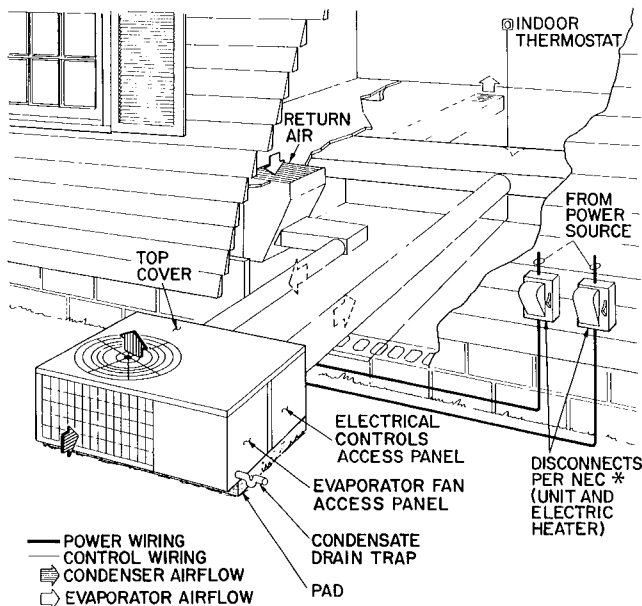
PARAT NO.	DESCRIPTION	MODEL 50QQ
99TZ900521	Thermostat Subbase 1-stage cooling, automatic changeover 2-stage heating, Carrier, Honeywell	All
99TZ900571	Thermostat Subbase 2-stage cooling, manual changeover 2-stage heating, Carrier, Honeywell	All
50LQ90002106	Solid-State Time Guard® Control (Six 50LQ900021)	All
50LQ90001106	Service Sentry (Six 50LQ900011)	All
38RQ900012	Supplemental Heat Relay—Used with 25 kW heater and 2 outdoor thermostats	060
50LQ90000106	Outdoor Thermostat (Six 50LQ900001)	All
50LQ900031	Reversible Filter Drier and AccuRater Assembly	All
32LT900301	Motormaster® Head Pressure Control	All 208/230-v
32LT900611	Motormaster Head Pressure Control	All 460-v
50YM900051	Duct Flange Kit	018-048
88EM0050MA01	Electric Heater—5 kW, 240-1	All
88EM0075MA01	Electric Heater—7.5 kW, 240-1	All
88EM0100MA01	Electric Heater—10 kW, 240-1	All
88EM0150MA01	Electric Heater—15 kW, 240-1	030-060
88EM0200MA01	Electric Heater—20 kW, 240-1	036-060
88EM0250MA01	Electric Heater—25 kW, 240-1	060
88EM0100EA01	Electric Heater—10 kW, 240-3	030-060
88EM0150EA01	Electric Heater—15 kW, 240-3	030-060
88EM0200EA01	Electric Heater—20 kW, 240-3	042-060
88EM0250EA01	Electric Heater—25 kW, 240-3	060
88EM0100FA01	Electric Heater—10 kW, 480-3	036-060
88EM0150FA01	Electric Heater—15 kW, 480-3	036-060
88EM0200FA01	Electric Heater—20 kW, 480-3	036-060
88EM0250FA01	Electric Heater—25 kW, 480-3	060
HC95DE023	Start Capacitor*	018
HC95DD058	Start Capacitor*	024, 030
HC95DE088	Start Capacitor*	036-048
HC95DE208	Start Capacitor*	060
HN61HB510	Start Relay*	018
HN61KB021	Start Relay*	024-048
HN61KB075	Start Relay*	060

*Available through Service Parts

NOTE: Electric heaters are rated at 240 and 480 volts

Step 4—Provide for Cooling Cycle condensate Disposal— Condensate may be drained directly onto gravel apron or connected by drain line(s) to a dry well. Follow local codes.

CONNECT DRAIN LINE to rubber condensate drain fitting on side of unit (see Fig. 5). Use clamp provided. Install factory-supplied condensate trap (taped to indoor fan compartment for shipment) at end of drain line. If a drain line is not used, connect condensate trap to unit drain fitting as shown in Fig. 4.



*Separate disconnect per NEC required for electric heater

Fig. 4—Typical Installation

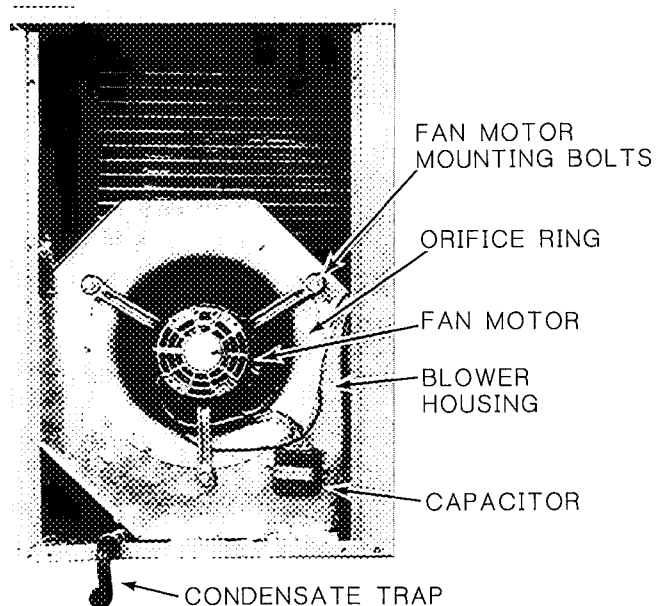


Fig. 5—Condensate Drain and Trap Details

Step 5—Make Electrical Connections—Install field wiring in compliance with local and national fire, safety and electrical codes. Be sure voltage to unit is within $\pm 10\%$ of voltage indicated on nameplate. Contact local power company for correction of improper line voltage.

Operation of unit on improper line voltage constitutes abuse and may cause unit damage that could affect warranty.

See Table 3 for recommended fuse sizes.

INSTALL A BRANCH CIRCUIT DISCONNECT PER NEC of adequate size to handle unit starting current. Provide a separate disconnect for unit and for each accessory electric heater circuit as required. (See electric heater Installation, Start-Up and Service Instructions.) Locate disconnect(s) within sight from and readily accessible from the unit, per Section 440-14 of National Electrical Code (NEC).

ROUTE LINE POWER LEADS INTO UNIT—Extend leads from disconnect per NEC through hole provided (Fig. 1) into line wiring splice box. Use copper wire only.

CONNECT GROUND LEAD TO GROUND LUG in splice box for safety. Connect power wiring. See Fig. 7. Connect line power leads to yellow and black pigtails on single-phase units.

SET INDOOR FAN MOTOR SPEED—Refer to page 3 for minimum allowable air quantity for safe electric heater operation. Indoor fan motor is factory wired for low-speed operation on all models. Fan motor is equipped with spade-type speed selector terminals marked 1, 2 and 3 on 3-speed motors (042 and 048), and 1 and 2 on 2-speed motors (018, 024, 030, 036 and 060).

For electric heater operation, set motor at: **LOW**—sizes 018 through 042, and 060; **MED**—size 048.

MOTOR TERMINAL	1	2	3
FAN SPEED (3-speed, 042, 048)	High	Medium	Low
FAN SPEED (2-Speed, 018-036, 060)	High	Low	—

For air delivery performance, refer to Table 4.

ROUTE CONTROL POWER WIRES (24v) through $\frac{7}{8}$ -in. connector provided in unit, Fig. 1. Extend leads to unit control wiring terminal board in unit control box, Fig. 6. Connect leads to terminal board as shown in Fig. 8.

The unit transformer supplies 24-v power for complete system including accessory electric heater. A resettable circuit breaker is provided in the 24-v circuit.

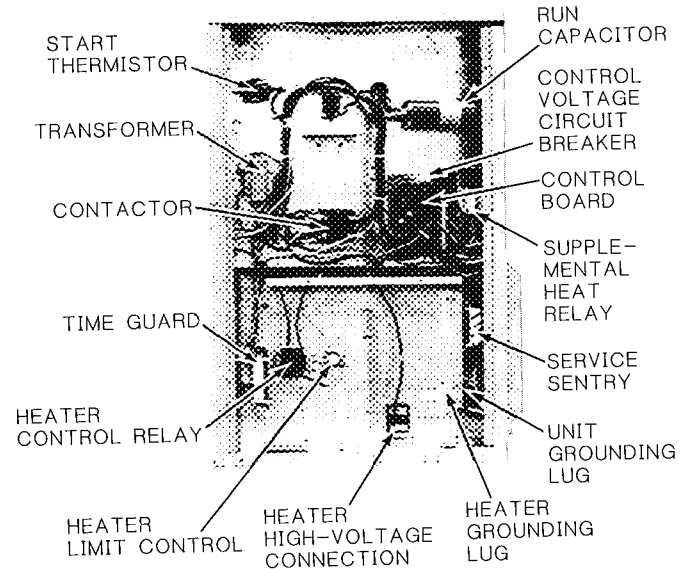


Fig. 6—Control Section

ACCESSORY DUCT FLANGE KIT INSTALLATION—018-048

1. Refer to Fig. 8 for duct adapter dimensions and hole locations.
2. Mark hole locations.

Table 3—Unit Electrical Data (60 Hz)

MODEL 50QQ	V-PH	OPER VOLTAGE*		COMPRESSOR		IFM FLA	OFM FLA	MAX FUSE† OR HACR CKT BKR AMPS	MCA
		Max	Min	LRA	RLA				
018	208/230-1	253	187	50.0	9.3	3.5	1.4	25	16.5
024				53.0	11.6	3.5	1.4	30	19.4
030				65.0	13.9	3.5	1.4	35	22.2
036				82.0	17.2	3.5	2.2	40	27.2
042				106.0	20.7	3.5	2.2	50	31.6
048				110.0	22.4	4.6	2.2	50	34.8
060				178.0	30.2	6.7	2.8	60	47.3
030	208/230-3	253	187	53.0	8.1	3.5	1.4	20	15.0
036				67.5	10.8	3.5	2.2	25	19.2
042				79.5	12.0	4.6	2.2	30	21.8
048				90.0	14.6	4.6	2.2	35	25.0
060				124.0	20.5	6.7	2.8	45	35.1
036	460-3	506	414	33.8	5.0	1.7	0.7	15	8.7
042				39.8	6.3	2.0	1.3	15	11.2
048				45.0	7.0	2.0	1.3	15	12.1
060				62.0	10.3	3.4	1.3	25	17.6

- FLA — Full Load Amps
- HACR—Heating, Air Conditioning, Refrigeration
- IFM — Indoor Fan Motor
- LRA — Locked Rotor Amps
- MCA — Minimum Circuit Amps
- OFM — Outdoor Fan Motor
- RLA — Rated Load Amps

*Permissible limits of the voltage range at which units will operate satisfactorily.

†Maximum dual element fuse

NOTE: Use copper wire only.

Table 4—Air Delivery (Cfm) Performance

MODEL 50QQ	UNIT VOLTAGE	BLOWER MOTOR SPEED	COIL	EXTERNAL STATIC PRESSURE (in. wc)										
				0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018-10	230	Low	Dry	—	—	—	—	—	800	730	640	—	—	—
		Wet	—	—	—	—	—	750	680	550	—	—	—	
		High	Dry	—	—	—	—	—	820	680	550	—	—	—
		Wet	—	—	—	—	—	785	685	575	—	—	—	
024-10	230	Low	Dry	1450	1410	1375	1320	1345	1175	1090	985	850	760	—
		Wet	1390	1340	1290	1225	1165	1105	1020	915	740	—	—	
		High	Dry	1500	1475	1435	1390	1335	1260	1180	1090	980	840	—
		Wet	1460	1405	1350	1295	1255	1190	1110	1020	870	—	—	
030-10 & 30	230	Low	Dry	—	—	1425	1360	1295	1235	1160	1080	995	925	815
		Wet	—	—	1380	1315	1250	1190	1125	1045	960	895	805	790
		High	Dry	—	—	1500	1425	1245	1275	1190	1120	1020	935	830
		Wet	—	—	1450	1375	1295	1230	1145	1080	985	905	805	805
036-10 & 30 042-10	230, 460	Low	Dry	—	—	1440	1400	1345	1290	1225	1140	1040	930	—
		Wet	—	—	1400	1365	1290	1240	1185	1090	990	890	—	—
		High	Dry	—	—	1500	1460	1410	1345	1270	1195	1075	930	—
		Wet	—	—	1465	1430	1365	1300	1230	1145	1020	890	—	—
042-30 048-10 & 30	230, 460	Low	Dry	1850	1810	1770	1725	1685	1640	1600	1535	1480	1410	1345
		Wet	1820	1775	1730	1695	1650	1610	1555	1500	1440	1385	1320	1320
		Med	Dry	1960	1915	1885	1830	1780	1725	1655	1600	1540	1470	1400
		Wet	1895	1880	1850	1850	1795	1745	1690	1620	1565	1510	1445	1375
		High	Dry	2230	2160	2120	2070	2010	1950	1890	1820	1750	1675	1590
		Wet	2145	2105	2060	2000	1940	1880	1820	1750	1690	1615	1540	1540
		Low	Dry	2395	2365	2335	2290	2245	2205	2150	2100	2050	2000	1915
		Wet	2375	2325	2295	2250	2225	2180	2135	2070	2020	1960	1875	1875
		High	Dry	2570	2525	2470	2425	2370	2335	2265	2220	2160	2100	2030
		Wet	2550	2485	2435	2385	2345	2310	2235	2190	2130	2075	2000	2000

NOTES:

1. Air delivery values are based on 230- or 460-volt unit operating voltage without air filter or optional electric heaters. Deduct field-supplied air filter and electric heater pressure drop to obtain external static pressure available for ducting.
2. Dashes indicate portions of table that are beyond blower motor capability.
3. Do not operate unit at a cooling airflow less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Indoor coil icing may occur at airflows below this point.

3. Using duct flange as a template, make sure marked locations line up with clearance holes on flanges.
4. At marked locations, drill screw engagement holes using a #26 (.147-in.) twist drill.

CAUTION
On 042, 048, do not drill deeper than one inch in shaded area. Damage to refrigerant coil could result.

5. Attach duct adapters using #10B, 1/2-in. long screws supplied in accessory kit.
6. Finished kit installation accommodates a 14-in. x 14-in. duct.

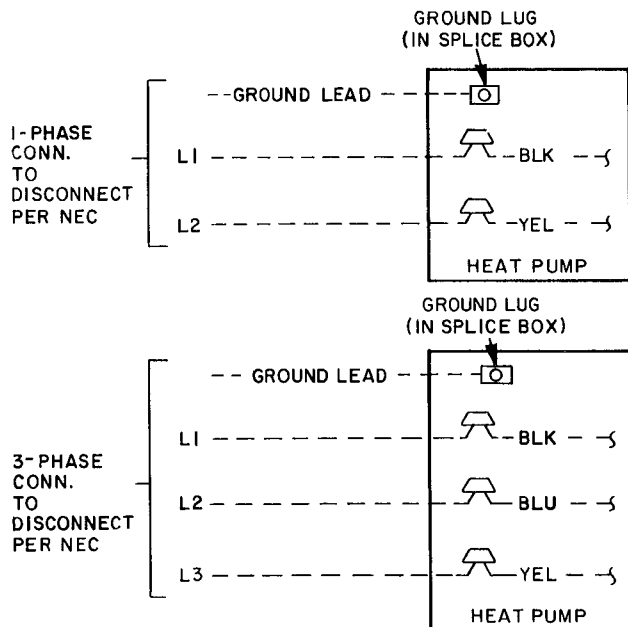


Fig. 7—Line Power Connections

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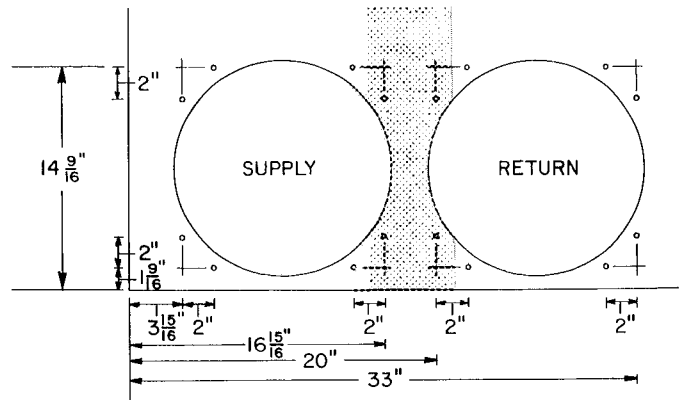
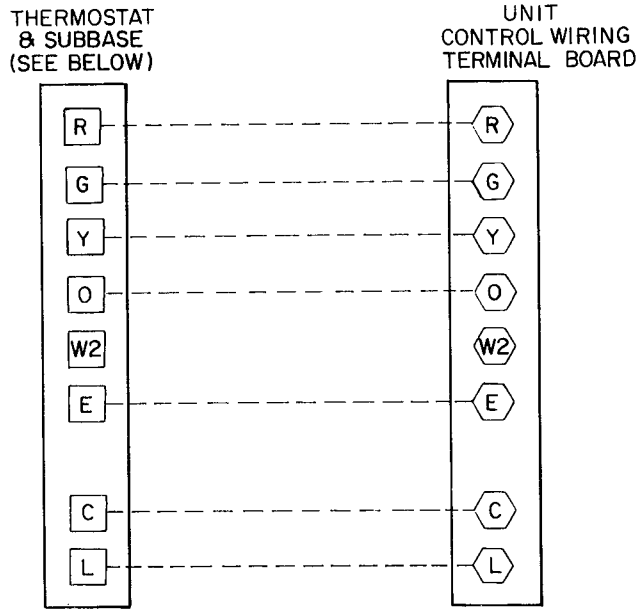


Fig. 8—Duct Flange Kit Dimensions and Hole Locations

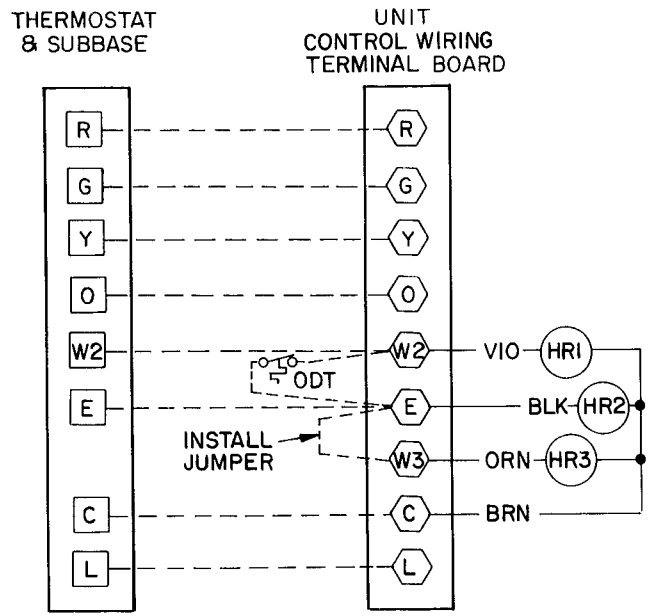
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ELECTRIC HEATER INSTALLATION—For complete heater installation data, refer to separate accessory electric heater Installation, Start-Up and Service Instructions.



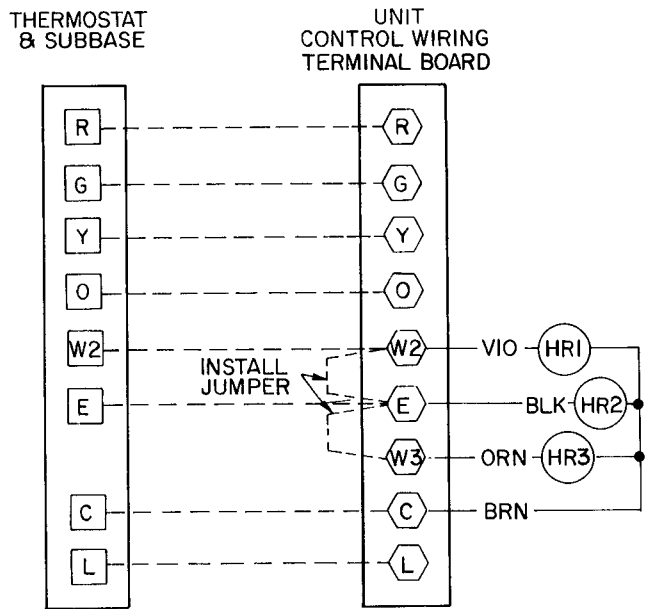
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COOLING AND ONE-STAGE HEATING
(without Electric Heater)



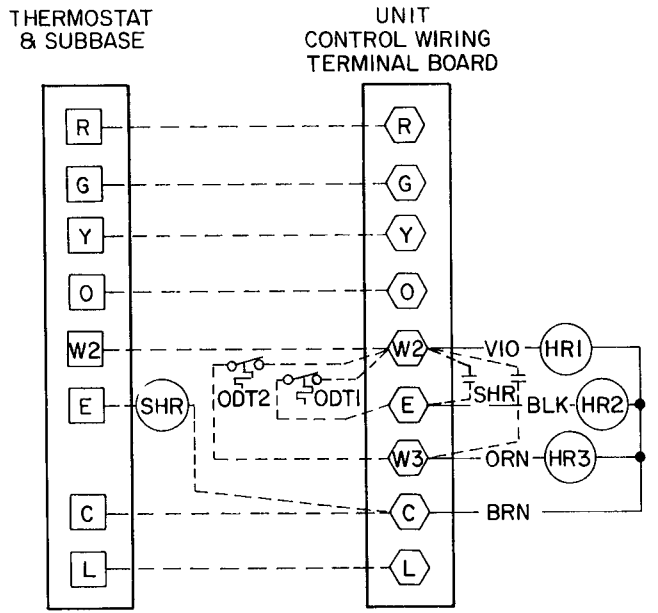
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COOLING AND TWO-STAGE HEATING
(Unit equipped with Electric Heater, Supplemental Heat, One Outdoor Thermostat)



A88055

COOLING AND TWO-STAGE HEATING
(Unit equipped with Electric Heater, Supplemental Heat, No Outdoor Thermostats)



A88054

COOLING AND TWO-STAGE HEATING
(Unit equipped with Electric Heater, Supplemental Heat Relay, Two Outdoor Thermostats)

Fig. 9—Control Connections

START-UP

The 50QQ unit compressors are equipped with crankcase heaters. It is recommended that heater be energized a minimum of 24 hours before starting unit. To energize heater only, set thermostat at OFF position; turn on unit main power at disconnect switch.

Heat Anticipator Settings for Room Thermostat—Set anticipator settings for room thermostat according to separate accessory electric heater Installation Instructions.

Accessory Outdoor Thermostat provides adjustable outdoor control of accessory electric heaters of 15 kW and larger. This thermostat makes contact when a drop in outdoor temperature occurs. It energizes a stage of electric heat when the outdoor temperature setting is reached, provided the room thermostat is on the second stage of heating. An outdoor thermostat is recommended for the second stage of electric heat. Refer to heat load of building and unit capacity to determine the correct outdoor thermostat setting.

The accessory supplemental heat relay is required when 2 outdoor thermostats are used. It is automatically energized by the manually operated supplemental heat switch in the indoor thermostat subbase. The indoor thermostat locks out compressor and the relay bypasses the outdoor thermostats for electric heater operation during heat pump shutdown. When one outdoor thermostat is used, a supplemental heat relay is not required. The supplemental heat switch in the indoor thermostat subbase bypasses outdoor thermostat, locks out compressor and activates electric heater.

MOUNT OUTDOOR THERMOSTAT—Locate maximum of 2 outdoor thermostats in the controls section on the center post to the left of the electric heater. Fasten with screws in holes provided. Route capillary tube per instructions in thermostat package.

MOUNT SUPPLEMENTAL HEAT RELAY in low-voltage section of control box to right of low-voltage connections, using holes provided.

To Start Unit—Check that main power is on and that compressor crankcase heater has been energized for at least 24 hours.

1. Check that heater main power is on as applicable.
2. Set selector switch at OFF.
3. Set fan switch as desired (FAN) (AUTO.).
4. Set thermostat dial at the desired temperature.
5. Set selector switch at HEAT or COOL. Check system refrigerant charge as described under Service.

Unit Single-Phase Compressors are Equipped with a Compressor Start Thermistor (PTC device)—When supply voltage is within 10% limit and compressor does not start, check the start thermistor with an ohmmeter.

CHECKING START THERMISTOR

1. Shut off all power to unit and wait 10 minutes for thermistor to cool to ambient temperature.
2. Remove thermistor from circuit.
3. Measure resistance of thermistor with ohmmeter. Normal resistance readings are 25 ohms \pm 20% at 75 F ambient temperature.
4. If ohmmeter resistance reading is not within \pm 20%, the thermistor is defective and must be replaced.

If start thermistor is good and compressor does not start, disconnect the thermistor from starting circuit and give compressor a temporary capacitance boost. Run compressor for 10 minutes, then shut off and allow system pressure to

equalize. Reconnect start thermistor and try restarting compressor without boost capacitor. If after 2 attempts the compressor does not start, remove thermistor and add an accessory start capacitor and relay.

SERVICE

▲ WARNING

Before installing or servicing unit, turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

Unit Controls and Safety Devices

The following controls are used on all units:

HIGH-PRESSURE RELIEF VALVE (Safety Control) is located in compressor. Relief valve opens at a pressure differential of approximately 450 psi between suction (low side) and discharge (high side) to allow pressure equalization.

INTERNAL CURRENT AND TEMPERATURE SENSITIVE OVERLOAD (Safety Control) resets automatically when internal compressor motor temperature drops to a safe level. When an internal overload is suspected of being open, check by using an ohmmeter or continuity tester.

DEFROST CONTROL, consisting of a control board and defrost thermostat, interrupts normal system heating operation to remove frost and ice formation on outdoor coil. Frost impairs unit performance. Defrost control simultaneously stops outdoor fan, energizes reversing valve solenoid to switch system into cooling cycle (outdoor unit as condenser, indoor unit as evaporator), and activates accessory electric heater. Unit can defrost every 90 minutes, but will do so only if outdoor temperatures are in the frosting temperature zone.

For heat pump to defrost, 2 conditions are necessary:

1. Defrost timer contacts must be closed.
2. Refrigerant temperature must be cold enough to cause defrost thermostat contacts to close. Contacts close at 27 ± 5 F.

Every 90 minutes of elapsed running time, the defrost timer contacts close for 10 seconds. If the defrost thermostat contacts are closed, the unit defrosts. The defrost timer limits defrosting period to 10 minutes. Normally the frost is removed and the defrost thermostat contacts will open to terminate defrosting before 10 minutes have elapsed. Defrost thermostat contacts open at 80 ± 6 F. When defrosting is terminated, the outdoor fan motor is energized and reversing valve solenoid is de-energized, returning unit to heating cycle.

The 90-minute period to check for defrost can be changed to 50 or 30 minutes by moving a jumper wire on the defrost printed-circuit board.

HEAT PUMP CIRCUITS shown in Fig. 10 are refrigerant flow diagrams for heating and cooling cycles.

Refrigerant Charging

▲ WARNING

Avoid contact with hot gas discharge line to prevent a burn when working on compressor.

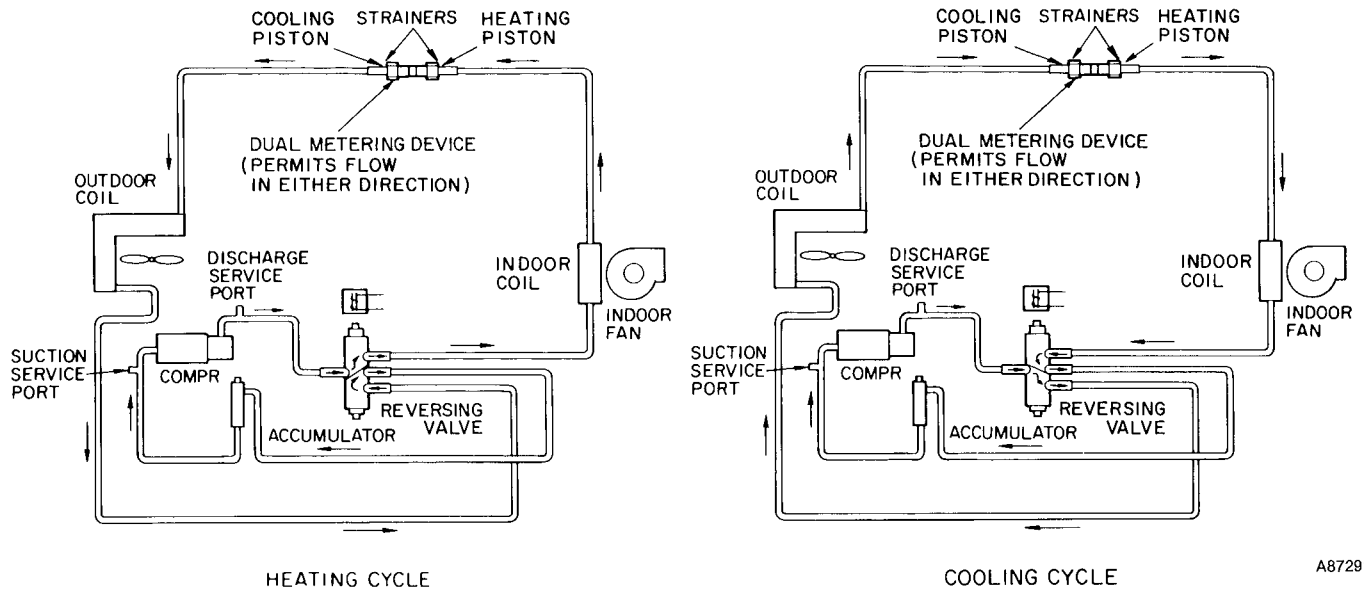


Fig. 10—Refrigerant Flow Diagrams

Table 5—Service Data

MODEL 50QQ	018	024	030	036	042	048	060
R-22 CHARGE* (lb)	7 lbs 4 oz	6 lbs 8 oz	8 lbs 0 oz	7 lbs 4 oz	8 lbs 12 oz	9 lbs 0 oz	9 lbs 0 oz
Piston Htg/clg.	52/42	61/49	67/32	76/63	78/70	82/73	93/84
INDOOR FAN	Centrifugal—Direct Drive						
Rpm		840		840		1100	1100
Diameter (in.)	10				12		
Width (in.)	6				6		
Range (cfm)	525-750	700-1000	875-1250	1020-1450	1170-1670	1340-1920	1690-2420
Motor Hp	1/3	1/3	1/3	1/2	1/2	1/2	3/4
OUTDOOR FAN	Propeller—Direct Drive						
Cfm	2200	2200	2200	2700	3200	3200	3400
Rpm	840	840	840	1100	1100	1100	1100
Diameter (in.)	22	22	22	22	22	22	22
Motor Hp	1/5	1/5	1/5	1/4	1/4	1/4	1/2

*Factory refrigerant charge

⚠ WARNING

To prevent personal injury, wear safety glasses and gloves when handling refrigerant.

Do not overcharge system. An overcharge can cause compressor flooding.

Unit refrigerant system is factory charged. When recharging is necessary, weigh in total charge indicated in Table 5. (Charge *must* be weighed in during heating season.) Remove any refrigerant remaining in system before recharging. If system has lost complete charge, evacuate system to 5000 microns (29.7-in. vacuum) before recharging. Schrader fitting connections are provided on unit suction and discharge lines for evacuation and charging. (See Fig. 12 for Schrader fitting location.) Volumetric charging device is an accurate device used to recharge systems by weight. These cylinders are available at refrigeration supply firms.

CHARGING AND ADJUSTING REFRIGERANT CHARGE

NOTE: Check refrigerant charge in cooling mode when outdoor temperature is above 65 F. Check charge in heating

mode when temperature is below 65 F. If charge must be checked in opposite mode, do not operate unit continually for more than 10 minutes or damage to compressor may result.

Refrigerant system is fully charged with R-22 refrigerant, tested, and factory sealed. For more applications, factory charge is the correct amount for best performance; however, this charge may require a slight adjustment to attain rated performance.

NOTE: Adjustment of refrigerant charge is not required unless unit is suspected of not having proper R-22 charge.

⚠ CAUTION

When evaluating refrigerant charge, an indicated adjustment to specified factory charge must always be very minimal. If a substantial adjustment is indicated, an abnormal condition exists somewhere in system, such as insufficient airflow across either or both coils.

Heating Mode

1. Remove gage port caps from both service valves and attach gage manifold. Use hoses with valve core depressors.

Table 6—Field Charging Table—Fixed Restrictor

HEATING OPERATING PRESSURES PSIG (Pressures at High and Low Side Service Ports)

MODEL 50QQ	INDOOR DRY BULB (F)	OUTDOOR TEMPERATURE (F) DRY BULB								
			60	50	40	30	20	10	0	-10
018	65	High	217	202	189	178	168	157	149	140
		Low	77.2	65	53.8	43.7	34.7	26.8	19.7	12.6
	70	High	232	217	203	192	181	169	158	147
024	65	High	248	232	218	205	195	184	174	165
		Low	78.4	65.9	54.9	44.4	35.2	27.3	21.1	13.2
	70	High	251	235	221	209	196	185	176	165
030	65	High	219	203	190	179	168	153	150	141
		Low	70.5	58.9	48.7	39.8	31.9	24.7	18.1	11.6
	70	High	235	219	205	195	184	170	158	145
036	65	High	218	202	190	180	172	161	152	142
		Low	70.9	59.1	48.8	39.8	31.9	24.6	18.1	11.6
	70	High	231	216	202	192	186	174	163	153
042	65	High	212	197	184	172	162	153	144	135
		Low	69.6	58.1	48	39.2	31.5	24.4	18	11.6
	70	High	226	211	197	185	174	164	155	145
048	65	High	243	227	213	200	189	177	167	156
		Low	69	57.7	47.7	39	31.4	24.3	18.1	11.8
	70	High	229	213	200	187	175	164	154	144
060	65	High	214	199	185	174	163	155	145	136
		Low	65.2	54.2	44.7	36.4	29	22.5	16.6	10.8
	70	High	228	213	199	187	175	164	155	146
060	65	High	243	227	213	200	189	178	168	158
		Low	66.4	55.4	45.7	37.3	29.9	23.2	17.1	11.0

NOTE: Add charge if pressures are low Bleed out charge if pressures are high. Allow ± 5 psig tolerance on high-side pressure.

B COOLING DESIRED SUPERHEAT TEMP (F)
(Measured at Low-Side Service Port)

OUTDOOR DBT DGT (F)	EVAPORATOR AIR INLET WBT (F)											
	54	56	58	60	62	64	66	68	70	72	74	76
60	12	15	18	21	24	27	30	33	36	38	40	43
65	10	13	16	19	21	24	27	30	33	36	38	41
70	7	10	13	16	19	21	24	27	30	33	36	39
75	*	6	9	12	15	18	21	24	28	31	34	37
80	*	*	5	8	12	15	18	21	25	28	31	35
85	*	*	*	*	8	11	15	19	22	26	30	33
90	*	*	*	*	5	9	13	16	20	24	27	31
95	*	*	*	*	*	6	10	14	18	22	25	29
100	*	*	*	*	*	*	8	12	15	20	23	27
105	*	*	*	*	*	*	5	9	13	17	22	26
110	*	*	*	*	*	*	*	6	11	15	20	25
115	*	*	*	*	*	*	*	*	8	14	18	23

*Do not attempt to charge system under these conditions or refrigerant slugging may occur

NOTE: Add charge if actual superheat temperature is higher than chart value. Remove if lower Allow ± 3 F for tolerance.

Unit is factory charged with R-22 in accordance with amount shown on rating plate. This chart is intended for usage when minor unit charge adjustments are required. For large charge adjustments, evacuate unit and weigh in charge according to unit rating plate. Best performance will be achieved when unit operates with a suction gas superheat at compressor inlet of 5 F at normal rating conditions of Air Conditioning and Refrigeration Institute (ARI). This chart may be used to approximate the charge if ARI rating conditions cannot be obtained. ARI rating conditions are 95 F db outdoor, 89 F and 67 F wb indoor. See Table 4 for required indoor airflow rates. Charge unit with outdoor fan operating only on high speed.

C REQUIRED SUCTION TUBE (F) VS. DESIRED SUPERHEAT (F)
(Measured at Low-Side Service Port)

DESIRED SUPERHEAT TEMP (F)	SUCTION OR LOW-SIDE PRESSURE (psig) AT SERVICE PORT								
	61.5	64.2	67.1	70	73	76	79.2	82.4	85.7
0	35	37	39	41	43	45	47	49	51
2	37	39	43	43	45	47	49	51	53
4	39	41	43	45	47	49	51	53	55
6	41	43	45	47	49	51	53	55	57
8	43	45	47	49	51	53	55	57	59
10	45	47	49	51	53	55	57	59	61
12	47	49	51	53	55	57	59	61	63
14	49	51	53	55	57	59	61	63	65
16	51	53	55	57	59	61	63	65	67
18	53	55	57	59	61	63	65	67	69
20	55	57	59	61	63	65	67	69	71
22	57	59	61	63	65	67	69	71	73
24	59	61	63	65	67	69	71	73	75
26	61	63	65	67	69	71	73	75	77
28	63	65	67	69	71	73	75	77	79
30	65	67	69	71	73	75	77	79	81
32	67	69	71	73	75	77	79	81	83
34	69	71	73	75	77	79	81	83	85
36	71	73	75	77	79	81	83	85	87
38	73	75	77	79	81	83	85	87	89
40	75	77	79	81	83	85	87	89	91

NOTE: Measure suction tube (F) with accurate superheat thermocouple or thermistor-type thermometer.

FINAL DISPOSAL: CAUTION—CAREFULLY RELIEVE REFRIGERANT PRESSURE WITHIN UNIT BEFORE FINAL DISPOSAL

2. Start unit and allow to operate until operating conditions stabilize and pressures level out.
3. Evaluate system performance and refrigerant charge level by determining following conditions:
 - a. High- and low-side pressure gage reading.
 - b. Dry-bulb temperature of inlet air at outdoor coil.
 - c. Dry-bulb temperature of inlet air at indoor coil. This may be read at central return-air grille.
 - d. Compare readings to those listed in Heating Operating Pressures section of charging chart inside unit (refer to Table 6, part A). The Heating Operating Pressures portion of the chart is for checking charge only when unit is in heating mode and outside temperatures are below 60 F.

If charge adjustment is necessary, charge can be adjusted accurately only by blowing the charge, evacuating system, and recharging unit with correct charge as listed on unit rating plate. A volumetric charging device such as Dial-a-charge is recommended for use when recharging.

Cooling Mode—A superheat charging label is affixed to electrical access door. The label includes a Field Superheat Charging table (see Table 6, part B) and a Required Suction Tube Temperature (F) chart (see Table 6, part C).

An accurate superheat-, thermocouple-, or thermistor-type thermometer, a sling psychrometer, and a gage manifold are required when using superheat charging method for evaluating unit charge. *Do not use mercury or small dial-type thermometers. They are not adequate for this type of measurement.*

Proceed as follows:

1. Remove caps from low- and high-pressure service fittings.
2. Using hoses with valve core depressors, attach low- and high-pressure gage hoses to low- and high-pressure service fittings, respectively.
3. Start unit in cooling mode. Let unit run until system pressures stabilize.
4. Measure and record following:
 - a. Outdoor ambient air dry-bulb temperature (F).
 - b. Evaporator inlet air wet-bulb temperature (F).
 - c. Suction tube temperature (F) at low side service fitting.
 - d. Suction (low side) pressure (psig).
5. Using Field Superheat Charging table, compare outdoor air dry-bulb temperature (F) with evaporator inlet air wet-bulb temperature (F) to determine desired system operating superheat temperature.
6. Using Required Suction Tube table, compare desired superheat temperature (F) with suction (low side) operating pressure (psig) to determine proper suction tube temperature.
7. Compare actual suction tube temperature with proper suction tube temperature. Using a tolerance of ± 3 F, add refrigerant if actual temperature is more than 3 F higher than proper suction tube temperature, or remove refrigerant if actual temperature is more than 3 F lower than required suction tube temperature.

Metering Device (Dual-Piston Type) Servicing—See Fig. 11 for dual-piston components. The pistons have a refrigerant metering orifice through them. The retainers form a stop for the pistons in the refrigerant bypass mode, and a sealing surface for liquid line flare connection. To check, clean or replace piston:

1. Shut off power to unit.

2. Remove refrigerant from unit using approved refrigerant removal methods.
3. Remove liquid line flare connections from metering device.
4. Note position of arrow on metering device body with respect to unit.
5. Pull retainer out of body. Be careful not to scratch flare sealing surface. If retainer does not pull out easily, carefully use locking pliers to remove retainer. Replace scratched or damaged retainer.
6. Slide piston out by inserting a small soft wire through metering hole (18-gage thermostat wire). See that metering hole, sealing surface around piston cones and fluted portion of piston are not damaged.
7. Chart on unit access panel illustrates proper arrangement and sizes of piston.
8. Clean piston refrigerant metering orifice.
9. Replace retainer O-ring before reassembling metering device. O-ring Part No. is 99CC501052.

LIQUID LINE STRAINERS (to protect metering device), are made of wire mesh and located in the liquid line on each side of the metering device. The strainers are pressed into the line. Remove strainer by threading a #10 sheet metal screw into strainer and pulling the screw with pliers.

Compressor Removal—See Table 7 for compressor information and Fig. 12 for component location. Follow safety codes, and wear safety glasses and work gloves. Have quenching cloth available (step 8).

Table 7—Compressor Data

MODEL 50QQ	PRODUCTION COMPRESSOR*	OIL RECHARGE (oz)
018	H22B173	37
024	JD25	44
030	JD30	44
036	JD37	44
042	JD42	44
048	JD45	44
060	H23A623	47

*Refer to compressor nameplate for complete model number.

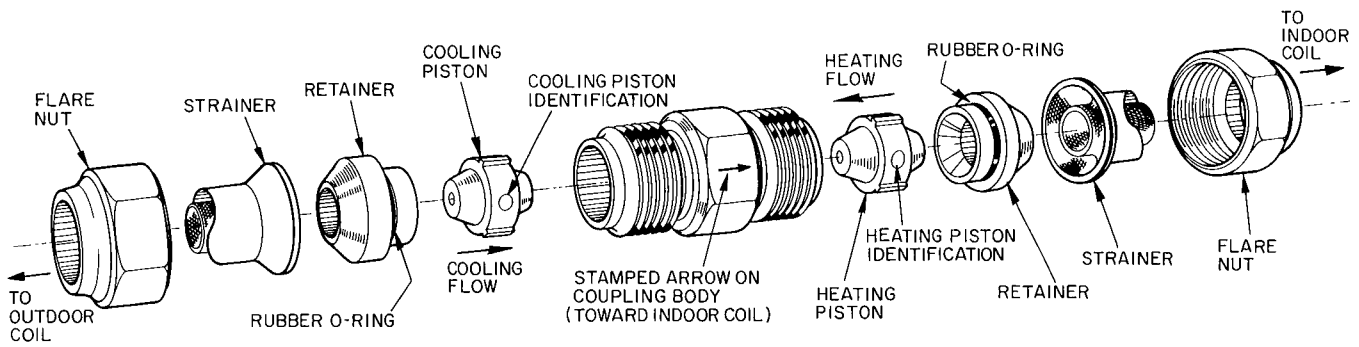
⚠ CAUTION

Copper tubing is used in unit coils. Do not overheat or place excessive strain on tubing or damage may result.

1. Shut off power to unit. Remove compressor access panel to expose compressor. See Fig. 12.
2. Remove refrigerant from unit using approved refrigerant removal methods.
3. Remove core from suction and discharge line Schrader fittings.
4. Disconnect compressor wiring at compressor terminal box.
5. Using a tubing cutter, cut suction and discharge lines at convenient place near compressor for easy reassembly to new compressor with copper slip couplings.

⚠ CAUTION

Excessive movement of copper lines at compressor may cause a break where lines connect to other system components.



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Fig. 11—Metering Device (Dual-Piston) Components

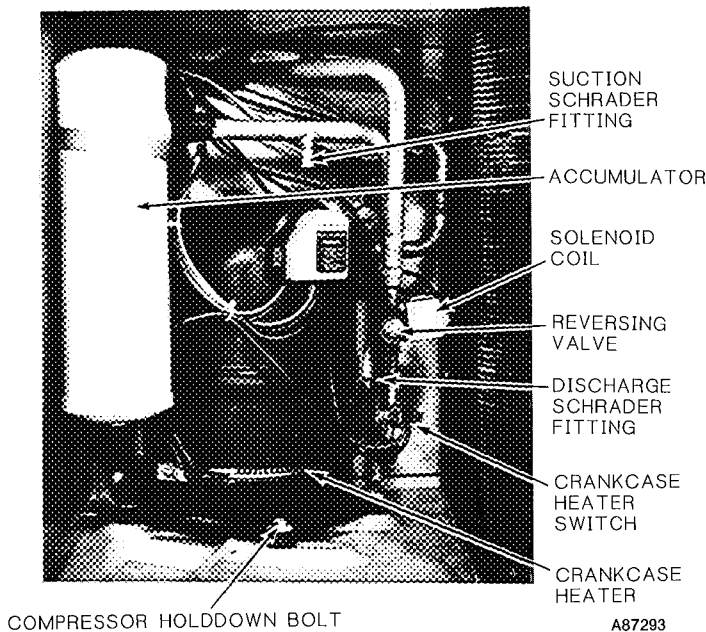


Fig. 12—Compressor Section

6. Remove wraparound crankcase heater (if used) from compressor base.
7. Remove compressor holddown bolts and lift compressor out.
8. Carefully unbraid suction and discharge line piping stubs from compressor. If oil vapor in piping stubs ignites, use quenching cloth.

▲ CAUTION

Muffler may contain quantity of oil.

9. Braze piping stubs (removed in step 8) on new compressor.
10. Install new compressor in unit. Braze suction and discharge lines to compressor piping stubs (at points where cut, step 5) using field-supplied copper couplings. Ensure compressor holddown bolts are in place. Connect wiring.

NOTE: Reinstall wraparound crankcase heater (if used) on compressors.

11. Clean system. Add new suction line filter drier as described below. Refer to Fig. 10.

NOTE: If a compressor failure was caused by motor winding burnout, the byproducts of the burnout must be separated from the circulating refrigerant. This must be done before the byproducts enter the reversing valve or accumulator and render parts inoperative. Burnout byproducts can cause future system operating problems if left in the system.

Clean the system by installing a suction line drier in the refrigerant line where the suction gas enters the reversing valve. During the cooling cycle, this is the line from the indoor coil running across the top of compressor compartment; during heating cycle, install drier in line between outdoor coil and reversing valve. If possible, run unit in cooling mode when cleaning system as installation of temporary suction drier is simplified.

For drier installation during heating cycle, cut line between outdoor coil and reversing valve, install fittings and tubing, and install suction filter drier. To provide protection for the reversing valve, do not place filter drier between reversing valve and accumulator. Since the suction drier works in one mode only, temporarily wire the unit in the selected mode (heating or cooling, based on suction drier location). To ensure cooling operation only, install a jumper between terminals R and O on the low-voltage terminal board. For heating operation only, remove and insulate one of the reversing valve solenoid leads. Run unit for 48 hours and check oil for acidity. If satisfactory, remove suction line drier. Refer to and follow procedure under Metering Device Servicing for cleaning of pistons. Rewire unit to normal conditions.

12. Triple-evacuate and recharge unit. See Refrigerant Charging.

Filter Drier—Install an accessory reversible, liquid line filter drier assembly, following the instructions in accessory package.

NOTE: Follow instructions carefully as piston locations are reversed from those shown when a filter drier is not used.

Lubrication

COMPRESSOR contains factory oil charge. Replace oil when lost. See Table 7 for oil recharge. Use Carrier PP33-1, Texaco Capella WF-32 or Suniso 3GS oil.

FAN MOTOR BEARINGS are prelubricated for 3 years heavy duty or 5 years normal duty. Oiling holes are provided at each end of fan motor, remove fan motor and lubricate motor with 32 drops (16 drops per hole) of SAE 10 nondetergent oil at intervals described below:

- Annually, when environment is very dirty, ambient temperature is higher than 105 F and average unit operating time exceeds 15 hours a day.
- Every 3 years when environment is reasonably clean, ambient temperature is less than 105 F and unit operating time averages 8 to 15 hours a day.
- Every 5 years when environment is clean, ambient temperature is less than 105 F and unit operating time averages less than 8 hours a day.

Indoor Coil

⚠ WARNING

Before performing recommended maintenance, be sure main power switch to unit is turned off. Electrical shock can cause personal injury or death.

Lift or remove unit top cover for access to indoor coil. Inspect coil periodically. Clean as described under Outdoor Coil.

Condensate Drain—Clean condensate drain trap with bottle brush; then flush condensate pan beneath indoor coil with clean water. Ensure water flows freely through condensate drain.

Indoor Fan Assembly (Fig. 2)—Fan wheel should be centered in fan housing. To adjust fan, remove as follows:

Disconnect fan motor wiring. Remove 6 sheet metal screws holding fan orifice in place. Remove 3 fan motor bracket mounting screws. Slide out complete fan, motor and orifice assembly.

Reassemble in reverse order.

To clean fan wheel and housing, use a brush, warm water and detergent. Do not splash water on motor.

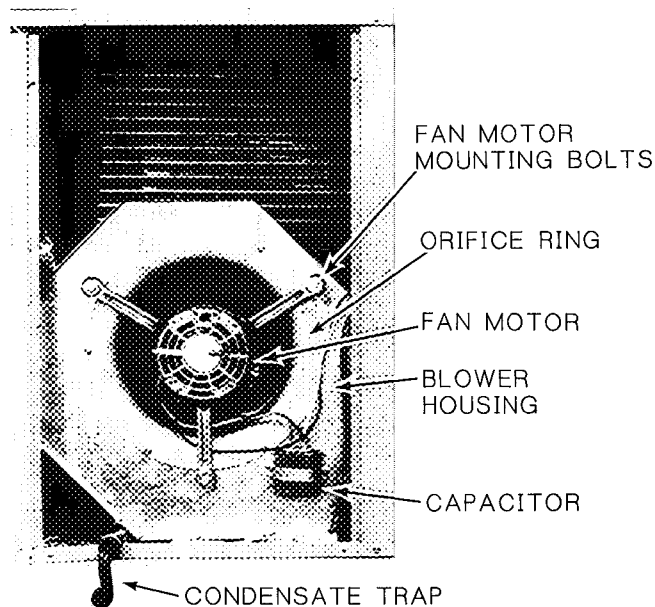


Fig. 13—Indoor Fan

Outdoor Air Fan—Fan position is shown in Figs. 14 and 15. Adjust fan by loosening setscrews and moving blades up or down. To remove outdoor air fan and motor: disconnect power, and remove screws holding discharge grille in place. Disconnect fan motor leads from the motor. Lift complete fan, motor, and orifice assembly (Fig. 16) out of unit. After replacing fan motor assembly, reconnect fan motor leads.

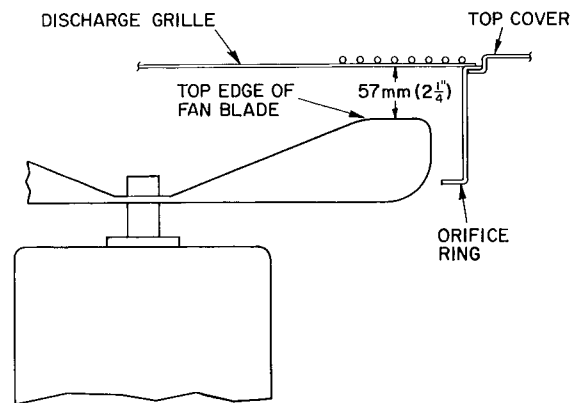


Fig. 14—Outdoor Fan Position

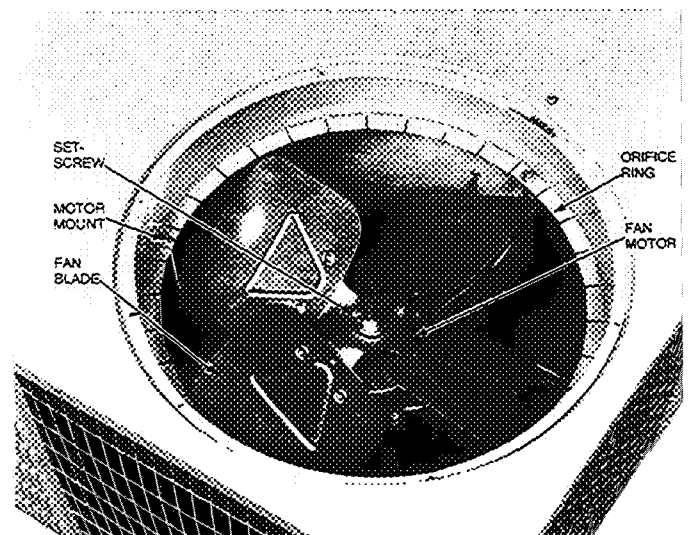


Fig. 15—Fan and Motor

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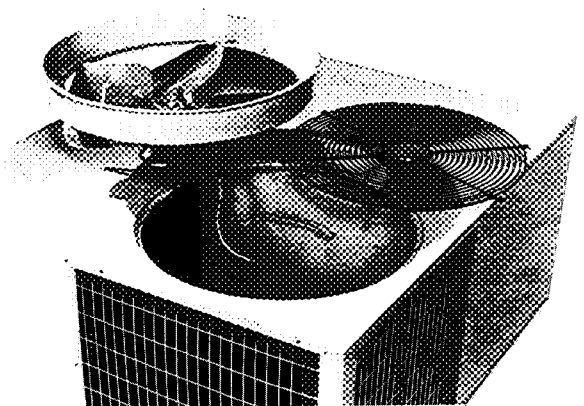


Fig. 16—Fan and Motor Removed

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Return Air Filter (Field Supplied)—Replace disposable filter 4 times a year, clean permanent filter a minimum of 4 times yearly or as required. Flush permanent filter with hot water, steam or soak in mild solution of soap or detergent and water. Allow filters to dry and replace. Refer to filter manufacturer's instructions, as required, for other types of filters.

Outdoor Coil—Inspect outdoor coil regularly. A dirty coil can lead to premature compressor failure and higher operating costs. If cleaning is required, be sure power to system is shut off before attempting to clean coil.

Outdoor coil may be cleaned with brush, vacuum cleaner, or low-pressure water (weather permitting). Do not use industrial strength cleaning fluids for cleaning coils. If coil has 2 rows, make coil accessible by removing the top cover and wash out with garden hose.

▲ WARNING

Be careful! Coil fins are sharp. Protect hands with gloves when cleaning or handling coil.

Sequence of Operation (Refer to Figs. 17, 18, 19)—When power is supplied to unit, transformer (TRAN) is energized. If crankcase heater switch (CHS) is closed and outside temperature is below 65 F, crankcase heater (CH) will be energized.

COOLING—On a call for cooling, thermostat makes circuit R-O, R-Y and R-G. When room temperature rises to within 2 degrees of control setting of thermostat, circuit R-O makes, energizing reversing valve solenoid (RVS). Unit is now in standby condition for cooling. As room temperature rises, the second-stage bulb makes, allowing a circuit (R-Y) through low-pressure switch (LPS) to contactor (C), starting compressor (COMP) and outdoor fan motor (OFM). Circuit R-G energizes indoor fan relay (IFR) starting indoor fan motor (IFM).

When thermostat is satisfied, contacts open de-energizing contactor. Indoor fan relay, compressor and motor stop.

HEATING—On a call for heat, thermostat makes circuits R-Y and R-G. Circuit R-Y is completed, allowing circuit through low-pressure switch (LPS) to contactor (C), starting compressor (COMP) and outdoor fan motor (OFM). Circuit R-G also is completed, energizing indoor fan relay (IFR) and starting indoor fan motor (IFM).

Should room temperature continue to fall, circuit R-W is made through second-stage thermostat bulb. If optional electric heat package is used, a sequencer is energized bringing on first bank of supplemental electric heat. When thermostat is satisfied, contacts open, de-energizing contactor and sequencer. Motors and heaters de-energize.

DEFROST—Defrost board (DB) is a time/temperature control which includes a field-selectable time period between check if defrost is necessary (30, 50 and 90 minutes). Electronic timer and defrost cycle start only when contactor is energized and defrost thermostat (DFT) is closed.

Defrost mode is identical to cooling mode except outdoor fan motor stops and a bank of optional electric heat turns on to warm air supplying the conditioned space.

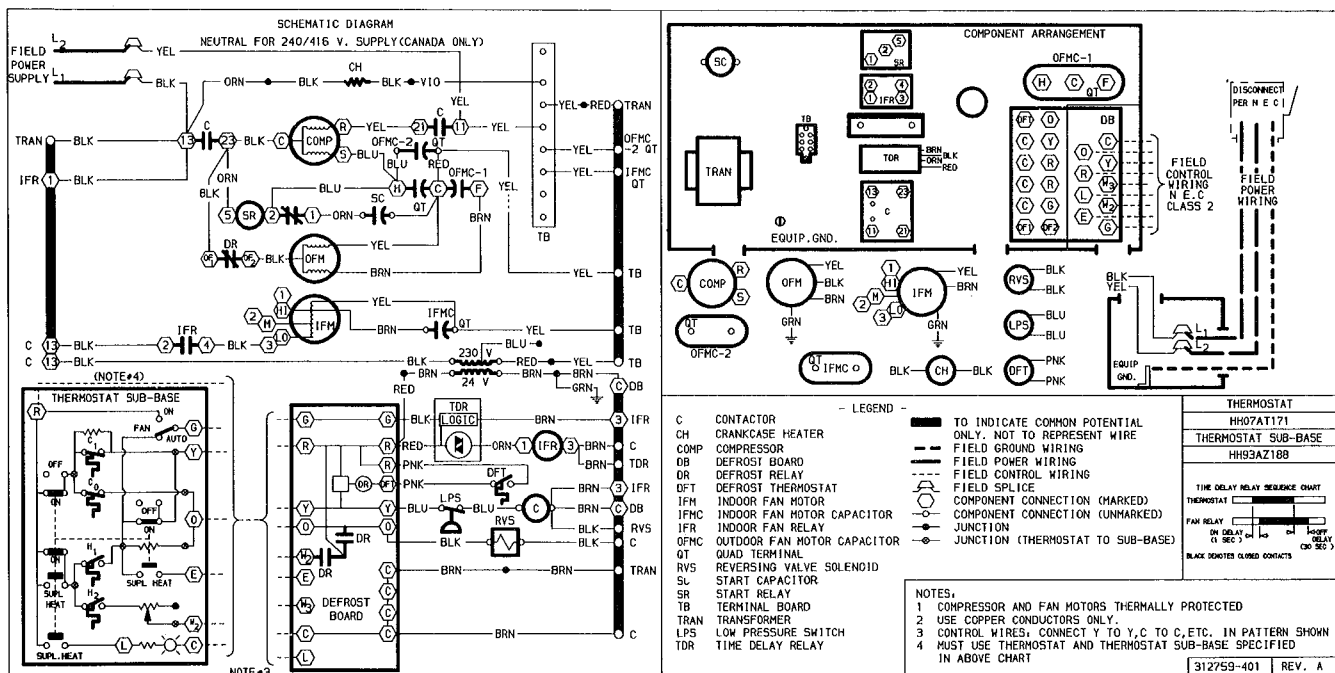
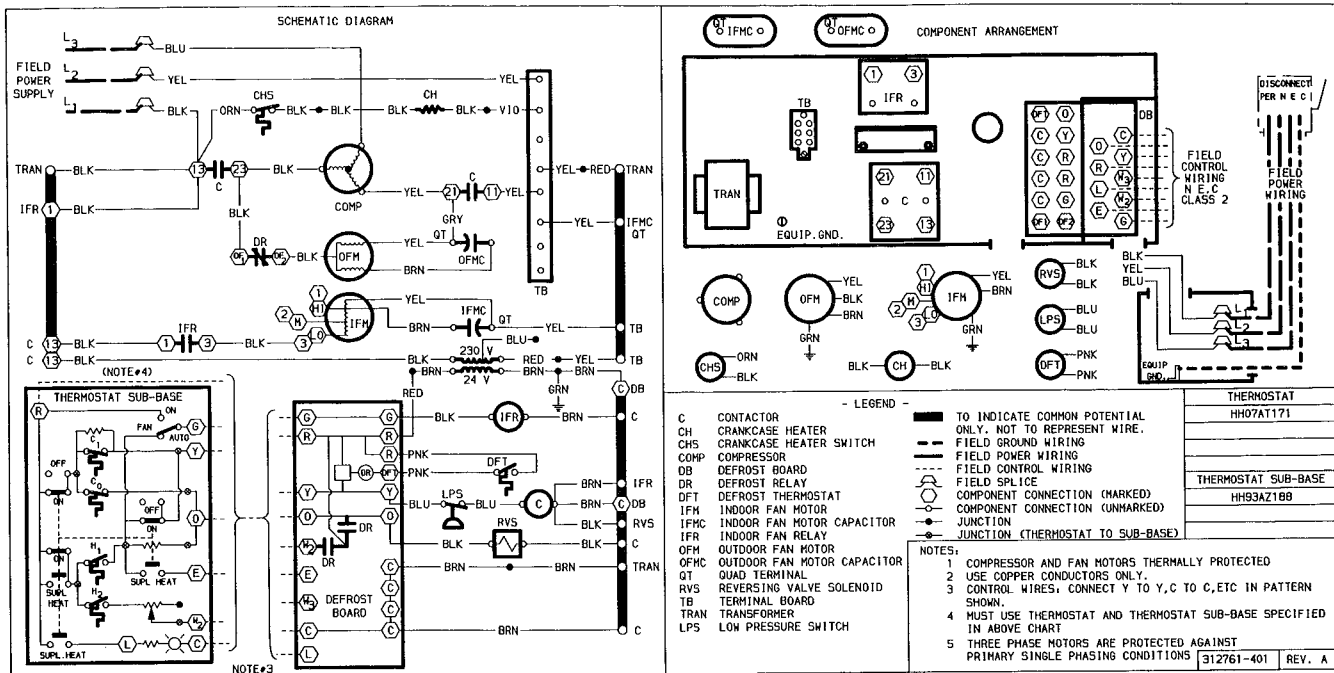
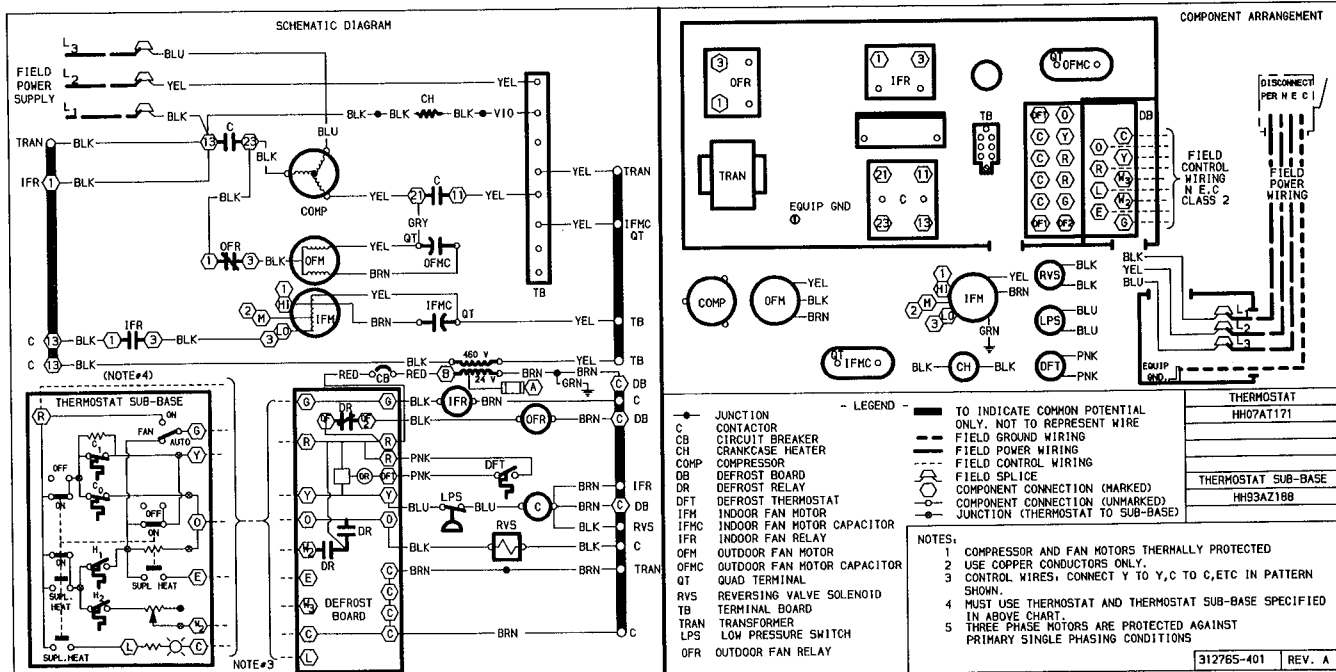


Fig. 17—Wiring Diagram—Single Phase 230V



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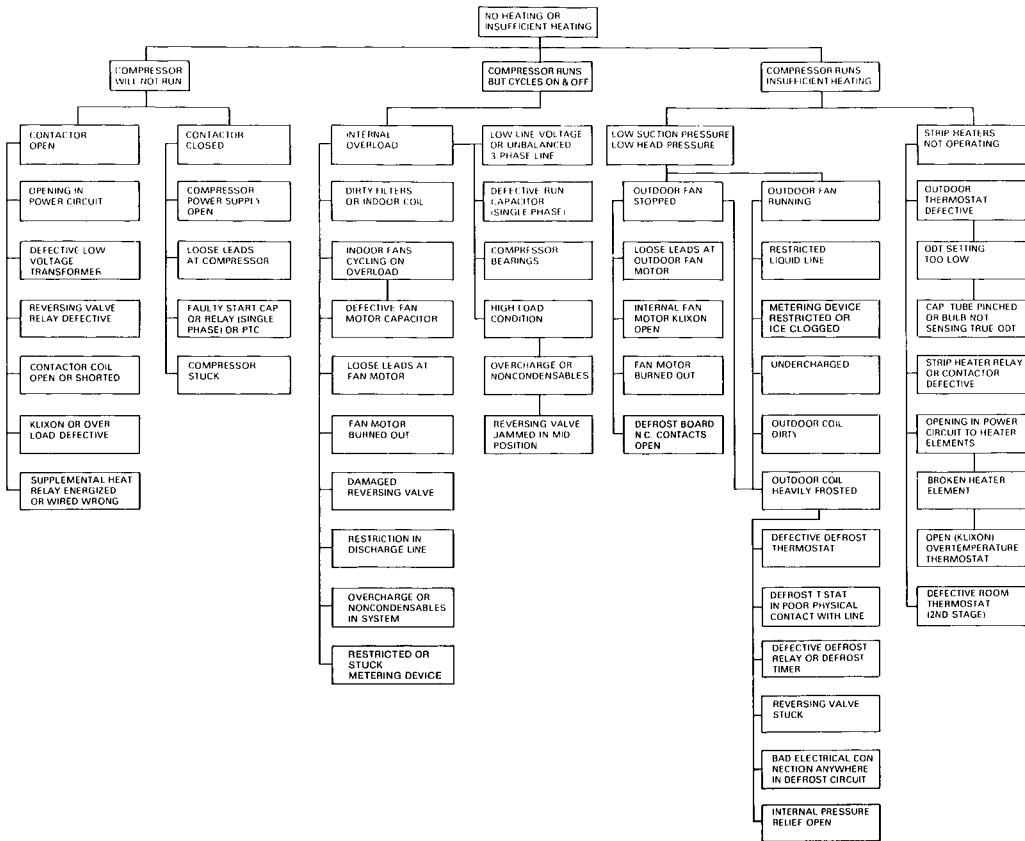
Fig. 18—Wiring Diagram—3 Phase 230V.



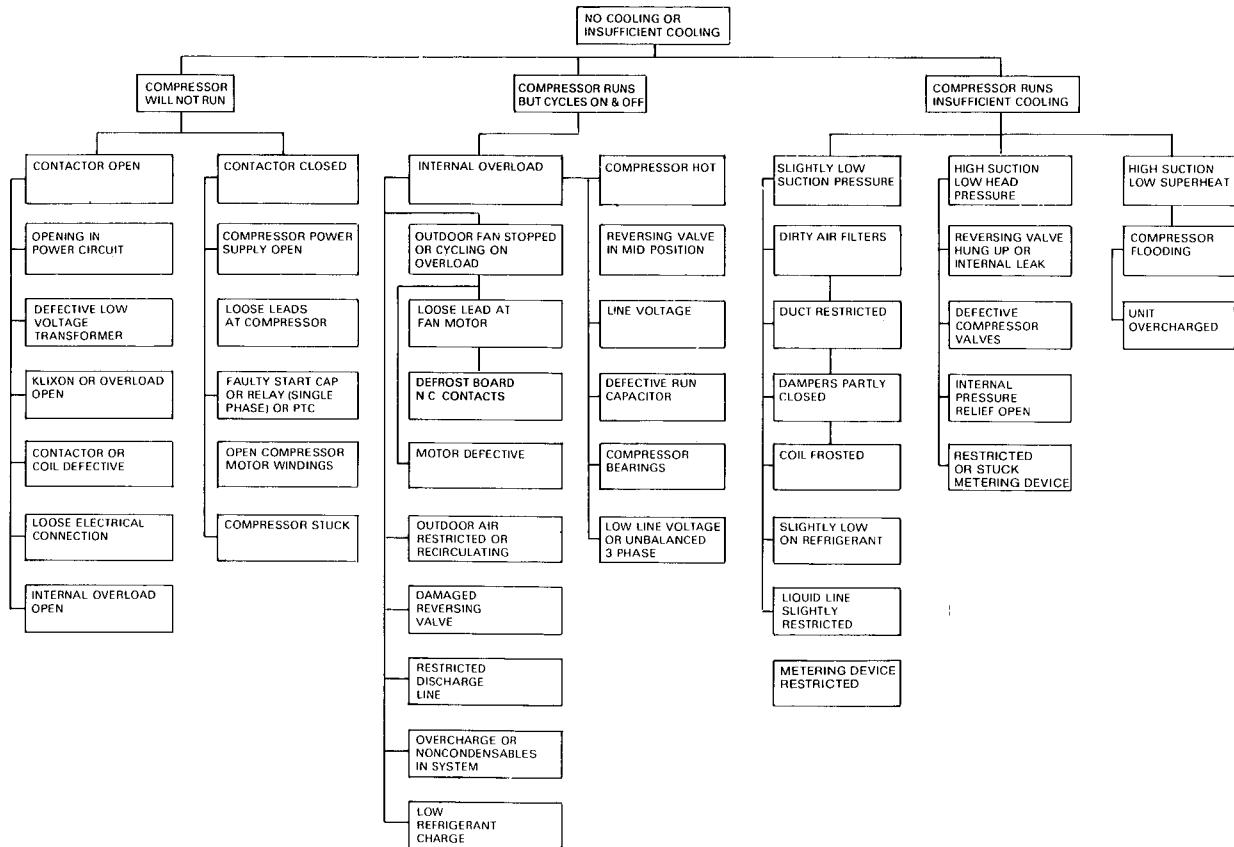
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Fig. 19—Wiring Diagram—3 Phase 460V.

TROUBLESHOOTING CHART—HEATING CYCLE



TROUBLESHOOTING CHART—COOLING CYCLE



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