

Installation, Start-Up and Service Instructions

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SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service air-conditioning equipment.

Untrained personnel can perform the basic maintenance functions of 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, tags and labels attached to the unit, and other safety precautions that may apply.

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

⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

⚠ WARNING

Disconnect gas piping from unit when pressure testing at pressure greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, a unit connected to such piping must be isolated by manually closing the gas valve(s).

INSTALLATION

Step 1 — Provide Unit Support

ROOF CURB — Assemble or install accessory roof curb in accordance with instructions shipped with this accessory. See Fig. 1 and 2. Install insulation, cant strips, roofing, and counter flashing as shown. Ductwork can be installed to roof curb before unit is set in place. Curb should be level. Unit leveling tolerance is $\pm \frac{1}{16}$ in. per linear ft in any direction. This is necessary to permit unit drain to function properly. Refer to Accessory Roof Curb Installation Instructions for additional information as required. When accessory roof curb is used, unit may be installed on class A, B, or C roof covering material.

IMPORTANT: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket with the roof curb as shown in Fig. 1. Improperly applied gasket can also result in air leaks and poor unit performance.

ALTERNATE UNIT SUPPORT — When the curb 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.

Step 2 — Rig and Place Unit — Inspect unit for transportation damage. File any claim with transportation agency.

Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Rollers may be used to move unit across a roof. Level by using unit frame as a reference; leveling tolerance is $\pm \frac{1}{16}$ in. per linear ft in any direction. See Fig. 3 for additional information. Unit operating weight is shown in Table 1.

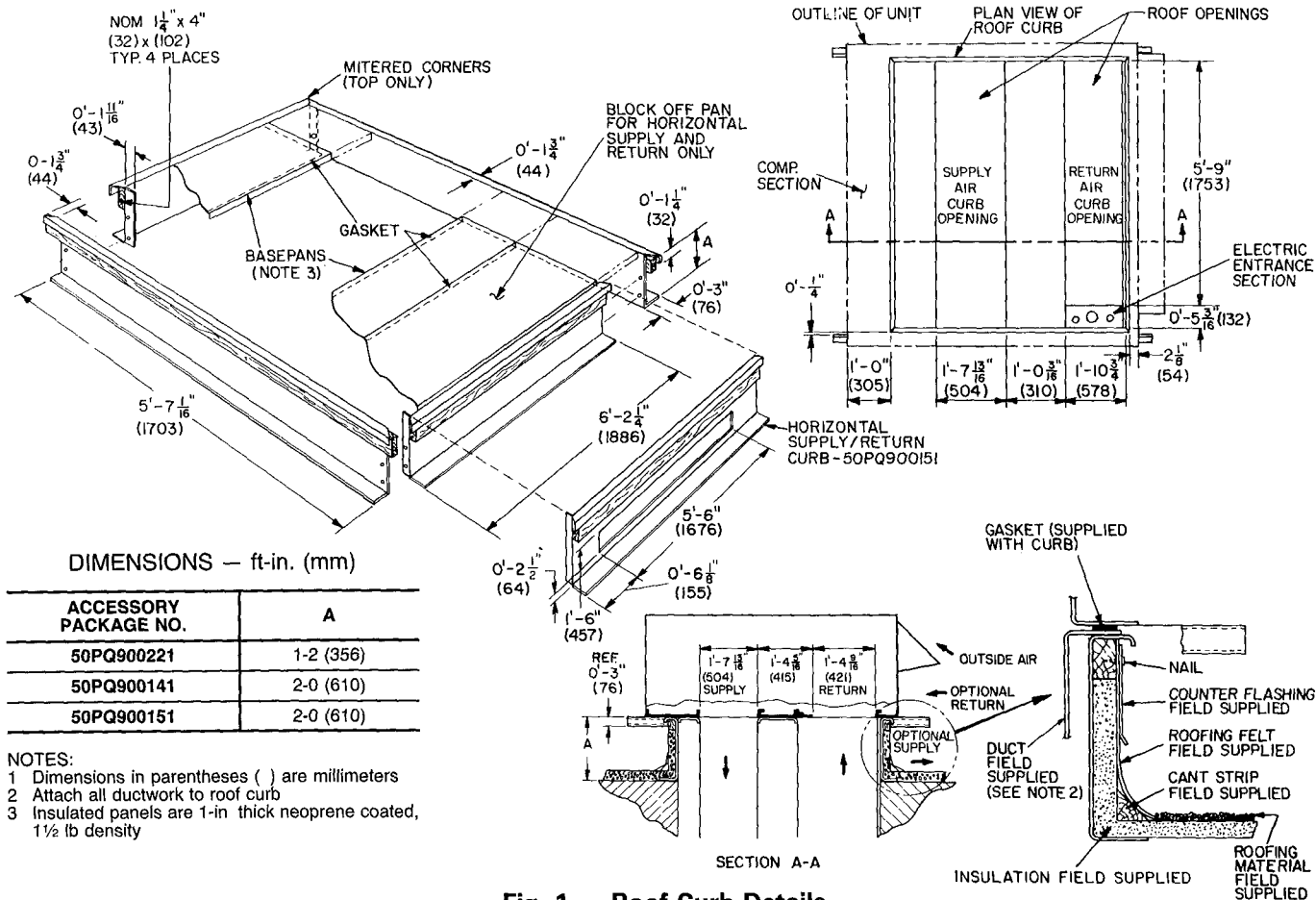
Four lifting holes are provided in ends of unit base rails as shown in Fig. 3. Refer to rigging instructions on unit.

POSITIONING — Maintain clearance, per Fig. 4, around and above unit to provide minimum distance from combustible materials, proper airflow, and service access.

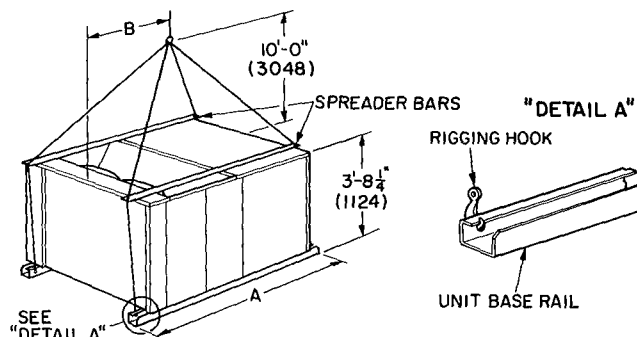
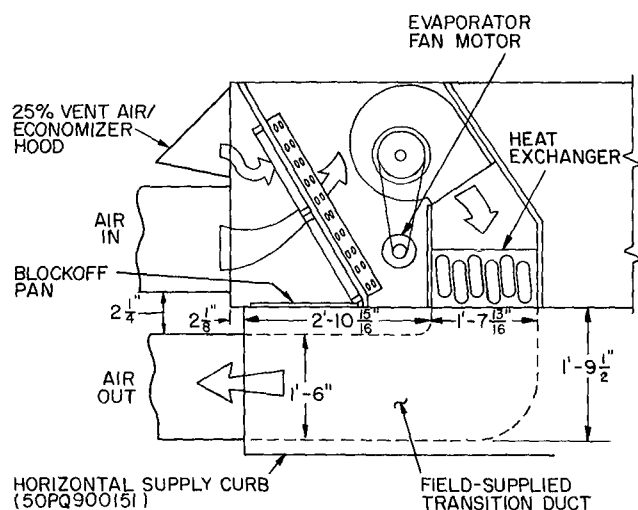
Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air. For proper unit operation, adequate combustion and ventilation air must be provided in accordance with Section 5.3 (Air for Combustion and Ventilation) of the National Fuel Gas Code, ANSI (American National Standards Institute) Z223.1-1984.

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

Locate mechanical draft system flue-assembly at least 4 ft from any opening through which combustion products could enter the building, and at least 4 ft from any adjacent building. When unit is located adjacent to public walkways, flue assembly must be at least 7 ft above grade.



- NOTES:
- 1 Dimensions in parentheses () are millimeters
 - 2 Attach all ductwork to roof curb
 - 3 Insulated panels are 1-in thick neoprene coated, 1½ lb density



UNIT 48	MAX WEIGHT		DIMENSIONS			
			A		B	
	Lb	Kg	In.	mm	In.	mm
TJ024	2410	1095	91.25	2318	33	838

- NOTES:
- 1 Dimensions in () are in millimeters.
 - 2 Refer to Table 1 for unit operating weights
 - 3 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.
 - 4 Weights do not include optional economizer. See Table 1 for economizer weight.
 - 5 Weights given are for aluminum evaporator and condenser coil plate fins. Weights of other metal combinations are listed in Table 1.

CAUTION

All panels must be in place when rigging.

Fig. 3 - Rigging Details



Table 1 — Physical Data

UNIT SIZE 48	TJ024	
OPERATING WT (lb)		
Al/Al*	2150	
Unit Al/Cu*	2280	
Cu/Cu*	2390	
Economizer	110	
Roof Curb†	200	
COMPRESSOR	Semi-Hermetic — 6 Cylinders	
Number	2	
Oil (oz)	152 ea	
Capacity Steps (%)	50,100	
REFRIGERANT	R-22	
Charge (lb) Sys 1**, Sys 2	16.25, 16.25	
REFRIGERANT METERING DEVICE	Capillary Tubes	
Upper Circuit		
No. ...Length (in.)...ID/OD	13...25. 0.055/0.125	
Lower Circuit		
No. ...Length (in.)...ID/OD	13...25. .0.055/0.125	
CONDENSER COIL	Copper Tubes, Aluminum or Copper Plate Fins	
Rows	4	
Fins/in.	13.6 Al or 12.4 Cu	
Total Face Area (sq ft)	22.2	
CONDENSER AIR FAN	Propeller Type, Direct Drive	
Nominal Cfm	11,400	
Number...Diameter (in.)	2...26	
Motor Hp (1075 Rpm)	1	
Watts Input (Total)	3000	
EVAPORATOR COIL	Copper Tubes, Aluminum or Copper Plate Fins	
Rows	4	
Fins/in.	14.4 Al or 13.1 Cu	
Total Face Area (sq ft)	17.9	
EVAPORATOR FAN**	Centrifugal, Fixed Pitch Belt Drive	
Quantity...Size (in.)	Standard 7½ hp	Optional 5 hp
Nominal Cfm	2...12x12	2...12x12
Maximum Allowable Rpm	8000	8000
Motor Pulley Pitch Diameter (in.)	1500	1500
Fan Pulley Pitch Diameter (in.)	6.10	5.10
Belt, Quantity...Type...Length (in.)	8.40	8.40
Factory Speed Setting (Rpm)	1...BX...51	1...B...50
Motor Hp (Service Factor)	1287	1070
Motor Frame Size	7½ (1.15)	5 (1.15)
	184T	184T
FURNACE SECTION		
Rollout Switch Cutout Temp (F)††	190	
Burner Orifice Diameter (in. ...drill size)	113...33	
Natural Gas		
Pilot Orifice Diameter (in. ...drill size)	064...52	
Natural Gas		
Thermostat Heat Anticipator Setting		
208/230/575; Stage 1/Stage 2	98/44	
460; Stage 1/Stage 2	1.2/44	
Gas Valve Quantity	2	
HIGH-PRESSURE SWITCH		
Cutout (psig)	426	
Reset (psig)	320	
LOW-PRESSURE SWITCH (Liquid Line)		
Cutout (psig)	7	
Reset (psig)	22	
AIR INLET SCREENS		
Economizer, Quantity...Size (in.)	2...20 x 25 x 1	
	1...20 x 20 x 1	
RETURN-AIR FILTERS (TYPE)	10% Efficient — 2-in Throwaway Fiberglass	
Quantity... Size (in.)	4...20 x 20 x 2	
	4...16 x 20 x 2	

*Evaporator coil fin material/condenser coil fin material.

†Weight of 14 in. roof curb

**On 48TJ024 units, evaporator coil is intertwined. System 1 is lower portion of condenser coil, and System 2 is upper portion of condenser coil.

††Rollout switch is manual reset.

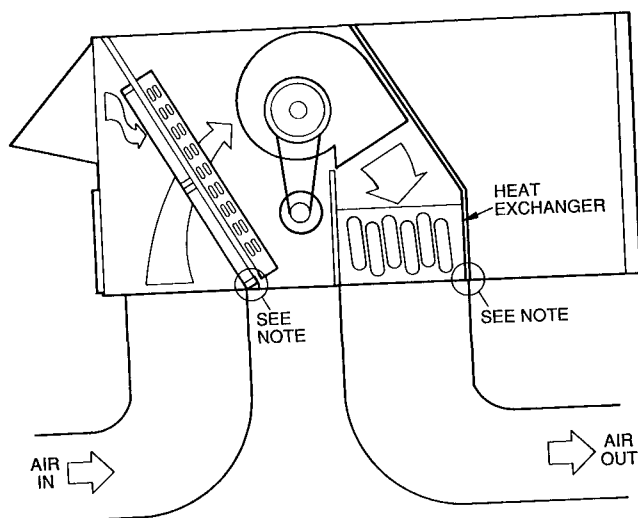
NOTE: The information in this table applies to the 48TJD024.

ROOF MOUNT — Check building codes for weight distribution requirements. Unit weight is shown in Table 1.

Step 3 — Field Fabricate Ductwork — Secure all ducts to building structure. Use flexible duct connectors between unit and ducts as required. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

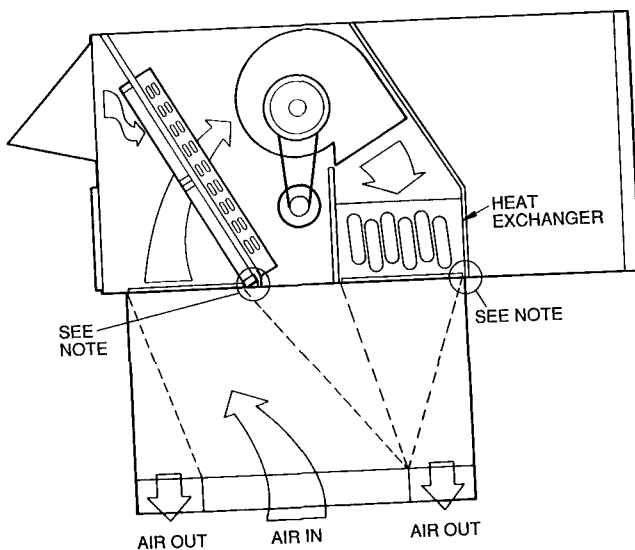
Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

Step 4 — Make Unit Duct Connections — Unit is shipped for through-the-bottom duct connections. Ductwork openings are shown in Fig. 1 and 4. Duct connections are shown in Fig. 5. Field-fabricated concentric ductwork may be connected as shown in Fig. 6 and 7. Attach all ductwork to roof curb and roof curb basepans.



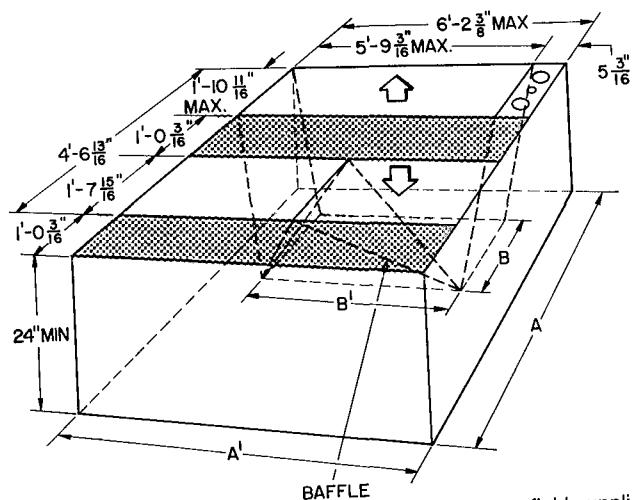
NOTE: Do not drill in this area; damage to basepan may result in water leak.

Fig. 5 — Air Distribution — Through-the-Bottom



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

Fig. 6 — Concentric Duct Air Distribution



NOTE: Dimensions A, A', B and B' are obtained from field-supplied ceiling diffuser.

Shaded area indicates block-off pans.

Fig. 7 — Concentric Duct Details

Step 5 — Install Flue Hood — Flue hood is shipped secured under main control box. To install, secure flue hood to access panel. See Fig. 8.

NOTE: When properly installed, flue hood will line up with combustion fan housing. See Fig. 9.



Fig. 8 — Flue Hood Location

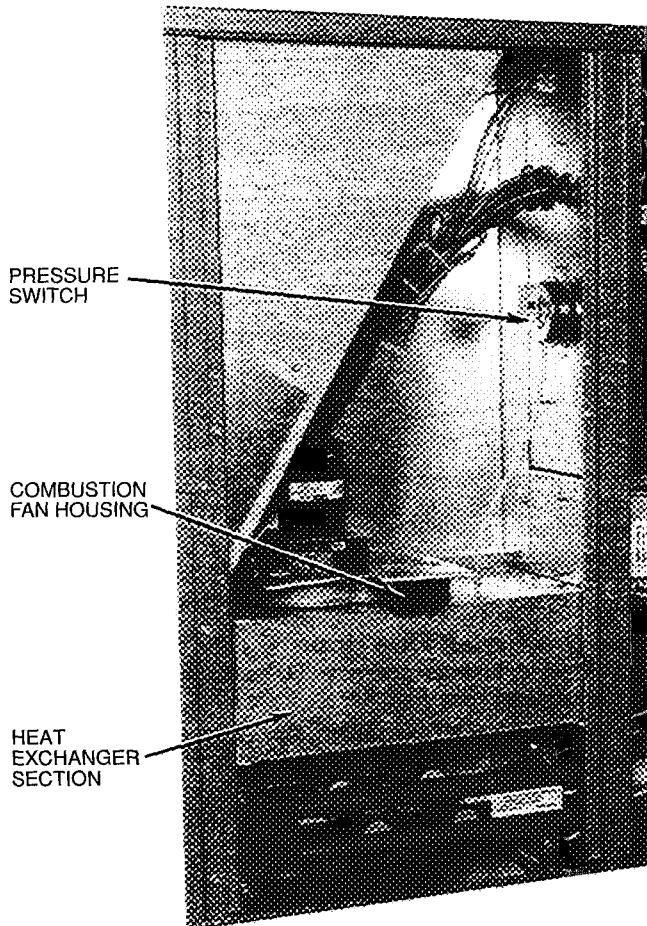


Fig. 9 – Combustion Fan Housing Location

Step 6 – Trap Condensate Drain — See Fig. 10 for drain location. One 3/4-in. half coupling is provided inside unit evaporator section for condensate drain connection. An 8 1/2 in. x 3/4-in. diameter and 2-in. x 3/4-in. diameter pipe nipple, coupled to standard 3/4-in. diameter elbows, provides a straight path down through hole in unit base rail (see Fig. 11). A trap at least 4 in. deep must be used.

Step 7 – Install Gas Piping — Unit is equipped for use with natural gas. Installation must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1-1984.

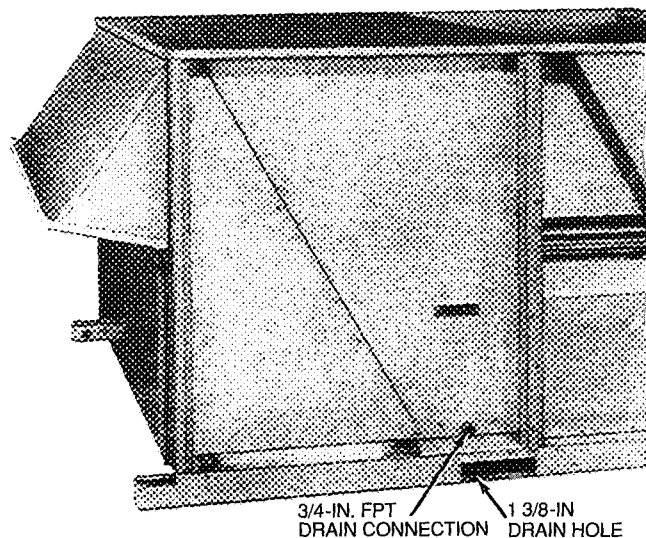


Fig. 10 – Condensate Drain Details

A 1/8-in. NPT plug, accessible for test gage connection, must be field installed immediately upstream of gas supply connection to the unit. See Fig. 12.

Natural gas pressure at unit gas connection must not be less than 5 in. wg or greater than 13.5 in. wg.

Size gas-supply piping for 0.5-in. wg maximum pressure drop. Do not use supply pipe smaller than unit gas connection.

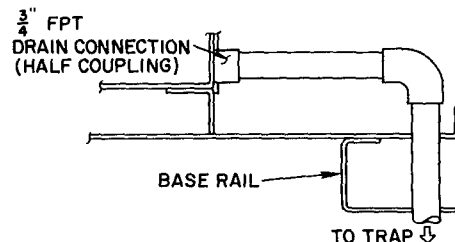
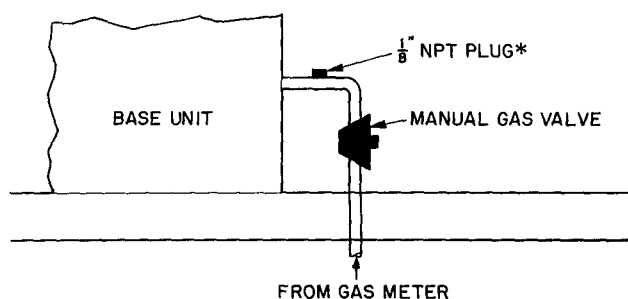


Fig. 11 – Condensate Drain Piping Details



*Use NPT plug for pressure test.

Fig. 12 – Gas Piping Guide

Step 8 – Make Electrical Connections

FIELD POWER SUPPLY — Unit is factory wired for voltage shown on unit nameplate. Units are provided with terminal block.

When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (Table 2).

All field wiring must comply with NEC and local requirements.

Route power and ground lines through control box end panel or unit basepan (see Fig. 4) to terminal connections as shown on unit wiring diagram and Fig. 13.

⚠ WARNING

The unit must be electrically grounded in accordance with local codes and NEC ANSI/NFPA (National Fire Protection Association) 70-1984.

Field wiring must conform 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.

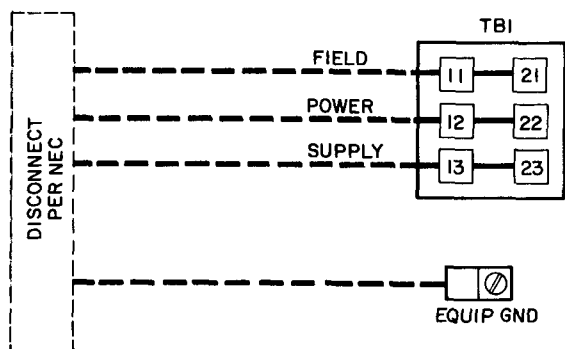
Table 2 – Electrical Data

UNIT	V-PH-HZ	VOLTAGE RANGE		COMPR		OFM		IFM		COMBUSTION FAN MOTOR	POWER SUPPLY	
		Min	Max	RLA	LRA	Qty	FLA	Hp	FLA	FLA	MCA	MOCP* (Amps)
48TJ024	208/230-3-60	187	253	49.3 (ea)	170 (ea)	2	5.4 (ea)	5.0 7.5	16.2 21.9	.57	138 144	175 175
	460-3-60	414	508	22.2 (ea)	77 (ea)	2	2.7 (ea)	5.0 7.5	6.6 10.0	.57	62 66	80 80
	575-3-60	518	632	15.9 (ea)	62 (ea)	2	5.6 (ea)	5.0 7.5	6.1 9.0	.90	53 56	60 70

LEGEND

FLA — Full Load Amps
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*This is the maximum size permissible; smaller fuse size may be used where conditions permit.



LEGEND

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

Fig. 13 — Field Power Wiring Connections

IMPORTANT: BE CERTAIN UNUSED WIRES ARE CAPPED. Failure to do so may damage the transformers and void any applicable Carrier warranty.

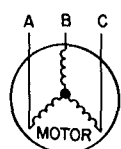
Operating voltage to compressor must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2%.

Use the following formula to determine the percent voltage imbalance.

% Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60.



AB = 452 v
BC = 464 v
AC = 455 v

$$\begin{aligned} \text{Average Voltage} &= \frac{452 + 464 + 455}{3} \\ &= \frac{1371}{3} = 457 \end{aligned}$$

Determine maximum deviation from average voltage:

(AB) 457 - 452 = 5 v
(BC) 464 - 457 = 7 v
(AC) 457 - 455 = 2 v

Maximum deviation is 7 v.

Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457} = 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

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 CONTROL WIRING — Install a Carrier-approved accessory thermostat assembly according to installation instructions included with accessory. Locate thermostat assembly on a solid wall in the conditioned space to sense average temperature.

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 and in Fig. 14.

NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 50 to 75 ft, 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.

Set heat anticipator settings as indicated in Table 1. Settings may be changed slightly to provide a greater degree of comfort for a particular installation.

Refer to Accessory Remote Control Panel instructions if required.

Step 9 — Make Outdoor-Air Inlet Adjustments

MANUAL OUTDOOR-AIR DAMPER — All units (except those equipped with a factory-installed economizer) have a manual outdoor-air damper to provide ventilation air.

Damper can be preset 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 (Fig. 15).

OPTIONAL ECONOMIZER

Enthalpy Control Module (See Fig. 16-18) — For maximum benefit of outdoor air, set enthalpy control to the A setting (Fig. 17 and 19).

DAMPER VENT POSITION SETTING

1. Set fan switch at ON position (continuous fan operation) and close night switch if used.
2. Set system selector switch at OFF position.
3. Turn damper adjustment knob located on enthalpy control module clockwise slowly until dampers assume desired vent position. *Do not manually operate damper motor. Damage to motor will result.*

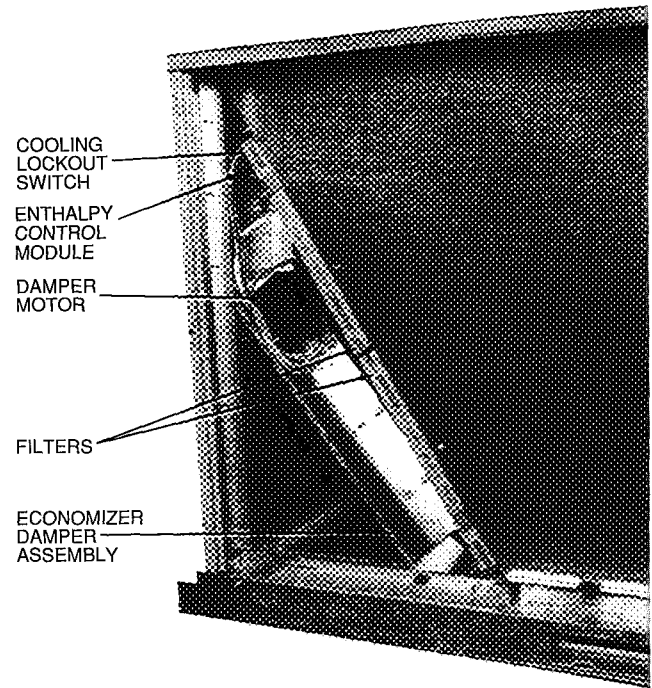


Fig. 16 — Economizer Damper Assembly-End View

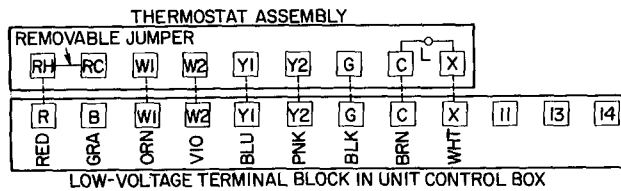


Fig. 14 — Field Control Thermostat Wiring

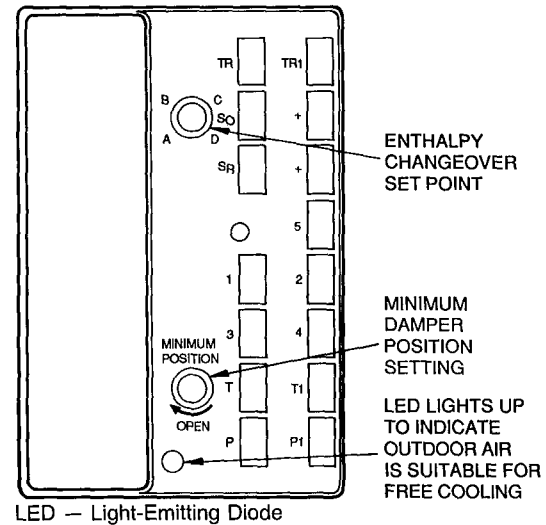


Fig. 17 — Enthalpy Control Module

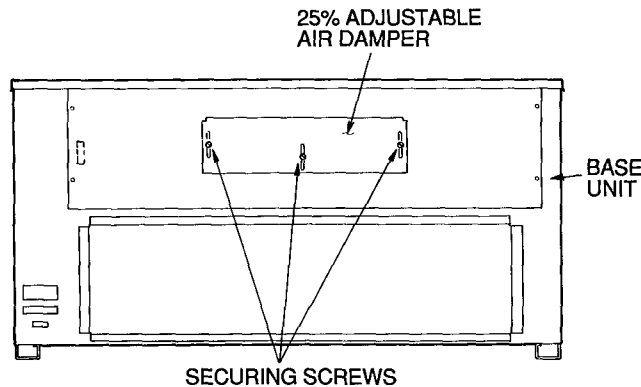


Fig. 15 — 25% Outdoor-Air Section Details

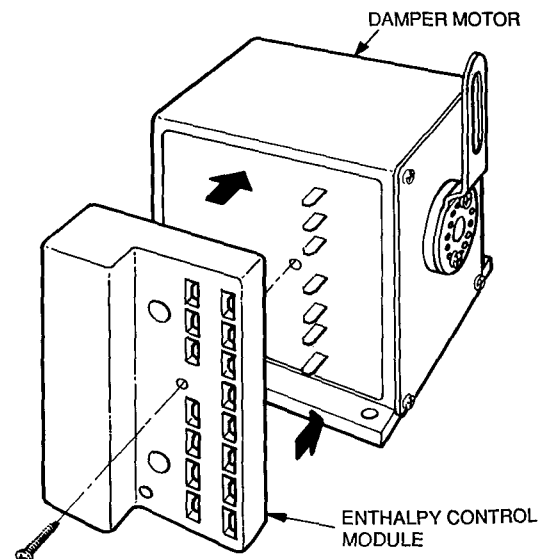


Fig. 18 — Enthalpy Control Module Location

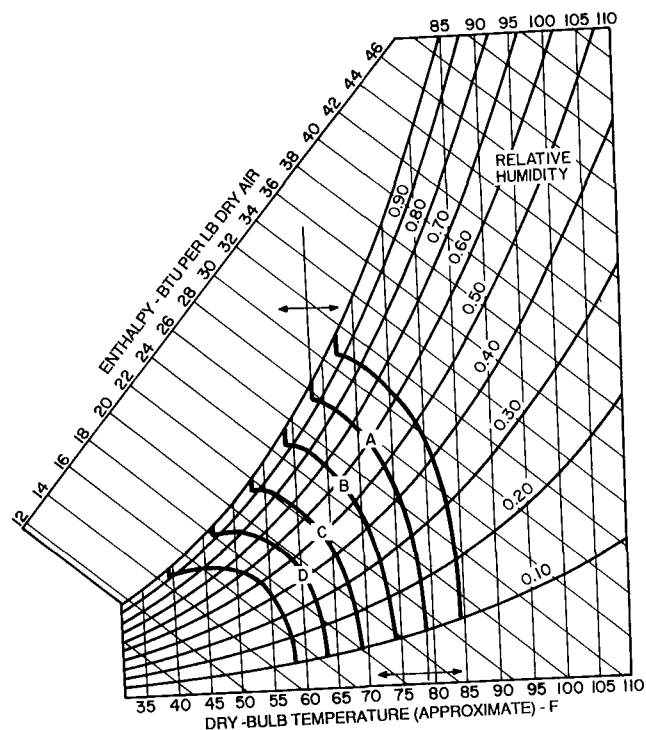


Fig. 19 — Psychrometric Chart for Enthalpy Control

Step 10 — Install Outdoor-Air Hood — The outdoor-air hood is common to 25% air ventilation and economizer. If economizer is used, all electrical connections have been made and adjusted at the factory. Assemble and install hood in the field.

NOTE: The hood top cover, upper and lower filter retainers, hood drain pan, and filter support bracket are secured to the top crate above the condenser fans. The screens, hood side panels, remaining section of filter support bracket and hardware are in a package located inside the return-air filter access panel (Fig. 20 and 21).

1. Assemble hood top cover, side panels, upper filter retainer, and drain pan (see Fig. 22).
2. Secure lower filter retainer and support bracket to unit as shown in Fig. 22.
3. Loosen sheet metal screws for top cover of base unit located above outdoor-air inlet opening.
4. Match notches in hood top cover with unit top cover screws. Insert hood flange between top cover flange and unit. Tighten screws.
5. Insert outdoor-air inlet screens and spacer in channel created by lower filter retainer and filter support bracket.
6. Attach remaining section of filter support bracket.

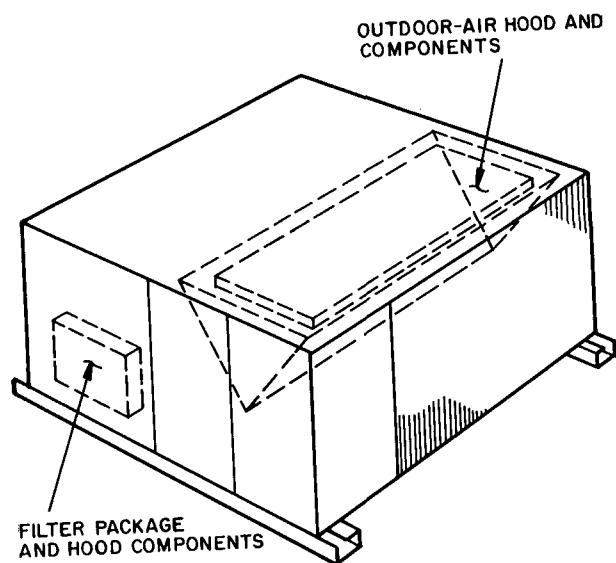


Fig. 20 — Outdoor-Air Hood Component Location

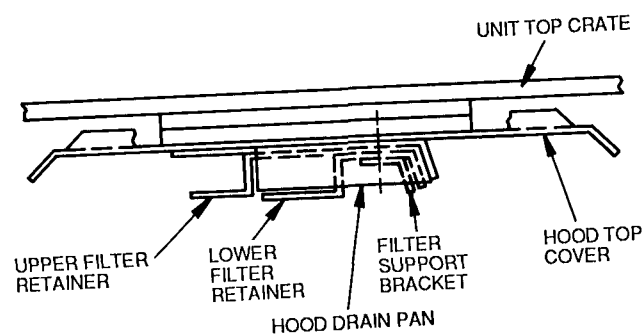


Fig. 21 — Outdoor-Air Hood Components

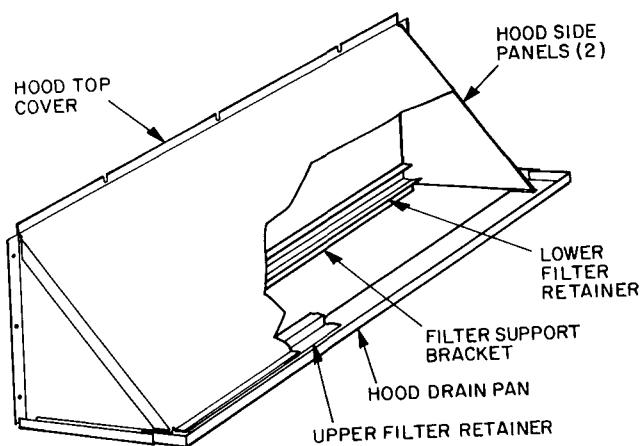


Fig. 22 — Outdoor-Air Hood Details

START-UP

Unit Preparation — Check that unit has been installed in accordance with installation instructions and applicable codes.

Compressor Mounting — Loosen the compressor hold-down bolts until sidewise movement of the washer under each hold-down bolt head can be obtained. Do not loosen completely as bolts are self-locking and will maintain adjustment.

Internal Wiring — Check all electrical connections in unit control boxes; tighten as required.

Refrigerant Service Valves — The units have one service valve on the suction line, one on the discharge line and one on the liquid line for each circuit. Be sure all valves are open.

Crankcase Heater(s) — Crankcase heater is energized as long as there is power to the unit.

NOTE: Unit power must be on for 24 hours prior to start-up.

Evaporator Fan — Fan belt and fixed pulleys are factory-installed. See Table 3 for Fan Performance Data. Remove tape from fan pulley. Be sure that fans rotate in the proper direction. See Table 4 for air quantity limits. To alter fan performance, see Performance Adjustment on page 13.

Condenser-Fans and Motors — Condenser fans and motors are factory set. Refer to Condenser-Fan Adjustment section on page 13 as required. Be sure that fans rotate in the proper direction.

Return-Air Filters — Check that correct filters are installed in filter tracks (see Table 1). Do not operate unit without return-air filters.

Outdoor-Air Inlet Screens — Outdoor-air inlet screens must be in place before operating unit.

Accessory Economizer Adjustment — Remove filter access panel. Check that outdoor-air damper is closed and return-air damper is open.

Economizer operation and adjustment are described in Economizer Operation section on page 11; and Accessory Economizer Adjustment section on page 13, respectively.

Table 3 — Fan Performance Data

CFM	EXTERNAL STATIC PRESSURE (in. wg)															
	0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6000	792	1.85	855	2.17	922	2.44	985	2.71	1044	3.04	1104	3.26	1160	3.57	1216	3.82
6500	843	2.26	905	2.60	967	2.90	1027	3.22	1084	3.54	1138	3.90	1192	4.13	1249	4.45
7000	898	2.57	944	2.99	1014	3.43	1070	3.86	1125	4.08	1177	4.13	1231	4.80	1273	5.15
7500	947	3.23	1006	3.65	1064	4.10	1118	4.50	1169	4.82	1220	5.15	1270	5.55	1311	5.90
8000	1001	3.87	1066	4.45	1115	4.79	1165	5.18	1216	5.58	1264	5.98	1305	6.36	1345	6.64
8500	1062	4.72	1115	5.13	1166	5.50	1216	6.00	1265	6.44	1305	6.86	1356	7.28	—	—
9000	1117	5.47	1169	5.90	1218	6.43	1265	6.97	1307	7.45	—	—	—	—	—	—

LEGEND

Indicates factory-supplied 7½ hp motor and drive

Boldface — Indicates optional 5 hp motor and drive.

— Indicates no value

Bhp — Brake horsepower input to fan.

Rpm — Revolutions per minute.

NOTES:

1. Fan performance data that is not shaded or in boldface indicates field-supplied drive.
2. Fan performance is based on wet coils, clean filters, and casing losses.
3. Refer to Table 1 for condenser fan watts input.
4. Static pressure losses must be added to external static pressure before entering Fan Performance table

Economizer Pressure Drop (in. wg)

CFM				
4000	5000	6000	7000	9000
.03	.05	.07	.09	.11

5. To convert Bhp to watts use the following equation:

$$\text{Watts input} = \frac{\text{Bhp} \times 746}{\text{Motor efficiency}}$$

Motor efficiencies:

5 Hp-0.85

7½ Hp-0.82

Service factors:

5 Hp-1.15

7½ Hp-1.15

6. All other rpms require replacement drives.

Table 4 — Air Quantity Limits

UNIT	MIN CFM	MAX CFM
48TJ024	6000	9000

Base Unit Operation

COOLING — Turn unit power on. Set system selector switch at COOL position, fan switch at AUTO. position, and the thermostat at a setting below room temperature.

Upon a rise in room temperature, cooling contact no. 1 in the thermostat closes, energizing the first-stage cooling contactor and the evaporator-fan contactor. The first-stage compressor, condenser motor, and evaporator fan motor then start and run.

Upon a further rise in room temperature, cooling contact no. 2 in the thermostat closes, energizing the second-stage cooling contactor. The second-stage compressor then starts and runs.

To Shut Off Unit When in Cooling Mode — Set system selector switch at OFF position or reset thermostat above room temperature.

The Cycle-LOC™ protective device shuts down the compressor when any safety device trips. A thermostat light then comes on. Determine the reason for safety trip before attempting to restart. To restart the unit, turn the thermostat to the OFF position and then to the COOL position.

A freeze protection thermostat is located on the evaporator coil and in the Cycle-LOC protective circuit. It detects ice build-up and turns off the compressor, thus allowing the coil to clear. Once ice melts, the compressor can be restarted.

HEATING — These units are equipped with manual reset rollout switch and a 100% lock-out ignitor module. If the unit fails to operate, check the rollout switch and/or ignitor module. Determine the reason for the lock-out before attempting to reset. To reset the rollout switch, depress the button on the switch. To reset the ignitor, turn the system switch to OFF position, then to HEAT or AUTO. position.

NOTE: The 48TJ units have 2 stages of heat.

Purge gas supply line of air by opening union just ahead of unit gas valve. When odor of gas is detected, retighten union and wait 5 minutes before proceeding.

Turn unit power on. Open manual gasline valve. Set thermostat system switch at HEAT or AUTO. position, and fan switch at AUTO. position.

First-stage thermostat calls for heat. The time-delay relay, controlling evaporator fan, begins timer sequence. Induced-draft relay closes and induced-draft motor starts.

Pressure switch closes and pilot valve no. 1 opens, allowing gas to flow to first-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame and the main gas valve no. 1 opens. If pilot flame is not sensed within 90 seconds, the pilot and main gas valves will close and remain closed for 335 seconds (approximately 5½ minutes). This ignition sequence will be retried indefinitely.

Once ignition is accomplished, if the pilot flame fails, the ignition sequence will be attempted 3 times. If after 3 tries the pilot has not relit, the system will be locked out (pilot and main gas valves close). To reset, turn the thermostat to OFF position and then back to either HEAT or AUTO. position. Gas flows to main burners and first-stage burners ignite. Spark ignitor turns off.

When time-delay sequence is complete, time-delay relay closes and evaporator-fan motor starts.

With an additional heating load, the second-stage thermostat closes (the control relay closes during first-stage operation). Pilot valve no. 2 opens. The spark ignitor oper-

ates and ignites pilot. The sensor detects a flame, and main gas valve no. 2 opens. If pilot flame is not sensed within 90 seconds, the pilot and main gas valves will close and remain closed for 335 seconds (approximately 5½ minutes). This ignition sequence will be retried indefinitely.

Once ignition is accomplished, if the pilot flame fails, the ignition sequence will be attempted 3 times. If after 3 tries the pilot has not relit, the system will be locked out (pilot and main gas valves close). To reset, turn the thermostat to OFF position and then back to either HEAT or AUTO. position. Gas flows to main burners and second-stage burners ignite. The spark ignitor turns off.

NOTE: Burners are factory adjusted and should burn equally with a soft blue flame. Flame should not lift off burner face. Refer to Main Burners section on page 15.

When the second-stage thermostat is satisfied, the second-stage gas valve closes.

When first-stage thermostat is satisfied, first-stage gas valve closes. The induced-draft motor is deenergized, the time-delay relay opens, and timer sequence begins. When 90 second time delay is complete, the evaporator-fan motor goes off.

To Shut Off Unit When in Heating Mode — Set system selector switch at OFF position.

VENTILATION AIR CIRCULATION (Continuous Fan) — Turn unit power on. Set system selector switch at OFF, HEAT, or COOL position. Set fan switch at ON position. Evaporator-fan contactor is energized through the switch on the thermostat, and the evaporator fan runs continuously.

AUTOMATIC CHANGEOVER (with Automatic Changeover Thermostat) — Set system selector switch at AUTO. position. When temperature of conditioned space rises to cooling selector lever setting, unit automatically switches from heating mode to cooling mode. When temperature of the conditioned space falls to the selected heating level, unit automatically changes from cooling mode to heating mode. The thermostat is interlocked so that cooling and heating systems do not operate at the same time.

Economizer Operation — If unit is equipped with modulating outdoor-air control (economizer), it will operate as follows:

COOLING MODE — Evaporator fans, condenser fans, and compressor energize when there is a call for cooling and enthalpy of outdoor air is above enthalpy control setting. The economizer damper moves to VENT position.

Evaporator fan starts and economizer damper opens fully on a first-stage call for cooling when enthalpy of outdoor air is below the enthalpy control setting. Compressor remains off.

One compressor is energized and mechanical cooling integrates with economizer cooling upon a second-stage call for cooling.

If outdoor-air temperature falls below 50 F, the cooling lockout switch prevents compressor from operating.

Economizer damper modulates when mixed-air temperature is below mixed-air sensor setting.

HEATING MODE — Outdoor-air damper stays at VENT position while evaporator fan runs.

NOTE: If fan switch is at ON position and room thermostat is satisfied, damper goes to minimum ventilation position.

Head Pressure Control — All units have fan cycling thermostats which shut off one condenser-fan motor at 55 F. This permits unit to operate down to 45 F outdoor-air temperature.

SERVICE

▲ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury.

Cleaning — Inspect unit interior at beginning of each heating and cooling season and as operating conditions require. Remove unit top panel and/or side panels for access to unit interior.

MAIN AND PILOT BURNERS — At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the pilot and main burner flames through view port, contained in condenser section, and adjust if necessary. Refer to Pilot Adjustment section on page 15, or Main Burners section on page 15.

FLUE GAS PASSAGEWAYS — The flue collector box and heat exchanger cells may be inspected by removing heat exchanger access panel (Fig. 4), flue box cover, and main burner assembly (Fig. 23). Refer to Main Burners section on page 15 for burner removal sequence. If cleaning is required, remove heat exchanger turbulators (Fig. 24) and clean all parts with a wire brush.

COMBUSTION-AIR BLOWER — Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bi-monthly to determine proper cleaning frequency.

To inspect blower wheel, remove heat exchanger access panel. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel assembly by removing screws holding motor mounting plate to top of combustion fan housing (Fig. 23-24). The motor and wheel assembly will slide up and out of the fan housing. Remove the blower wheel from the motor shaft and clean with a detergent or solvent. Replace motor and wheel assembly.

EVAPORATOR COIL — Clean with commercial coil cleaner.

CONDENSER COIL — Clean condenser coil annually and as required by location and outdoor-air conditions. Inspect coil monthly; clean as required.

CONDENSATE DRAIN — Check and clean each year at start of cooling season. In winter, keep drains and traps dry or protect against freeze-up.

FILTERS — Clean or replace at start of each heating and cooling season, or more often if operating conditions require. Refer to Table 1 for type and size.

OUTDOOR-AIR INLET SCREENS — Clean screens with steam or hot water and a mild detergent. Do not use disposable filters in place of screens.

Lubrication

COMPRESSORS — Each compressor is charged with the correct amount of oil at the factory. On 06D compressors, observe the oil level in the sight glass at start-up. If unit oil level is below sight glass, add oil until level is approximately 1/4 sight glass.

If oil charge is above sight glass, do not remove any oil until the compressor crankcase heater has been energized for at least 24 hours.

FAN SHAFT BEARINGS — Lubricate fan shaft bearings at least once a year with suitable bearing grease. Extended grease line is provided. Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Sunoco	Prestige 42
Texaco	Multifak 2
Mobil	Mobilplex EP No. 1

*Preferred lubricant because it contains rust and oxidation inhibitors.

FAN MOTOR BEARINGS — No lubrication of condenser fan or evaporator-fan motors is required for first 5 years of operation. After 5 years, clean and repack bearings annually with a suitable bearing grease.

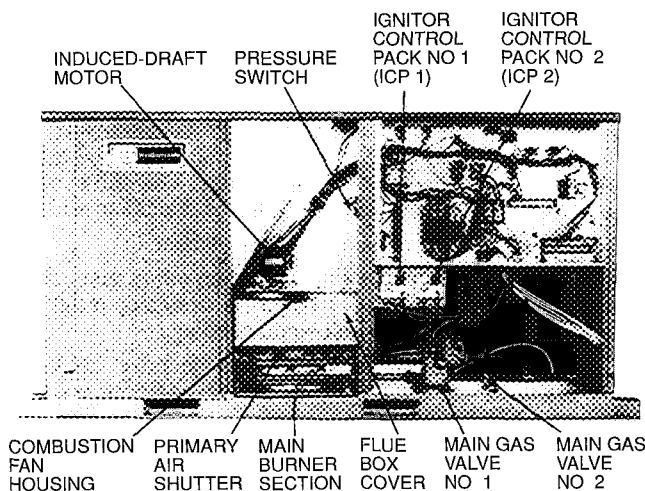


Fig. 23 — Typical Gas Heating Section, 2-Stage Units

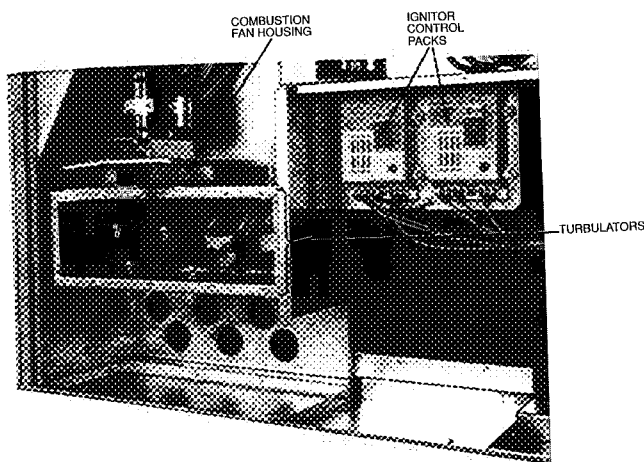


Fig. 24 — Typical Heat Section with Main Burners Removed

Evaporator-Fan

PERFORMANCE ADJUSTMENT — The 48TJ024 units have fixed pulleys. Fan speed can be adjusted only by changing the pulley(s)/belt.

To align fan and motor pulleys (see Fig. 25):

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting plate.

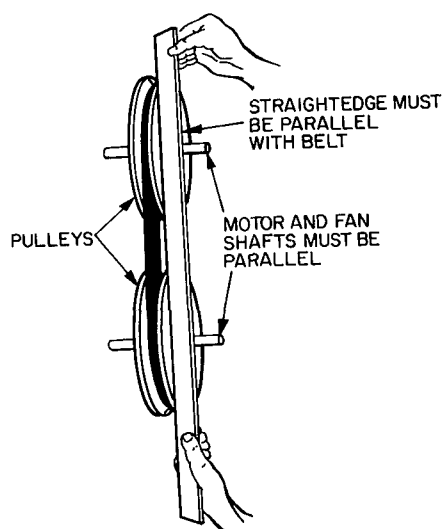


Fig. 25 — Evaporator-Fan Pulley Alignment

SERVICE AND REPLACEMENT — The 48TJ uses 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 evaporator fan access panel and the heating control access panel.
2. Remove the vertical support post (located between the evaporator fan and heating control access panels) and all screws securing it.
3. Loosen all nuts on the two carriage bolts and the one holding screw in the motor mounting base.
4. Raise motor and remove belt.
5. Remove the retainer clip (located at the top of the motor mounting plate) and the 4 screws securing it.
6. Remove the 8 screws that secure the motor mounting plate to the vertical panel.
7. Slide-out the motor and motor mounting plate.
8. Disconnect wiring connections and remove the 4 mounting bolts.
9. Remove the motor.
10. To install the new motor, reverse steps 1-8.

Belt Tension Adjustment — To adjust belt tension,

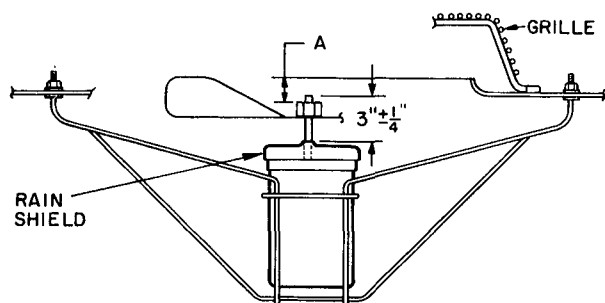
1. Loosen fan motor bolts.
2. Move motor mounting plate up or down for proper belt tension ($\frac{1}{2}$ in. deflection with one finger).
3. Tighten nuts.
4. Adjust bolts and nut on mounting plate to secure motor in fixed position.

Condenser-Fan Adjustment (Fig. 26)

1. Shut off unit power supply.
2. Remove fan top-grille assembly and loosen fan hub screws.
3. Adjust fan height on unit, using a straightedge placed across the fan orifice.
4. Tighten setscrews and replace rubber hubcap to prevent hub from rusting to motorshaft.
5. Fill hub recess with permagum if rubber hubcap is missing.

Accessory Economizer Adjustment — Make certain the outdoor-air damper is fully closed and the return-air damper is fully open before completing the following steps. Adjust linkage as necessary.

1. Turn on power to the unit.
2. Turn the thermostat fan switch to the ON position. The damper will go to the vent position.
3. Adjust the vent position with the minimum position adjustment on the module. See Fig. 17.



	208/230, 460-V UNITS	575-V UNITS
A (in.)	1.18 ± .12	.25 ± .12

Fig. 26 — Condenser-Fan Adjustment

Enthalpy Control Checkout Procedures

SOLID-STATE ENTHALPY CONTROL — Use this procedure for the solid-state enthalpy control that comes standard with the economizer. (See Table below).

Solid-State Enthalpy Control Contents

PART NO.	
HF25CA003	Economizer Motor Economizer Logic Module
HH57AC078	Solid-State Enthalpy Sensor
HH79AZ001	Mixed-Air Sensor

TEST PROCEDURE	RESULTS
A. Disconnect power at TR and TR1. Disconnect jumper between P and P1. See Fig. 17. B. Jumper TR to 1. C. Jumper T1 to T. D. Disconnect outdoor-air enthalpy connections from S_O and +. Factory-installed 620 ohm resistor should remain connected to S_R and +. E. Reconnect power to terminals TR and TR1	1. LED (light-emitting diode) should be off. 2. Motor is in closed position.

TEST PROCEDURE	RESULTS
A. Disconnect factory-installed resistor from terminals S _R and +.	1. LED should be on. 2. Motor drives toward open.

High and Low Enthalpy Simulation

TEST PROCEDURE	RESULTS
A. Reconnect factory-installed 620 ohm resistor between terminals S_R and +. B. Connect 1200 ohm checkout resistor between terminals S_O and +. C. Turn enthalpy setpoint potentiometer to position A.	Low enthalpy test results: 1. LED should be on. 2. Motor drives toward open.
D. Turn enthalpy setpoint potentiometer to position D E. Disconnect 1200 ohm checkout resistor.	High enthalpy test results: 1. LED should be off. 2. Motor drives toward closed.

Sensor Examination

TEST PROCEDURE	RESULTS
<i>Examination of outdoor-air enthalpy sensor:</i> A. Reconnect the + terminal of the enthalpy sensor to the + terminal of the enthalpy control module. B. Connect a DC milliammeter between terminal S_O of the enthalpy control module and terminal S of the enthalpy sensor. Connect positive meter lead to terminal S of the enthalpy sensor. <i>Examination of accessory return-air enthalpy sensor (HH57AC078):</i> A. Connect a DC milliammeter between terminal S_R of the enthalpy control module and terminal S of the enthalpy sensor. Connect positive meter lead to terminal S of the enthalpy sensor.	1. Milliammeter reading should be 3 to 24 mA if sensor is operating correctly. 2. If milliammeter reading is 0, the sensor is wired backwards or the sensor is defective.

Power Failure — Dampers have a spring return. In event of power failure, dampers will return to full closed position until power is restored. *Do not manually operate damper motor.*

Refrigerant Charge — Amount of refrigerant charge is listed on unit nameplate and in Table 1. Refer to Carrier Standard Service Techniques Manual, Refrigerants section.

Unit panels must be in place when unit is operating during charging procedure.

NO CHARGE — Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to Table 1).

LOW CHARGE COOLING — Using cooling charging chart (see Fig. 27), add refrigerant until conditions of the chart are met. Note that charging chart is different from ones normally used. Chart is based on charging units to correct superheat for various operating conditions. An accurate pressure gage and temperature sensing device are required. Connect temperature sensing device to service port on suction line and insulate it so that outdoor ambient temperature does not affect reading. Indoor-air cfm must be within normal operating range of unit.

TO USE COOLING CHARGING CHART — Take outdoor ambient temperature and read the suction pressure gage. Refer to chart to determine correct suction temperature. If suction temperature is high, add refrigerant. If suction temperature is low, carefully reclaim some of the charge. Re-check suction pressure as charge is adjusted.

Pilot Light — If pilots do not light as described in Start-Up, Heating section, be sure that pilot orifice is not obstructed, then check for spark ignitor malfunctions as follows:

1. Shut off control supply power to ignitor control pack (ICP).
2. Check that spark gap is $\frac{1}{8}$ in. $\pm$ $\frac{1}{32}$ inch.
3. Check that ICP is securely grounded.

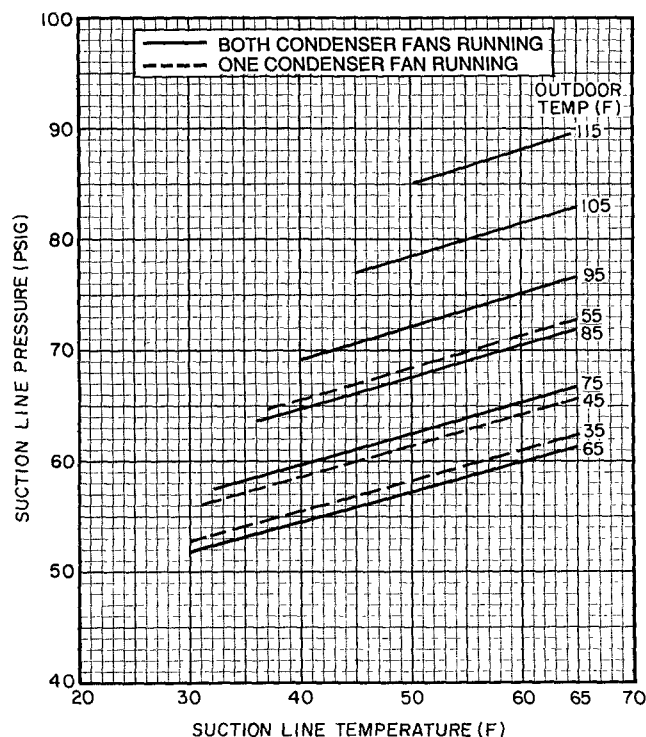


Fig. 27 — Cooling Charging Chart

4. Check that high-voltage lead is securely connected between ICP and electrode body.
5. Restore power to ICP. Check that 24-v is supplied to terminal **TH** of ICP.
6. Check unit label diagram for correct terminal usage if any wires are removed.

Pilot Adjustment

1. Set system selector switch at OFF position to shut off unit. Turn off power to unit.
2. Remove screw cap cover on pilot gas valve to expose adjusting screw.
3. Turn on power to unit. Set system selector switch to HEAT position and set thermostat to a setting that will call for heat. Pilot ignites.
4. With a small screwdriver, turn adjustment screw until flame fully engulfs sensor. Flame can be observed through view port (Fig. 28).
5. Replace cap on pilot gas valve. Turn off power to unit. Return valve(s) to original position.
6. Check for proper burner operation by cycling the burners. Wait 30 seconds between burner cycles.
7. Check that all unit panels are in place before leaving unit.

Gas Valve Adjustment

NATURAL GAS — The gas valve opens and closes in response to the thermostat or limit control.

When power is supplied to valve terminals 3 and 4, the pilot valve opens to the preset position. When power is supplied to terminals 1 and 2, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body (3.5 in. wg).

To adjust regulator:

1. Set thermostat at setting for no call for heat.
2. Turn main gas valve to OFF position.
3. Remove $\frac{1}{8}$ -in. pipe plug from manifold or gas valve pressure tap connection. Install a suitable pressure-measuring device.
4. Set main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment screw.
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, set thermostat setting for no call for heat, turn off main gas valve, remove pressure-measuring device and replace $\frac{1}{8}$ -in. pipe plug and screw cap.

Main Burners — For most applications, main burners are factory set and should require no adjustment. However, if burner adjustment is necessary:

1. Perform pilot adjustment.
2. Turn gas valve to ON position. Allow unit to operate at least 15 minutes with burner access panel in place.
3. Remove access panel.
4. Loosen primary air shutter (Fig. 28) and adjust to a minimum opening of $\frac{5}{8}$ inch.
5. Retighten primary air shutter and reinstall access panel.

To check ignition of main burners and fan switch operation, move thermostat dial above and below room temperature several times, pausing at least one minute between cycles.

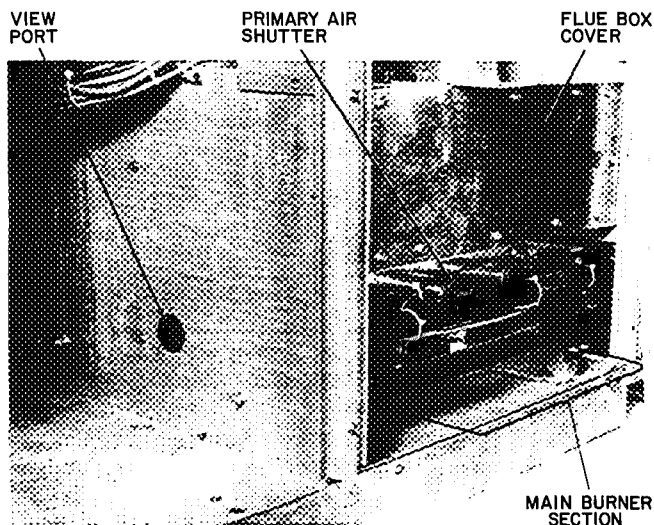


Fig. 28 — Typical Heating Section

MAIN BURNER REMOVAL

1. Shut off manual main gas valve.
2. Shut off power to unit.
3. Remove unit control box/gas valve access panel, burner section access panel, and center post (Fig. 4).
4. Disconnect pilot reignitor and pilot proving sensor leads at ICP, rollout switch leads at switch, and pilot tube gas connection(s) at the pilot orifice.
5. Disconnect gas connection(s) from between gas valve(s) and main burners.
6. Remove 2 screws securing burner assembly to base unit.
7. Slide burner assembly out of unit.

Replacement Parts — A complete list of replacement parts may be obtained from any Carrier distributor upon request.

LEGEND

(Fig. 29, Typical Component Arrangement, Fig. 30, Typical Wiring Schematic)

AHA — Adjustable Heat Anticipator
BKR W/AT — Breaks with Amp Turns
C — Contactor, Compressor
CB — Circuit Breaker
CC — Cooling Compensator
CH — Crankcase Heater
CLO — Compressor Lockout
CLS — Compressor Lockout Switch
COMP — Compressor Motor
CR — Control Relay
CT — Current Transformer
DM — Damper Motor
DU — Dummy Terminal
EC — Enthalpy Control
EQUIP — Equipment
FPT — Freeze Protection
FU — Fuse
GND — Ground
HPS — High-Pressure Switch
HR — Heat Relay
HV — High Voltage
I — Ignitor
ICP — Ignitor Control Pack
IDM — Induced-Draft Motor
IDR — Induced-Draft Relay

IFC — Indoor Fan Contactor
IFCB — Indoor Fan Circuit Breaker
IFM — Indoor Fan Motor
IFR — Indoor Fan Relay
IP — Internal Protector
L — Light
LOR — Lockout Relay
LPS — Low-Pressure Switch
LS — Limit Switch
MAT — Mixed-Air Thermostat
MGV — Main Gas Valve
NEC — National Electrical Code
OAT — Outdoor-Air Thermostat
OFC — Outdoor-Fan Contactor
OFM — Outdoor-Fan Motor
PGV — Pilot Gas Valve
PL — Plug Assembly
PRI — Primary
PS — Pressure Switch
QT — Quadruple Terminal
R — Relay
RS — Rollout Switch
SN — Sensor
SW — Switch
TB — Terminal Block
TC — Thermostat Cooling

TDR — Time Delay Relay
TH — Thermostat Heating
TRAN — Transformer

 Terminal (Marked)
 Terminal (Unmarked)
 Terminal Block
 Splice
 Splice (Marked)
 Factory Wiring
 Field Control Wiring
 Field Power Wiring
 Accessory or Optional Wiring
 To Indicate Common Potential Only, Not To Represent Wiring

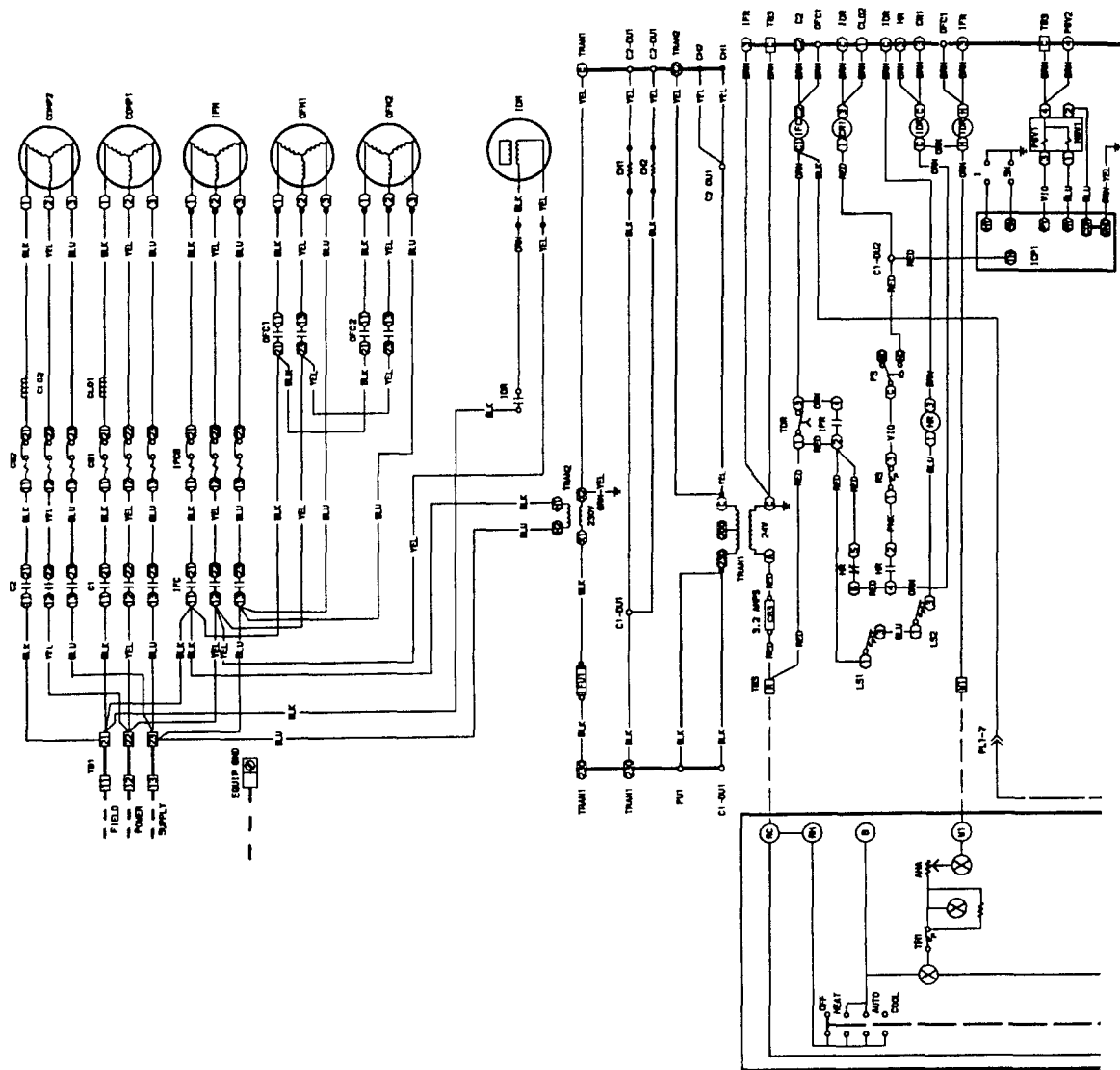
NOTES:

1. Compressor and/or fan motor(s) thermally protected; 3-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. Jumpers are omitted when unit is equipped with economizer.
4. Set thermostat heat anticipator(s)

$$\frac{W1}{.81} \quad \frac{W2}{.75}$$
5. CB must trip amps are equal to or less than 140% full load amps.
6. 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. A plain (no line) number signifies a normally-open contact.
7. The CLO locks out the compressor to prevent short cycling on compressor overload and safety devices; before replacing CLO, check these devices.

UNIT	W1	W2	VOLTAGE
48TJ024	98 1 20	.44 .44	(208/230/575 v) (460 v)





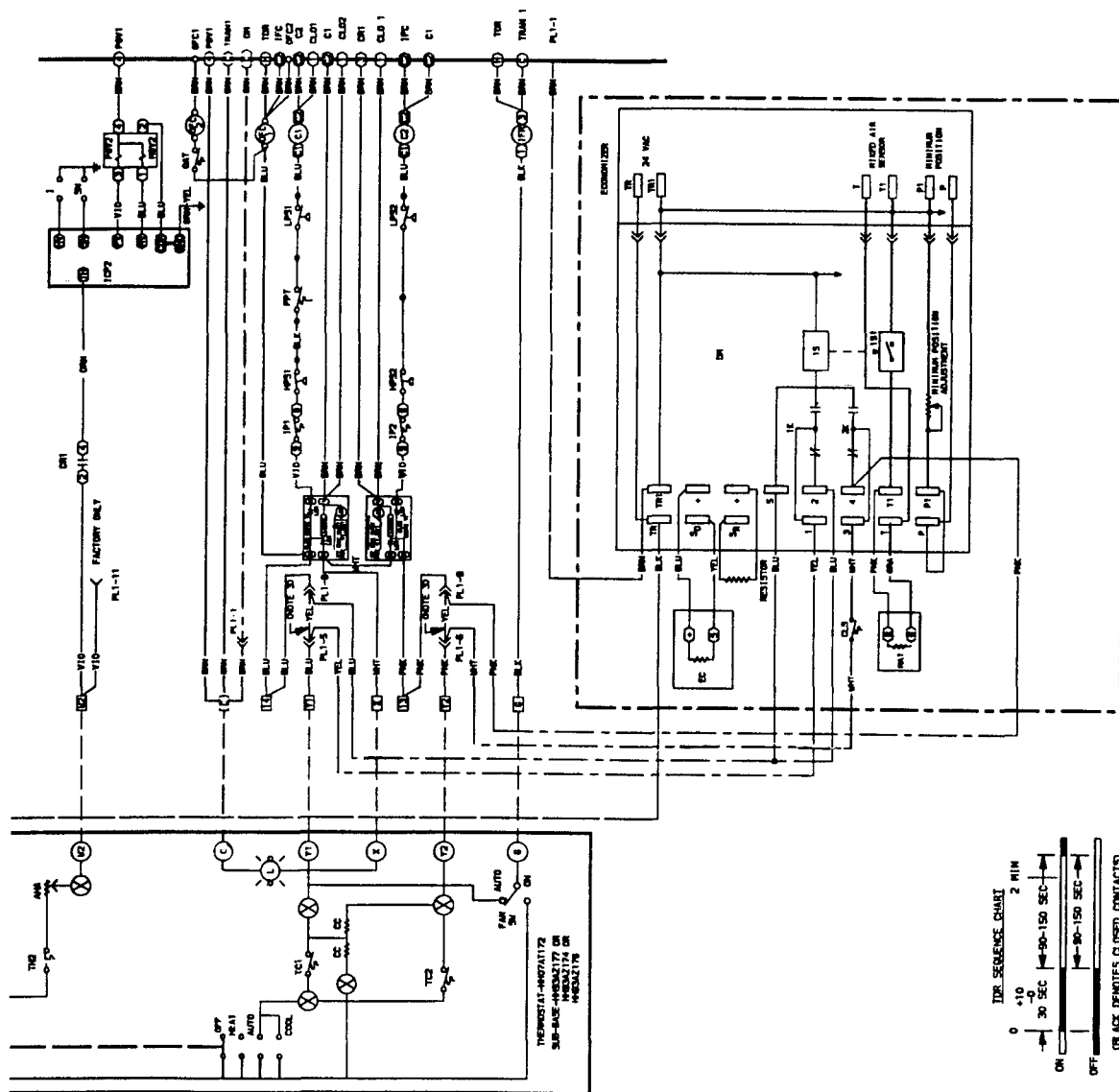


Fig. 30 — Typical Wiring Schematic

