



48HJD008-014
48HJE008-014
48HJF008-012

Single-Package Rooftop Heating/Cooling Units

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 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



Disconnect gas piping from unit when leak testing at pressure greater than ½ psig. Pressures greater than ½ psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than ½ psig, it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of ½ psig or less, a unit connected to such piping must be isolated by manually closing the gas valve(s).

⚠ WARNING

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

INSTALLATION

Unit is shipped in the vertical configuration. To convert to horizontal application, remove side duct opening covers. Using the same screws, install covers on vertical duct openings with the insulation-side down. Seals around duct openings must be tight.

IMPORTANT: An external filter kit **MUST** be used or the filters **MUST** be field-installed outside the unit on horizontal discharge applications with economizer or two-position damper. Otherwise, the economizer or two-position damper **MUST** be partially removed to access the filters. The area of the field-installed filters should be equal to the area of the factory-installed filters.

Step 1 — Provide Unit Support

ROOF CURB — Assemble and install accessory roof curb in accordance with instructions shipped with curb. See Fig. 1. Install insulation, cant strips, roofing, felt, and counter flashing as shown. *Ductwork must be attached to curb.* If gas, electric power, or control power is to be routed through the curb, attach the accessory thru-the-curb service connection plates to the roof curb in accordance with the accessory installation instructions. Connection plates must be installed before unit is set in roof curb.

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

Curb should be level. Unit leveling tolerances are shown in Fig. 2. This is necessary for unit drain to function properly. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

SLAB MOUNT (Horizontal Units Only) — Provide a level concrete slab that extends a minimum of 6 in. beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

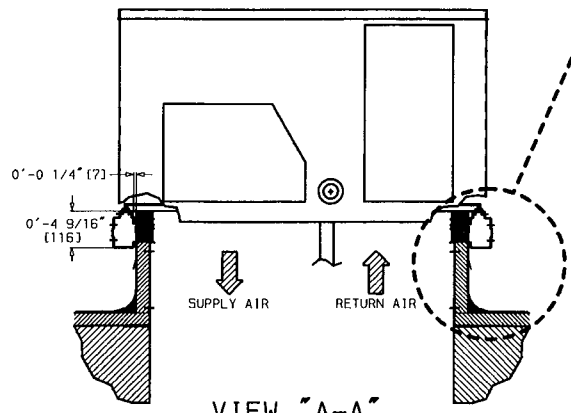
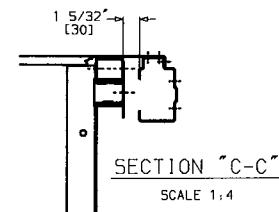
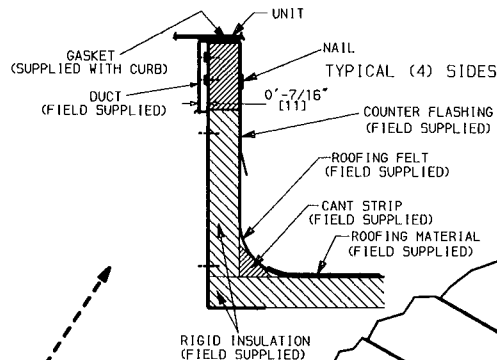
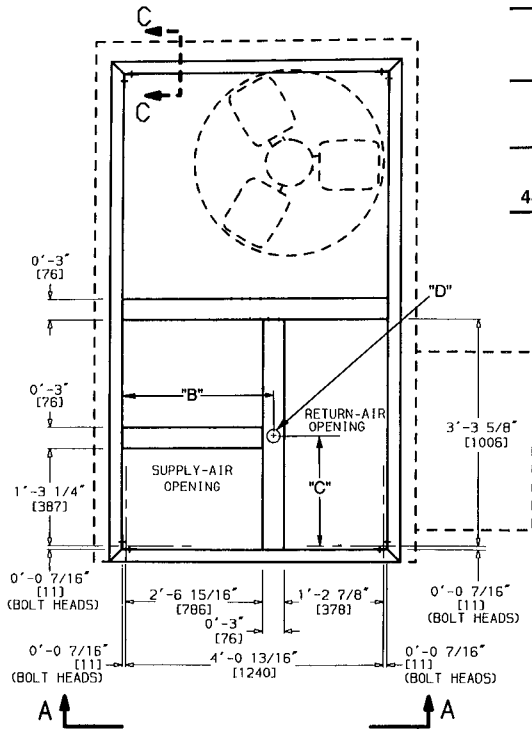
NOTE: Horizontal units may be installed on a roof curb if required.

ROOF CURB ACCESSORY	"A"	UNIT SIZE
50DJ901371	1'-2" [356]	48HJD/HJE/HJF008-012 48HJD/HJE014
50DJ901381	2'-0" [610]	

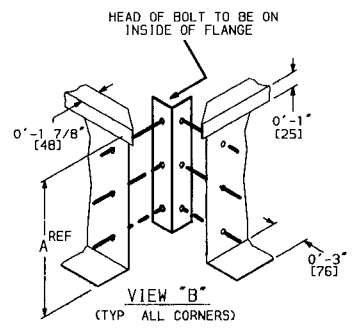
NOTES:

- 1 Roof curb accessory is shipped unassembled
- 2 Insulated panels
- 3 Dimensions in [] are in millimeters
- 4 Roof curb: galvanized steel.
- 5 Attach ductwork to curb (Flanges of duct rest on curb)
- 6 Service clearance 4 ft on each side.
- 7  Direction of airflow

UNIT SIZE	"B"	"C"	"D" ALT DRAIN HOLE	"E" GAS	"F" POWER	"G" CONTROL	CONNECTOR PKG ACY
48HJD/HJE/HJF008-012 48HJD/HJE014	1' 10 ¹⁵ / ₁₆ " [583]	1' 10 ¹⁵ / ₁₆ " [583]	1 ³ / ₄ " [45]	3/4" NPT	1" NPT	3/4" NPT	50DJ901551



VIEW "A-A"



VIEW "B"
(TYP ALL CORNERS)

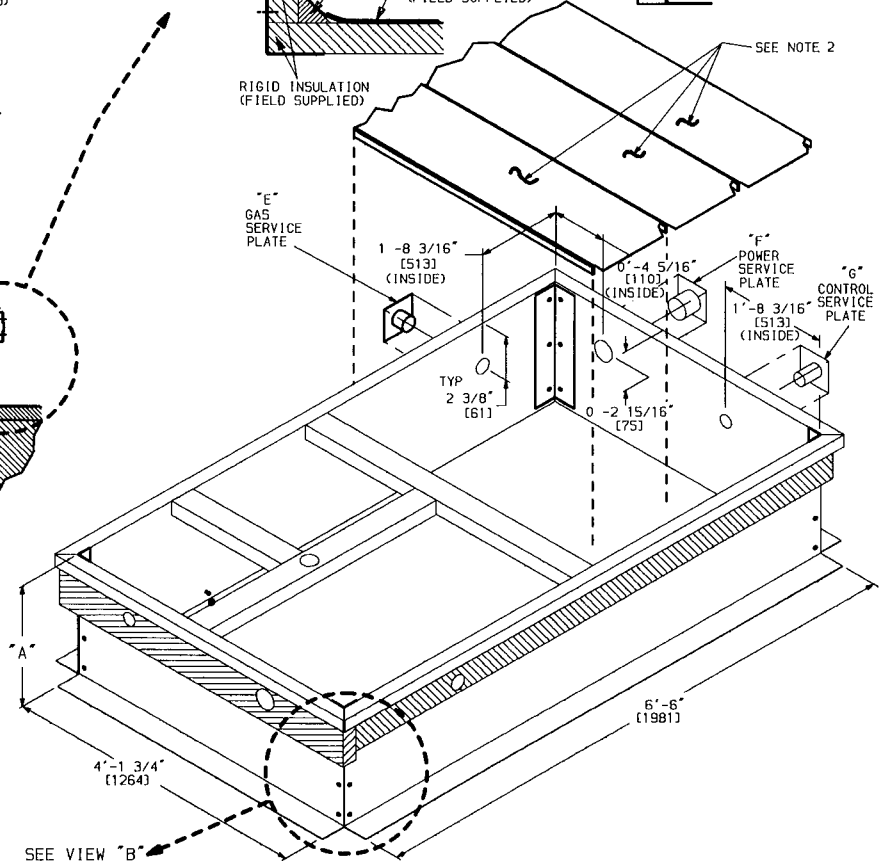


Fig. 1 — Roof Curb Details

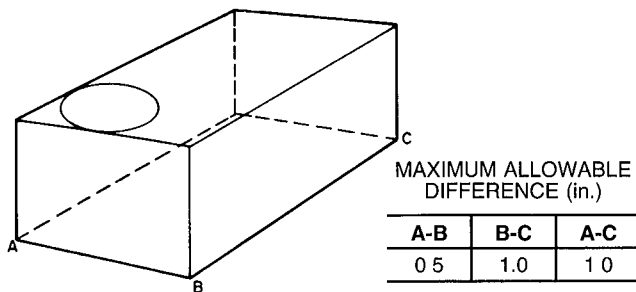


Fig. 2 — Unit Leveling Tolerances

Step 2 — Field Fabricate Ductwork — On vertical units, secure all ducts to roof curb and building structure. *Do not connect ductwork to unit.* For horizontal applications, field-supplied flanges should be attached to horizontal discharge openings and all ductwork secured to the flanges. Insulate and weather-proof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

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

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

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -0.35 in. wg with economizer or -0.45 in. wg without economizer.

These units are designed for a minimum continuous return-air temperature of 50 F (dry bulb) or an intermittent operation down to 45 F (dry bulb), such as when used with a night setback thermostat.

Step 3 — Determine Location of Drain Line and External Trap — The unit's $\frac{3}{4}$ -in. condensate drain connections are located at the bottom and end of the unit. Unit discharge connections do not determine the use of drain connections; either drain connection can be used with vertical or horizontal applications.

When using the standard end drain connection, make sure the plug in the alternate bottom connection is tight before installing the unit.

To use the bottom drain connection for a roof curb installation, relocate the factory-installed plug from the bottom connection to the end connection. See Fig. 3. The piping for the condensate drain and external trap can be completed after the unit is in place.

All units must have an external trap for condensate drainage. Install a trap at least 4 in. deep and protect against freeze-up. See Fig. 4. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1 in. per 10 ft of run. Do not use a pipe size smaller than the unit connection.

Step 4 — Rig and Place Unit — Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 5 for additional information. Operating weight is shown in Table 1 and Fig. 5.

Lifting holes are provided in base rails as shown in Fig. 5 and 6. Refer to rigging instructions on unit.

POSITIONING — Maintain clearance around and above unit to provide minimum distance from combustible materials, proper airflow, and service access. See Fig. 6.

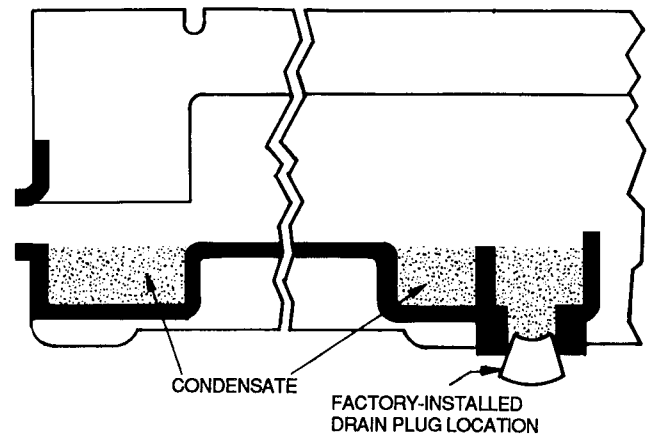
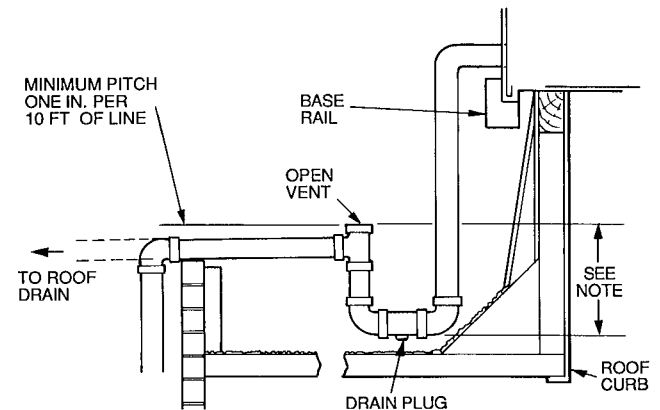


Fig. 3 — Condensate Drain Pan



NOTE: Trap should be deep enough to offset maximum unit static difference. A 4-in. trap is recommended.

Fig. 4 — External Trap Condensate Drain

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

Be sure that unit is installed so that snow will not block the combustion intake or flue outlet.

Unit may be installed directly on wood flooring or on Class A, B, or C roof-covering material when roof curb is used.

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

Position unit on roof curb so that the following clearances are maintained: $\frac{1}{4}$ -in. clearance between roof curb and base rails on each side and front of unit; $1\frac{5}{32}$ -in. clearance between roof curb and rear of unit. (See Fig. 1, section C-C.)

Locate mechanical draft system flue assembly at least 48 in. from any opening through which combustion products could enter the building, and at least 48 in. from an adjacent building or combustible material. When unit is located adjacent to public walkways, flue assembly must be at least 7 ft above grade.

Flue gas can deteriorate building materials. Orient unit so that flue gas will not affect building materials.

Adequate combustion-air space must be provided for proper operation of this equipment. Be sure that installation complies with all local codes and Section 5.3, Air for Combustion and Ventilation per NFPA, (National Fuel Gas Code),

ANSI (American National Standards Institute) Z223.1-1984 and Addendum Z223.1A-1987. In Canada, installation must be in accordance with the CAN1.B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

Flue vent discharge must have a minimum horizontal clearance of 4 ft from electric and gas meters, gas regulators, and gas relief equipment.

After unit is in position, remove shipping materials and rigging skids.

Step 5 – Install Flue Hood – Flue hood and rod are shipped screwed to the burner compartment access panel. Remove from shipping location and, using screws provided, install flue hood and rod in location shown in Fig. 6 and 7

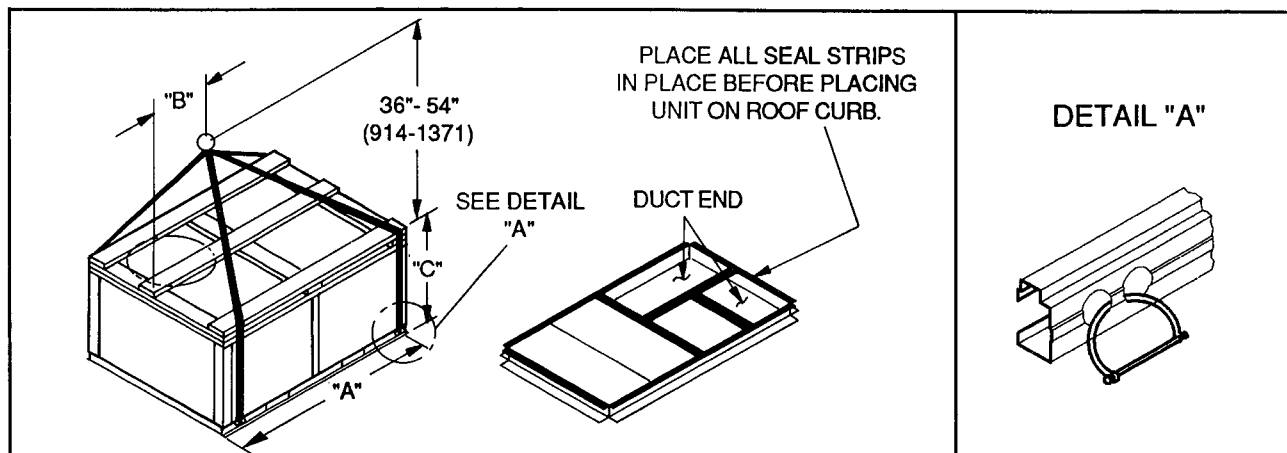
Step 6 – Install Gas Piping – Unit is equipped for use with type of gas shown on nameplate. Refer to local building codes, or in the absence of local codes, to ANSI

Z223.1-1984 and Addendum Z223.1A-1987 entitled NFGC. In Canada, installation must be in accordance with the CAN1.B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

For natural gas applications, gas pressure at unit gas connection must not be less than 4.0 in. wg or greater than 13.0 in. wg while unit is operating. For liquid propane applications, the gas pressure must not be less than 5.0 in. wg or greater than 13.0 in. wg at the unit connection.

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

Support gas piping as shown in the table in Fig. 8. For example, a 3/4-in. gas pipe must have one field-fabricated support beam every 8 ft. Therefore, an 18-ft long gas pipe would have a minimum of 3 support beams. See Fig. 8 for typical pipe guide and locations of external manual gas shut-off valve.



NOTES:

1. Dimensions in () are in millimeters.
2. Hook rigging shackles through holes in base rail as shown in detail "A". Holes in base rails are centered around the unit center of gravity. Use wooden top skid when rigging to prevent rigging straps from damaging unit.
3. Weights include base unit without economizer. See Table 1 for unit operating weights with accessory economizer.

CAUTION

All panels must be in place when rigging

UNIT	MAX WEIGHT		DIMENSIONS					
			“A”		“B”		“C”	
	lb	kg	in.	mm	in.	mm	in.	mm
48HJD/HJE/HJF008	870	395	75.38	2219	40.25	1022	41.31	1050
48HJD/HJE/HJF009	880	399	75.38	2219	40.25	1022	41.31	1050
48HJD/HJE/HJF012	1035	469	75.38	2219	40.25	1022	49.31	1253
48HJD/HJE014	1050	476	75.38	2219	40.25	1022	49.31	1253

Fig. 5 – Rigging Details

Table 1 — Physical Data

BASE UNIT 48	HJD/HJE/HJF008	HJD/HJE/HJF009	HJD/HJE/HJF012	HJD/HJE014
NOMINAL CAPACITY (tons)	7½	8½	10	12½
OPERATING WEIGHT (lb)				
Unit	870	880	1035	1050
With Economizer	914	924	1079	1094
Roof Curb	143	143	143	143
COMPRESSOR		Scroll		Reciprocating
Quantity	2	2	2	2
Oil (oz) (each compr)	60	65	64	65
REFRIGERANT TYPE		R-22		
Operating Charge (lb-oz)				
Circuit 1	6- 8	7-4	8-11	10-0
Circuit 2	5-14	6-4	8-3	9-3
CONDENSER FAN		Propeller		
Quantity...Diameter (in.)	1 .26	1..26	1..26	1 ..26
Nominal Cfm	6500	6500	7000	8200
Motor Hp...Rpm	¾ .1100	¾ .1100	¾...1100	¾ .1100
Watts Input (Total)	950	950	950	950
CONDENSER COIL		Enhanced Copper Tubes, Aluminum Lanced Fins		
Rows...Fins/in.	2 ..17	2...17	2...17	2...17
Total Face Area (sq ft)	18 0	20 5	25 0	25.0
EVAPORATOR FAN		Centrifugal		
Size (in.)	15 x 15	15 x 15	15 x 15	15 x 15
Type Drive	Belt	Belt	Belt	Belt
Nominal Cfm	3000	3400	4000	5000
Maximum Continuous Bhp	2.90	2.90	4.20	5.25
Motor Frame Size	56	56	56	56
Fan Rpm Range	840-1085	840-1085	860-1080	900-1260
Motor Bearing Type	Ball	Ball	Ball	Ball
Maximum Fan Rpm	2100	2100	2100	2100
Motor Pulley Pitch Diameter A/B (in.)	3 4/4 4	3 4/4 4	4 0/5.0	2.8/3 8
Nominal Motor Shaft Diameter (in.)	7/8	7/8	7/8	7/8
Fan Pulley Pitch Diameter (in.)	7.0	7 0	8 0	5 8
Belt — Type...Length (in.)	A..51	A...51	A...51	BX .46
Pulley Center Line Distance (in.)	16 75-19 25	16 75-19.25	15 85-17 50	15 85-17.50
Speed Change Per Full Turn of Movable Pulley Flange (rpm)	50	50	45	60
Movable Pulley Maximum Full Turns from Closed Position	5	5	5	6
Factory Setting — Full Turns Open	5	5	5	5
Factory Speed Setting (rpm)	840	840	860	960
Fan Shaft Diameter at Pulley (in.)	1	1	1	1
EVAPORATOR COIL		Enhanced Copper Tubes, Aluminum Double Wavy Fins		
Rows...Fins/in.	3.. 15	3.. 15	3 ..15	4 15
Total Face Area (sq ft)	8 0	8.0	10.0	11 1
FURNACE SECTION				
Rollout Switch Cutout (Temp (F))*	195	195	195	195
Burner Orifice Diameter (in. ...drill size)†				
Natural Gas — Std	120 .31	120 .31	120 31/.120 31/129...30	120 ..31/ 129. 30
Liquid Propane — Alt**	096 41	096 41	096...41/ 096 41/.102 ..38	096 41/ 102 38
Thermostat Heat Anticipator Setting (amps)				
208/230/460-v Stage 1	.14/ 14/ 14	14/ 14/ 14	14	14
Stage 2	.14/20/.20	.14/20/.20	.20	.20
Gas Input Stage 1	90,000/120,000/180,000	90,000/120,000/180,000	120,000/180,000/200,000	180,000/200,000
Stage 2	125,000/180,000/220,000	125,000/180,000/220,000	180,000/220,000/250,000	220,000/250,000
Efficiency (Steady State) (%)	82/82/82	82/82/82	82/82/80	82/80
Temperature Rise Range	20-50/35-65/45-75	20-50/35-65/45-75	35-65/35-65/40-70	35-65/40-70
Manifold Pressure (in. wg)				
Natural Gas — Std	3 5	3 5	3.5	3 5
Liquid Propane — Alt**	3.5	3.5	3.5	3.5
Field Gas Connection Size (in.)	50/ 75/.75	.50/ 75/.75	.75/ 75/.75	75/ 75
HIGH-PRESSURE SWITCH (psig)		450 ± 50		500 ± 50
Standard Compressor Internal Relief		428		428
Cutout		320		320
Reset (Auto.)				
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (psig)				
Cutout		7 ± 3		
Reset (Auto.)		22 ± 7		
FREEZE-PROTECTION THERMOSTAT				
Opens (F)		30 ± 5		
Closes (F)		45 ± 5		
OUTDOOR-AIR INLET SCREENS		Cleanable		
Quantity...Size (in.)		1 .20 x 25 x 1		
		1 .16 x 25 x 1		
RETURN-AIR FILTERS		Throwaway		
Quantity...Size (in.)	4 16 x 20 x 2	4 .16 x 20 x 2	4.. 20 x 20 x 2	4 .20 x 20 x 2

LEGEND

Bhp — Brake Horsepower

*Indicates automatic reset

†48HJD008,009 units have 3 burners

48HJD012 and 48HJE008,009 units have 4 burners.

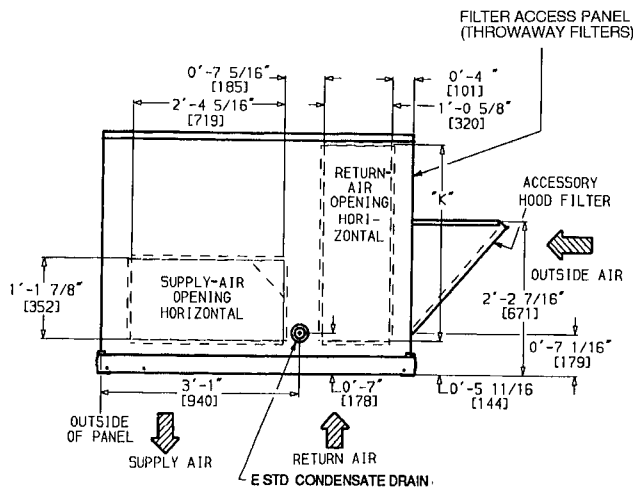
48HJF008,009; 48HJE/HJF012; and 48HJD/HJE014 units have 5 burners

**Liquid propane conversion kit is available as an accessory.

UNIT	STD UNIT WEIGHT		ECONOMIZER WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)	
	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg
48HJD/HJE/HJF008	870	395	44	20	189	86	161	73	239	109
48HJD/HJE/HJF009	880	399	44	20	191	87	163	74	242	110
48HJD/HJE/HJF012	1035	469	44	20	225	102	192	87	285	129
48HJD/HJE014	1050	476	44	20	228	103	195	88	289	131

UNIT	CORNER WEIGHT (D)		"H"		"J"		"K"		"L"	
	Lb	Kg	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm
48HJD/HJE/HJF008	280	127	2-0 ⁷ / ₈	632	3-5 ¹ / ₈	1050	2-9 ¹ / ₈	856	2-2 ¹ / ₈	663
48HJD/HJE/HJF009	284	129	1-2 ¹ / ₈	378	3-5 ¹ / ₈	1050	2-9 ¹ / ₈	856	2-2 ¹ / ₈	663
48HJD/HJE/HJF012	333	151	1-2 ¹ / ₈	378	4-1 ¹ / ₈	1253	3-0 ³ / ₈	924	2-10 ¹ / ₈	866
48HJD/HJE014	338	153	1-2 ¹ / ₈	378	4-1 ¹ / ₈	1253	3-0 ³ / ₈	924	2-10 ¹ / ₈	866

CONNECTION SIZES	
A	1 ³ / ₈ " Dia [35] Field Power Supply Hole
B	2 ¹ / ₈ " Dia [64] Power Supply Knockout
C	1 ³ / ₄ " Dia [44] Pressure-Gage Hose Opening
D	7/8" Dia [22] Field Control Wiring Hole
E	3/4"-14 NPT Condensate Drain
F	1/2"-14 NPT Gas Connection 48HJD008,009
F	3/4"-14 NPT Gas Connection 48HJE/HJF008,009, 48HJD/HJE/HJF012, 48HJD/HJE014
G	2" Dia [51] Power Supply Knockout



*Indicates vertical center of gravity
†Indicates horizontal center of gravity

NOTES:

1 Dimensions in [] are in millimeters
2 Center of gravity

3 Direction of airflow

4 On vertical discharge units, ductwork to be attached to accessory roof curb only. For horizontal discharge units, field supplied flanges should be attached to horizontal discharge openings, and all ductwork should be attached to the flanges.

5 Minimum clearances are as follows (local codes or jurisdiction may prevail):
NOTE: When installing these units, use the maximum clearance stated for your application.

a Between unit, flue side and combustible surfaces, 48 inches (Minimum clearance to combustibles, flue side, is 18 in. for units with accessory flue discharge deflector)

b Bottom to combustible surfaces (when not using curb), 1 in and 0 in. to bottom of base rail

c Condenser coil, for proper airflow, 36-in. one side, 12 in. the other. The side getting the greater clearance is optional.

d Overhead, 60 in. to assure proper condenser fan operation.

e Horizontal supply and return end, 0 inches

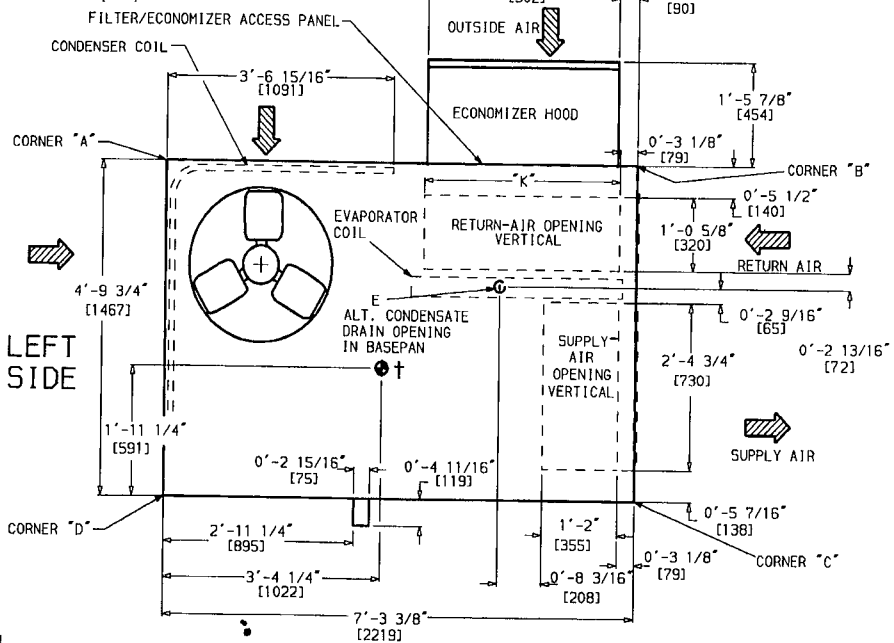
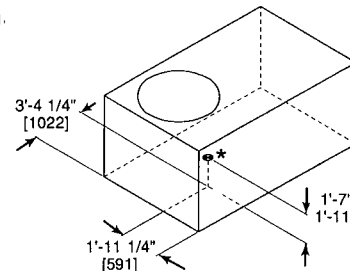
f Between units, control box side, 42 inches

g Between unit and ungrounded surfaces, control box side, 36 in. per NEC (National Electrical Code)

h Between unit and block or concrete walls and other grounded surfaces, control box side, 42 in. per NEC.

6 With the exception of the clearance for the condenser coil and combustion side, as stated in notes 5a, b, and c, a removable fence or barricade requires no clearance.

7 Units may be installed on combustible floors made from wood or class A, B, or C, roof covering material if set on base rail.



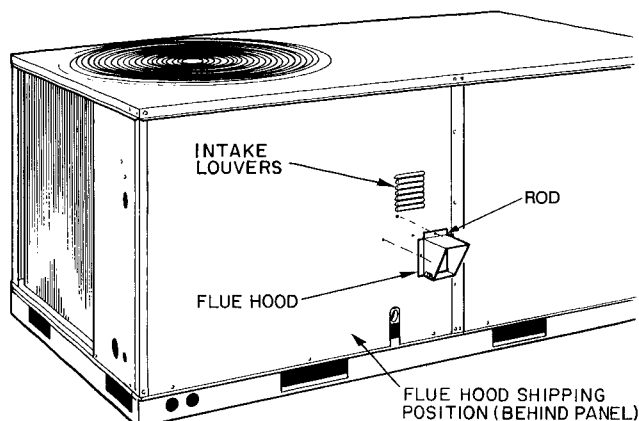
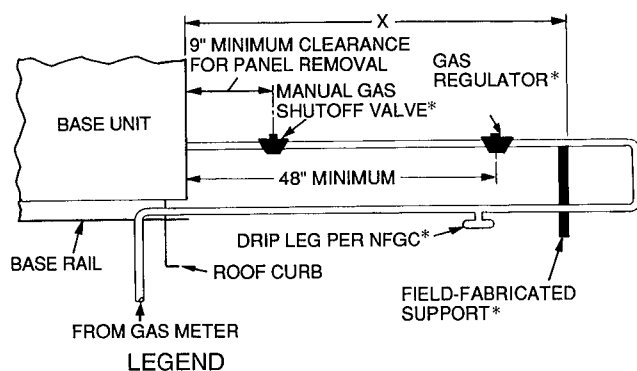


Fig. 7 — Flue Hood Details



NFGC — National Fuel Gas Code

*Field Supplied.

NOTE: Follow all local codes.

STEEL PIPE NOMINAL DIAMETER (in.)	SPACING OF SUPPORTS X DIMENSION (ft)
1/2	6
3/4 or 1	8
1 1/4 or Larger	10

**Fig. 8 — Gas Piping Guide
(With Accessory Thru-the-Curb
Service Connections)**

Step 7 — Make Electrical Connections

⚠ WARNING

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code) ANSI/NFPA (National Fire Protection Association), latest edition, and local electrical codes. *Do not use gas piping as an electrical ground.* Failure to follow this warning could result in the installer being liable for personal injury of others.

FIELD POWER SUPPLY — All units except 208/230-v units are factory wired for the voltage shown on the nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the transformer *must* be rewired by moving the black wire from the 230-v orange wire on the transformer and connecting it to the 200-v red wire from the transformer. The orange wire then must be insulated.

Refer to unit label diagram for additional information. Pigtails are provided for field service. Use factory-supplied splices or UL (Underwriters' Laboratories) approved copper connector.

When installing units, provide a disconnect per NEC.

All field wiring must comply with NEC and local requirements. In Canada, electrical connections must be made in accordance with CSA (Canadian Standards Association) C22.1 Canadian Electrical Code Part One.

Install conduit through side panel openings indicated in Fig. 6. Route power lines through connector to terminal connections as shown in Fig. 9.

On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in Table 2, Note 2 to determine the percent voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

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

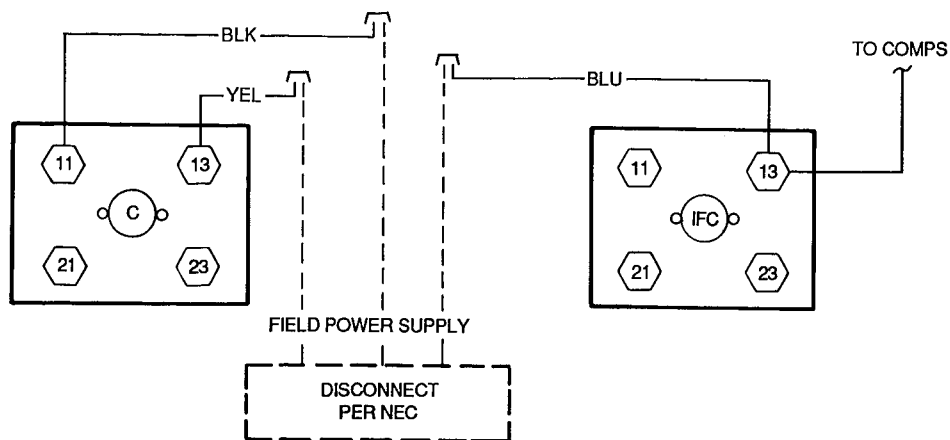
Route thermostat cable or equivalent single leads of colored wire from subbase terminals to low-voltage connections on unit (shown in Fig. 10) as described in Steps 1 - 4 below.

1. If unit is mounted on roof curb and accessory thru-the-curb service plate connection is used, route wire through connection plate.
2. Pass control wires through the hole provided on unit (see connection D, Connection Sizes table, Fig. 6).
3. Feed wires through the raceway built into the corner post to the 24-v barrier located on the left side of the control box. See Fig. 11. The raceway provides the UL required clearance between high- and low-voltage wiring.
4. Connect thermostat wires to screw terminals of low voltage connection board (see Fig. 10).

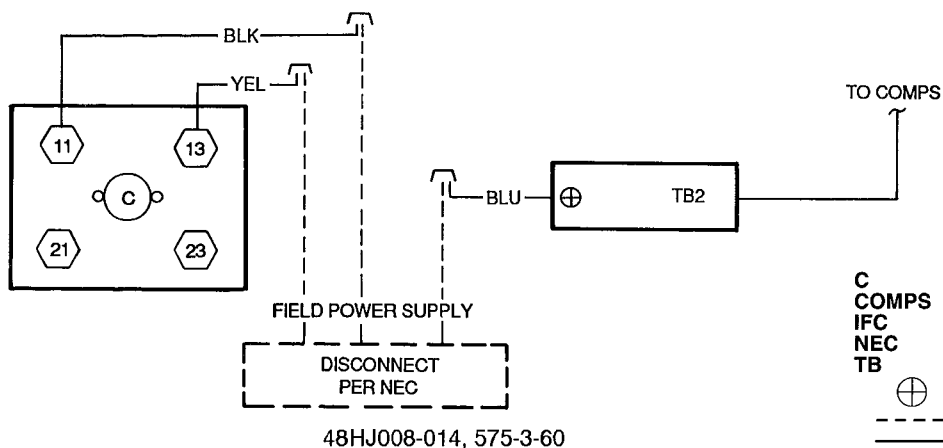
NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 51 to 75 ft, use no. 16 AWG insulated wire (35 C minimum). For over 75 ft, use no. 14 AWG insulated wire (35 C minimum).

NOTE: All wire larger than no. 18 AWG cannot be directly connected to the thermostat will require a junction box and splice at the thermostat.

HEAT ANTICIPATOR SETTINGS — On 48HJ008,009 units, set heat anticipator settings at .14 amp for both first and second stage heating for low heat. For all other stages and unit sizes, set heat anticipator settings at .14 amp for first stage and .20 amp for second-stage heating.



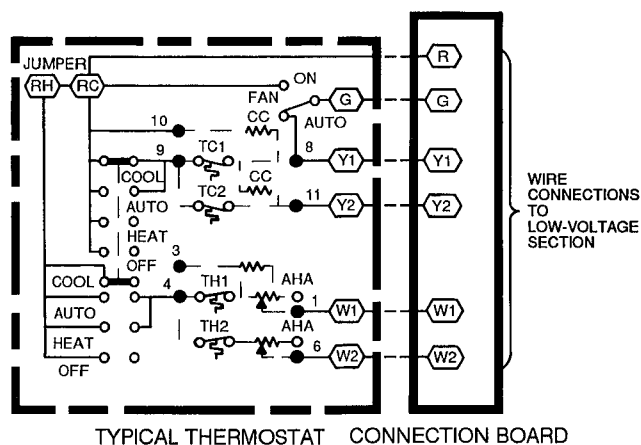
48HJ008-014, 208/230-3-60 AND 460-3-60



48HJ008-014, 575-3-60

- LEGEND
- C** — Contactor
 - COMPS** — Compressors
 - IFC** — Indoor (Evaporator) Fan Contactor
 - NEC** — National Electrical Code
 - TB** — Terminal Block
 - Terminal Block Connection
 - Field Wiring
 - Factory Wiring

Fig. 9 — Power Wiring Connections



TYPICAL THERMOSTAT CONNECTION BOARD

- LEGEND
- AHA** — Adjustable Heat Anticipator
 - CC** — Cooling Compensator
 - RC** — 24 v Cooling
 - RH** — 24 v Heating
 - TC** — Thermostat-Cooling
 - TH** — Thermostat-Heating
 - Field Wiring
 - Factory Wiring

Fig. 10 — Low-Voltage Connections With or Without Economizer or Two-Position Damper

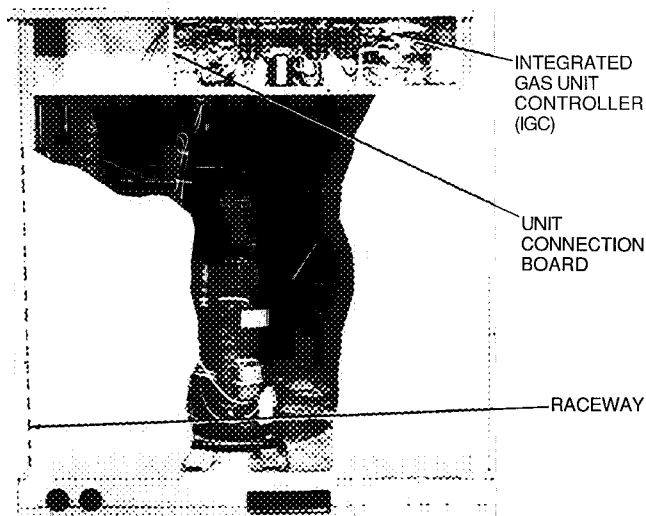


Fig. 11 — Field Control Wiring Raceway

Table 2 — Electrical Data

UNIT 48	NOMINAL VOLTS-PH-HZ	VOLTAGE RANGE		COMPR		OFM	IFM	COMBUSTION FAN MOTOR	POWER SUPPLY		MINIMUM UNIT DISCONNECT SIZE	
		Min	Max	RLA	LRA	FLA	FLA	FLA	MCA	MOCP	FLA	LRA
HJD/HJE/ HJF008 (7½ Tons)	208/230-3-60	187	254	13.5	99.0	3.8	7.5	.57	41.7/41.7	50/50*	44/44	276/276
	460-3-60	414	508	7.4	49.5	1.9	3.4	.30	22.0	25*	23	138
	575-3-60	518	632	5.8	40.0	1.9	3.4	.30	17.3	20*	18	111
HJD/HJE/ HJF009 (8½ Tons)	208/230-3-60	187	254	13.5	99.0	3.8	7.5	.57	41.7/41.7	50/50*	44/44	276/276
	460-3-60	414	508	7.4	49.5	1.9	3.4	.30	22.0	25*	23	138
	575-3-60	518	632	5.8	40.0	1.9	3.4	.30	17.3	20*	18	111
HJD/HJE/ HJF012 (10 Tons)	208/230-3-60	187	254	17.3	123.0	3.8	12.0	.57	54.7/54.7	60/60*	58/58	348/348
	460-3-60	414	508	9.0	62.0	1.9	5.4	.30	27.6	30*	29	175
	575-3-60	518	632	7.1	50.0	1.9	5.4	.30	21.8	30*	23	141
HJD/HJE014 (12½ Tons)	208/230-3-60	187	254	22.3	142.0	3.8	15.0	.57	69.0/69.0	80/80	69/69	386/386
	460-3-60	414	508	10.4	72.0	1.9	7.4	.30	32.8	35*	32	195
	575-3-60	518	632	9.6	58.5	1.9	7.4	.30	29.1	35*	29	158

LEGEND

CSA	—	Canadian Standards Association
FLA	—	Full Load Amps
HACR	—	Heating, Air Conditioning and Refrigeration
IFM	—	Indoor (Evaporator) Fan Motor
LRA	—	Locked Rotor Amps
MCA	—	Minimum Circuit Amps
MOCP	—	Maximum Overcurrent Protection
NEC	—	National Electrical Code
OFM	—	Outdoor (Condenser) Fan Motor
RLA	—	Rated Load Amps

*Fuse or HACR circuit breaker.



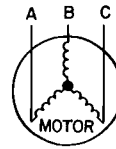
NOTES

- In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The CSA units may be fuse or circuit breaker.
- Unbalanced 3-phase Supply Voltage**
Never operate a motor where phase imbalance in supply voltage is greater than 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

$$(AB) 457 - 452 = 5 \text{ v}$$

$$(BC) 464 - 457 = 7 \text{ v}$$

$$(AC) 457 - 455 = 2 \text{ v}$$

Maximum deviation is 7 v

Determine percent voltage imbalance.

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{7}{457} \\ &= 1.53\% \end{aligned}$$

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.

Step 8 — Make Outdoor-Air Inlet Adjustments and Install Outdoor-Air Hood

OPTIONAL ECONOMIZER OR TWO-POSITION DAMPER — The economizer or two-position damper hood assembly is packaged and shipped in the filter section. Damper blades and control boards are installed at the factory and the economizer or two-position damper is shipped in the vertical discharge position.

NOTE: Horizontal discharge block-off plate is shipped with the air hood package. If unit is to be used for vertical discharge application, discard this plate.

To Assemble

1. Determine if ventilation air is required in building. If so, record quantity of ventilation air needed for use in Step 7.
2. Remove evaporator coil access panel. Save panel and screws. See Fig. 12.
3. Assemble outdoor-air hood top and side plates as shown in Fig. 13. Install seal strips on hood top and sides. Put aside screen retainer and retainer screws for later assembly. *Do not attach hood to unit at this time.*
4. Remove block-off panel from evaporator coil access panel and discard. Save screws. See Fig. 12.

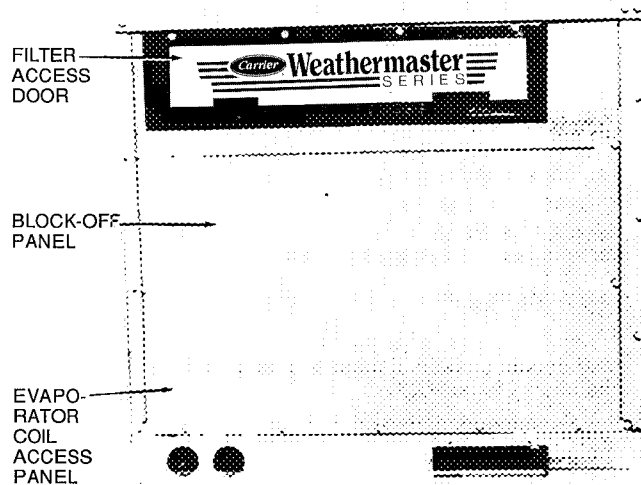


Fig. 12 — Access Panel Location

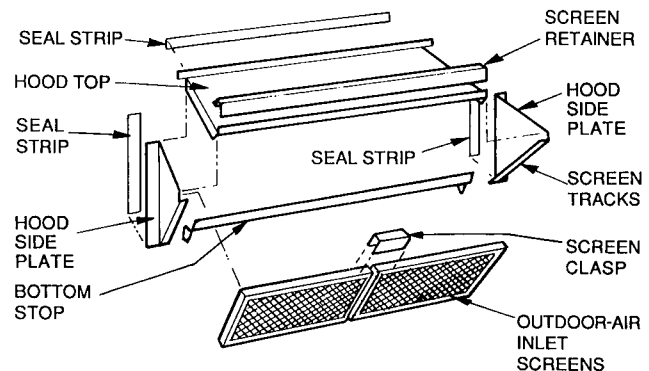
5. Slide economizer or two-position damper into unit and secure with screws. See Fig. 14. To convert to horizontal discharge application:
 - a. Rotate economizer/two-position damper clockwise 90 degrees until the motor faces the condenser section (see Fig. 15).
 - b. Remove tape from barometric relief damper. (See Fig. 14.) Rotate the barometric relief damper cover 90 degrees.
 - c. Install horizontal block-off plate over the opening on the access panel. Plate is shipped in package with outdoor-air hood.

NOTE: Block-off plate **MUST** be installed before installing hood assembly.

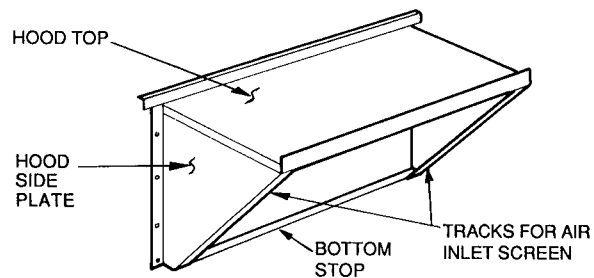
IMPORTANT: Filters **MUST** be field-installed outside the unit on horizontal discharge applications with economizer or two-position damper. Otherwise, the economizer or two-position damper will have to be partially removed to access the filters. The area of the field-installed filters should be equal to the area of the factory-installed filters.

6. Insert economizer/two-position damper plug into economizer control board or two-position damper wiring harness. Remove tape from barometric relief damper. See Fig. 14.
7. If ventilation air is not required, proceed to Step 8. If ventilation air is required, determine minimum position setting for required airflow. See Fig. 16.
Adjust minimum position setting by adjusting the screws on the position setting bracket. (See Fig. 14.) Slide bracket until the top screw is in the position determined by Fig. 16. Tighten screws.
8. *Units with economizer only:* Remove tape from outdoor-air thermostat (OAT). Fasten OAT to inside of hood using screws and speed clips provided. See Fig. 17. Make sure OAT terminals are positioned up.
9. Replace evaporator coil access panel with screws saved from Step 2.
10. Fasten hood top and side plate assembly and bottom stop (Fig. 18) to unit with screws saved from Step 4.
11. *Units with economizer only:* Place knob supplied with economizer on OAT. See Fig. 17. Set for 3° F below indoor room thermostat setting. If accessory enthalpy control (EC) is used in place of OAT, see instructions shipped with EC for installation and adjustment. See Fig. 17. Make wiring connections for OAT (see Fig. 19).
12. Slide outdoor-air inlet screen into screen track on hood side plates. While holding screen in place, fasten screen retainer to hood using screws provided.

NOTE: Refer to Fig. 20 for economizer/two-position damper barometric relief characteristics.



OUTDOOR-AIR HOOD-UNASSEMBLED



HOOD SIDES AND TOP-ASSEMBLED

Fig. 13 — Outdoor-Air Hood Details

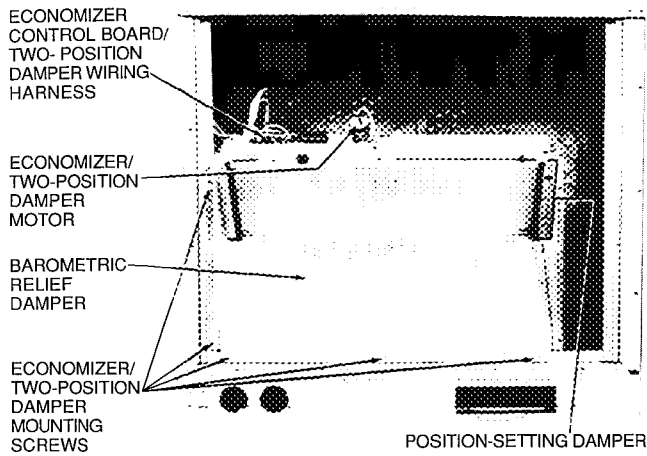


Fig. 14 – Economizer/Two-Position Damper Installed in Unit

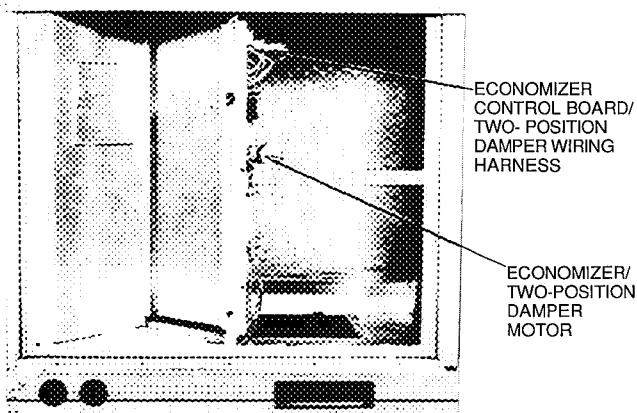
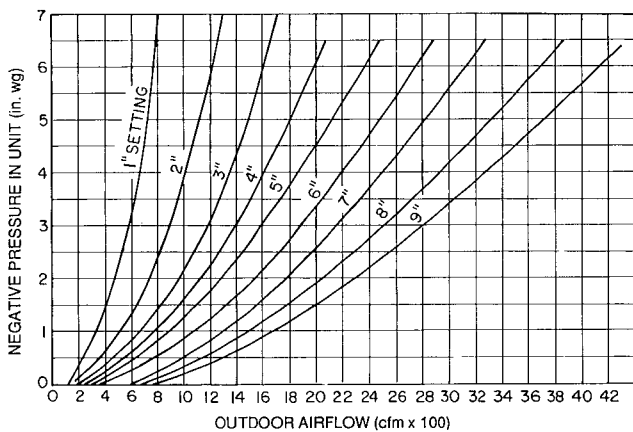
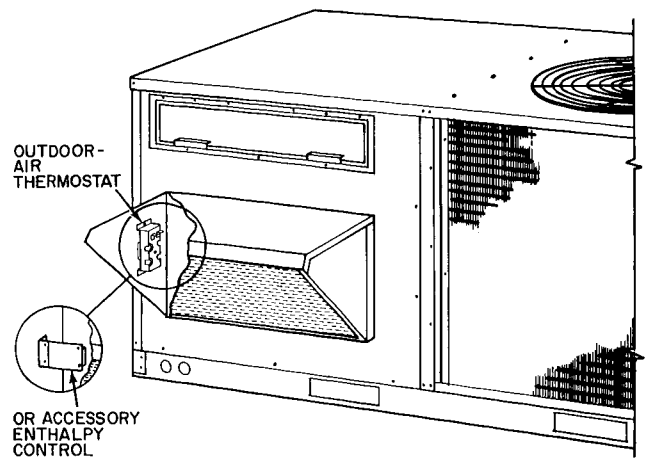


Fig. 15 – Horizontal Economizer/Two-Position Damper Installation (90 Degree Rotation)



Example:
 Given —
 Negative Pressure 0.1 in. wg
 Outdoor Air 1100 cfm
 Determine — Setting = 6

Fig. 16 – Minimum Position Setting



HOOD

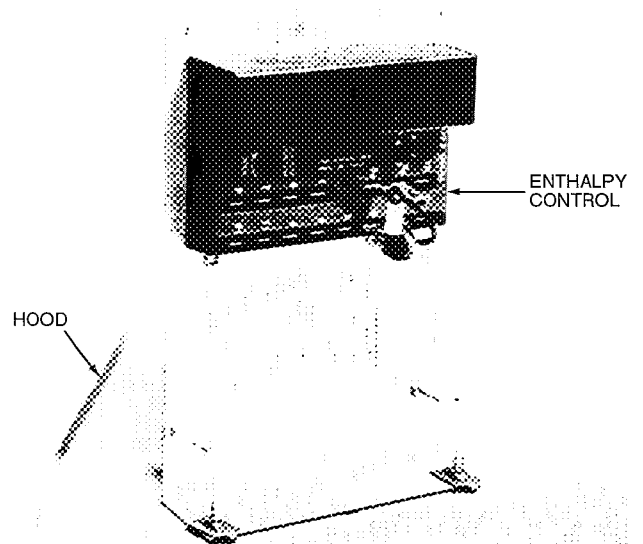


Fig. 17 – Outdoor-Air Thermostat/Enthalpy Control Installation

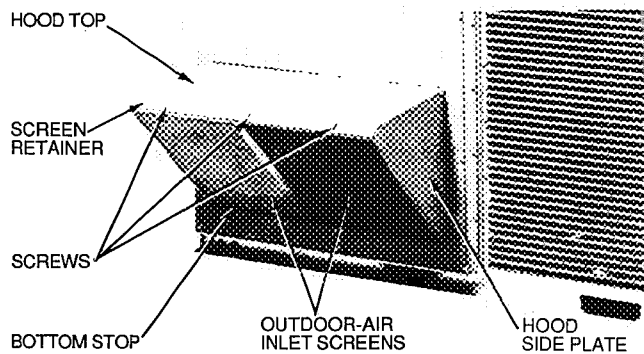


Fig. 18 - Air Hood Details

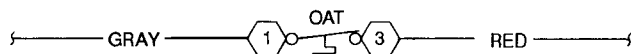


Fig. 19 - Wiring Connections for Outdoor-Air Thermostat

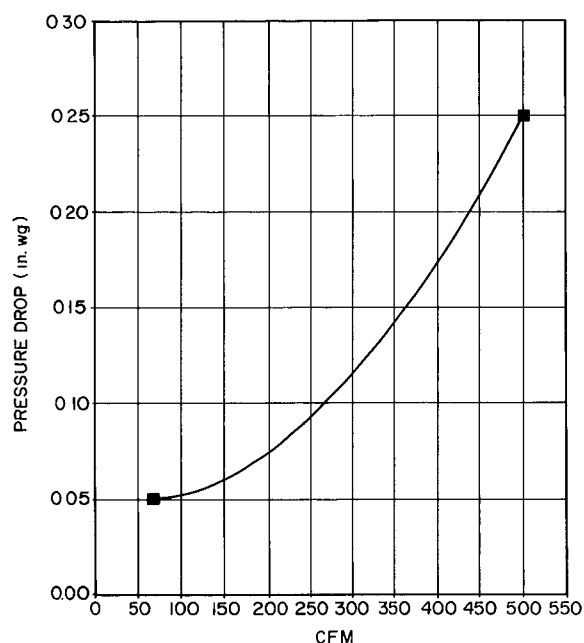


Fig. 20 - Economizer/Two-Position Damper Barometric Relief Damper Characteristics

Step 9 - Adjust Evaporator-Fan Speed -

Adjust evaporator-fan speed to meet jobsite conditions. Table 3 shows fan rpm at motor pulley settings for standard and alternate motors. Refer to Tables 4 - 9 to determine fan speed settings. Fan motor pulleys are factory set for speed shown in Table 1.

NOTE: Before adjusting fan speed, make sure the new fan speed will provide an acceptable air temperature rise range on heating as shown in Table 1.

To change fan speeds:

1. Shut off unit power supply.
2. Loosen belt by loosening fan motor mounting nuts. See Fig. 21 and 22.
3. Loosen movable pulley flange setscrew (see Fig. 23).
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Table 1.

5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table 1 for speed change for each full turn of pulley flange.)

To align fan and motor pulleys:

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

To adjust belt tension:

1. Loosen fan motor mounting nuts.
2. *Sizes 008, 009* - Slide motor mounting plate away from fan scroll for proper belt tension ($\frac{1}{2}$ -in. deflection with one finger) and tighten mounting nuts (see Fig. 21).
Sizes 012, 014 - Slide motor mounting plate downward to tighten belt tension. Secure motor mounting plate nuts. See Fig. 22.
3. Adjust bolt and nut on mounting plate to secure motor in fixed position.

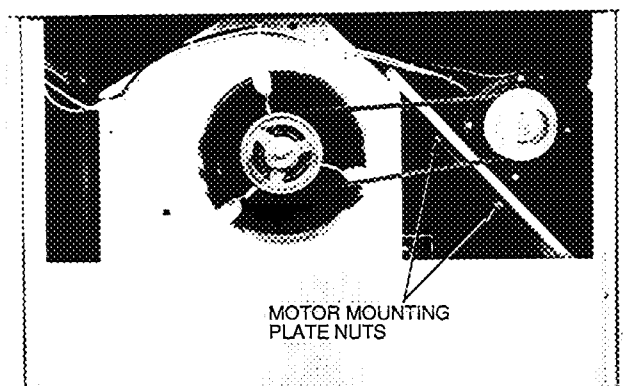


Fig. 21 - Typical Belt-Drive Motor Mounting for Sizes 008,009

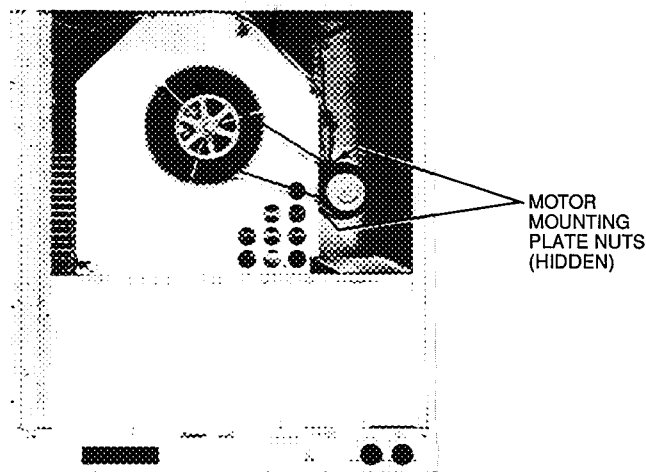


Fig. 22 - Typical Belt-Drive Motor Mounting for Sizes 012,014

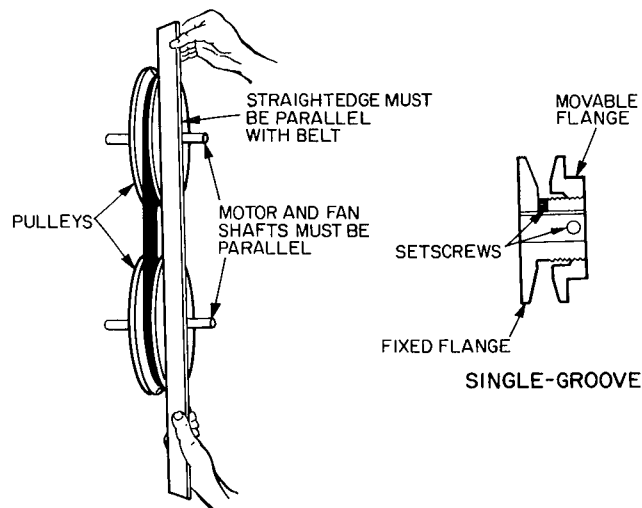


Fig. 23 – Evaporator-Fan Pulley Adjustment

Table 3 – Fan Rpm at Motor Pulley Settings

UNIT 48	MOTOR PULLEY TURNS OPEN												
	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
HJD/HJE/HJF008,009	1085	1060	1035	1010	985	960	935	910	890	865	840	—	—
HJD/HJE/HJF012	1080	1060	1035	1015	990	970	950	930	905	885	860	—	—
HJD/HJE014	1260	1220	1185	1155	1130	1100	1075	1045	1015	990	960	930	900

Table 4 – Fan Performance, 48HJ008,009 – Vertical Discharge Units

AIRFLOW (Cfm)	BELT DRIVE MOTOR															
	External Static Pressure (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts
2200	506	539	586	692	656	875	718	1064	776	1275	838	1578	898	1954	935	2275
2250	514	562	593	723	662	907	724	1097	781	1318	841	1604	902	1989	939	2292
2300	521	577	600	747	668	932	730	1131	786	1335	843	1621	905	2015	943	2309
2400	536	623	613	795	680	989	741	1199	796	1413	849	1665	910	2041	952	2411
2500	551	669	626	859	693	1056	753	1275	808	1499	859	1735	912	2050	963	2470
2550	559	692	634	891	700	1089	759	1318	814	1543	864	1779	915	2067	968	2479
2600	567	716	641	916	706	1123	764	1353	819	1587	869	1823	918	2093	973	2487
2700	582	779	655	981	719	1199	776	1430	831	1674	880	1919	927	2180	976	2495
2800	598	835	670	1056	732	1275	789	1517	842	1770	892	2023	938	2275	983	2562
2900	614	899	684	1123	745	1361	802	1604	854	1866	903	2136	949	2386		
3000	630	973	690	1207	759	1417	815	1700	866	1971	915	2240	961	2504		
3100	646	1047	714	1292	773	1543	828	1805	878	2076	926	2352				
3200	662	1131	729	1378	787	1648	841	1910	891	2188	938	2470				
3300	679	1216	744	1473	801	1753	854	2023	904	2300	950	2587				
3400	695	1310	759	1578	816	1858	867	2136	917	2420						
3500	712	1413	774	1683	830	1971	881	2257	930	2546						
3600	729	1517	790	1796	845	2093	895	2386								
3700	745	1630	805	1919	860	2223	909	2521								
3750	754	1691	813	1980	868	2283	917	2587								
3800	762	1753	821	2041	875	2343										
3900	779	1875	836	2171	890	2479										
4000	796	2006	852	2300	905	2612										
4100	813	2136	868	2445												
4200	830	2283	884	2587												
4250	839	2360														
4300	847	2428														

NOTES:

- 1 **Boldface** indicates a field-supplied drive is required (See Note 6)
- 2 **Shaded** indicates a field-supplied motor and drive are required
- 3 Maximum usable watts input is 2615. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected
- 4 Values include losses for filters, unit casing, and wet coils

- 5 Use of a field-supplied motor may affect wire sizing. Contact your distributor to verify
- 6 Motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.
- 7 To convert watts to bhp:

$$\text{bhp} = \frac{\text{watts input} \times \text{motor efficiency}}{746}$$

$$\text{Motor efficiency} = 80$$

Table 5 – Fan Performance, 48HJ012 – Vertical Discharge Units

AIRFLOW (Cfm)	BELT DRIVE MOTOR																			
	External Static Pressure (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts
3000	592	723	661	859	722	989	779	1131	829	1267	880	1404	924	1534	970	1736	1019	1828	1066	2082
3100	607	779	676	924	734	1056	791	1199	840	1344	890	1491	935	1695	977	1828	1026	1971	1070	2203
3200	622	835	690	989	746	1123	803	1275	852	1422	900	1569	946	1786	987	1920	1029	2065	1075	2265
3300	638	899	705	1056	759	1190	815	1353	864	1508	910	1665	957	1878	998	2022	1037	2169	1082	2326
3400	653	965	719	1131	772	1275	826	1439	876	1604	921	1753	967	1971	1009	2125	1047	2282	1087	2433
3500	669	1039	733	1207	786	1361	838	1526	888	1691	933	1858	976	2074	1020	2238	1058	2397	1095	2560
3600	684	1114	747	1284	800	1456	850	1613	900	1796	945	2014	986	2177	1030	2353	1069	2523	1106	2688
3700	700	1190	760	1370	814	1552	863	1700	912	1892	957	2117	998	2291	1039	2469	1081	2651	1117	2829
3800	715	1275	774	1456	828	1648	875	1805	924	1997	969	2230	1010	2406	1049	2587	1091	2782	1128	2981
3900	731	1370	787	1543	843	1753	888	1910	936	2151	981	2344	1022	2533	1060	2726	1100	2923	1143	3144
4000	747	1456	801	1639	857	1858	902	2032	948	2265	993	2469	1034	2670	1072	2866	1110	3068	1158	3332
4100	763	1560	816	1744	872	1971	916	2203	960	2380	1005	2596	1046	2810	1084	3010	1121	3213	1174	3535
4200	778	1665	831	1884	886	2084	929	2326	972	2505	1016	2735	1058	2952	1094	3155	1132	3369	1192	3753
4300	794	1770	846	1971	900	2256	943	2460	985	2642	1028	2866	1072	3117	1106	3311	1142	3531	1241	3987
4400	810	1884	861	2093	913	2380	958	2605	999	2791	1040	3010	1088	3276	1117	3473	1153	3698	1259	4256
4500	826	2006	876	2273	927	2505	973	2744	1012	2952	1053	3167	1099	3440	1128	3642	1163	3879	1259	4438
4600	842	2177	892	2406	940	2633	987	2904	1024	3117	1065	3321	1113	3611	1140	3817	1174	4049	1276	4775
4700	858	2300	907	2551	954	2782	1002	3068	1037	3275	1077	3481	1127	3759	1152	3997	1184	4233	1300	5068
4800	874	2433	922	2698	968	2933	1018	3232	1050	3439	1089	3646	1142	3973	1163	4184	1195	4422	1325	5376
4900	890	2578	938	2857	984	3063	1034	3406	1063	3609	1101	3816	1157	4163	1175	4377	1206	4617	1352	5698
5000	906	2735	953	3020	998	3216	1050	3588	1077	3765	1114	3993	1173	4360	1187	4576	1216	4818	1381	6035

NOTES:

- 1 **Shading** indicates a field-supplied drive is required (See Note 6)
- 2 **Shading** indicates a field-supplied motor and drive are required
- 3 Maximum usable watts input is 3775 Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure Unit warranty will not be affected
- 4 Values include losses for filters, unit casing, and wet coils

- 5 Use of a field-supplied motor may affect wire sizing Contact your distributor to verify
- 6 Motor drive range: 860 to 1080 rpm All other rpms require field-supplied drive
- 7 To convert watts to bhp:

$$\text{bhp} = \frac{\text{watts input} \times \text{motor efficiency}}{746}$$
 Motor efficiency = 85

Table 6 – Fan Performance, 48HJ014 – Vertical Discharge Units

AIRFLOW (Cfm)	BELT DRIVE MOTOR																			
	External Static Pressure (In. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts
3700	729	1259	790	1440	847	1615	902	1845	955	2044	1008	2272	1060	2494	1108	2719	1152	2919	1190	3092
3800	745	1340	805	1531	861	1700	915	1940	967	2149	1019	2378	1070	2620	1118	2846	1163	3074	1203	3267
3900	761	1423	820	1624	875	1802	928	2044	979	2272	1029	2494	1079	2737	1128	2983	1173	3221	1214	3433
4000	777	1514	836	1725	889	1914	941	2140	991	2387	1040	2620	1089	2873	1137	3120	1183	3368	1225	3590
4100	793	1615	851	1836	904	2027	955	2246	1004	2512	1052	2746	1100	3001	1147	3267	1193	3525	1236	3767
4200	810	1717	867	1948	918	2149	968	2361	1017	2638	1064	2882	1110	3138	1157	3414	1202	3674	1245	3943
4300	826	1828	883	2070	933	2272	982	2485	1030	2773	1076	3037	1121	3285	1167	3562	1212	3841	1255	4111
4400	842	1940	898	2193	948	2405	996	2611	1043	2901	1088	3184	1133	3442	1178	3720	1222	3999	1265	4279
4500	859	2061	914	2316	962	2539	1010	2755	1056	3037	1101	3341	1144	3590	1188	3878	1232	4167	1274	4456
4600	876	2184	930	2459	977	2683	1024	2910	1070	3175	1114	3498	1157	3767	1199	4046	1242	4344	1284	4642
4700	892	2316	945	2593	992	2837	1039	3065	1083	3322	1126	3655	1169	3943	1210	4223	1252	4527	1294	4828
4800	909	2468	961	2737	1008	3001	1053	3230	1097	3479	1140	3822	1181	4130	1222	4400	1263	4707	—	—
4900	926	2611	977	2891	1024	3166	1068	3405	1111	3646	1153	3971	1194	4307	1234	4606	1274	4893	—	—
5000	942	2773	993	3047	1039	3341	1080	3581	1125	3822	1166	4139	1207	4493	1247	4800	1286	5087	—	—
5100	959	2937	1009	3221	1055	3516	1097	3767	1139	4018	1180	4316	1220	4689	1259	5004	—	—	—	—
5200	976	3101	1025	3387	1071	3702	1112	3962	1153	4214	1194	4503	1233	4874	1272	5203	—	—	—	—
5300	993	3285	1041	3572	1086	3897	1127	4158	1166	4426	1208	4698	1246	5060	—	—	—	—	—	—
5400	1010	3470	1057	3757	1102	4093	1142	4372	1182	4642	1221	4902	—	—	—	—	—	—	—	—
5500	1027	3655	1073	3953	1118	4298	1157	4566	1197	4856	1235	5115	—	—	—	—	—	—	—	—
5600	1043	3860	1090	4158	1133	4512	1173	4810	1213	5067	—	—	—	—	—	—	—	—	—	—
5700	1060	4065	1106	4363	1149	4726	1188	5022	—	—	—	—	—	—	—	—	—	—	—	—
5800	1077	4279	1122	4586	1165	4939	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5900	1094	4503	1139	4810	1181	5170	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	1111	4726	1155	5032	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6100	1128	4957	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	1145	5200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTES:

- 1 **Shading** indicates a field-supplied drive is required (See Note 6)
- 2 **Shading** indicates a field-supplied motor and drive are required
- 3 Maximum usable watts input is 4400 Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure Unit warranty will not be affected
- 4 Values include losses for filters, unit casing, and wet coils

- 5 Use of a field-supplied motor may affect wire sizing Contact your distributor to verify
- 6 Motor drive range: 900 to 1260 rpm All other rpms require field-supplied drive
- 7 To convert watts to bhp:

$$\text{bhp} = \frac{\text{watts input} \times \text{motor efficiency}}{746}$$
 Motor efficiency = 87

Table 7 – Fan Performance, 48HJ008,009 – Horizontal Discharge Units

AIRFLOW (Cfm)	BELT DRIVE MOTOR															
	External Static Pressure (in. wg)															
	0.2		0.4		0.6		0.8		0.9		1.0		1.2		1.4	
	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts
2200	499	524	580	677	652	867	717	1056	748	1165	779	1275	839	1578	905	1954
2250	507	547	586	700	658	891	722	1097	752	1199	783	1301	843	1604	908	1989
2300	513	562	592	723	663	916	727	1131	756	1224	786	1327	846	1630	910	2015
2400	528	600	606	779	674	965	738	1199	766	1301	795	1404	853	1665	912	2041
2500	542	646	619	835	686	1022	748	1258	777	1370	806	1491	859	1718	919	2093
2550	550	669	627	867	692	1056	754	1292	783	1413	812	1543	864	1761	920	2110
2600	557	692	634	891	698	1089	759	1327	787	1456	816	1587	868	1805	921	2136
2700	573	747	648	956	711	1156	770	1404	798	1534	827	1665	878	1910	928	2162
2800	588	803	662	1022	723	1233	782	1473	809	1613	837	1753	889	2023	937	2266
2900	604	867	676	1089	737	1318	794	1560	821	1700	848	1840	900	2128	947	2377
3000	620	932	690	1165	750	1404	806	1648	832	1788	849	1927	910	2223	958	2504
3100	636	1006	704	1241	764	1499	818	1744	844	1884	870	2023	920	2326	968	2623
3200	652	1089	718	1327	778	1595	831	1849	856	1980	882	2119	931	2428	979	2735
3300	668	1173	732	1413	793	1700	844	1954	869	2093	894	2232	942	2537	989	2839
3400	684	1258	747	1508	807	1805	857	2076	882	2206	907	2343	953	2645	1000	2945
3500	701	1361	762	1613	821	1910	871	2188	895	2326	919	2462	966	2751	1011	3062
3600	717	1465	777	1718	835	2023	885	2317	908	2453	932	2587	978	2870	1022	3165
3700	733	1569	792	1831	849	2136	899	2445	922	2579	945	2713	990	2987	1034	3272
3750	742	1630	800	1892	856	2197	907	2512	929	2633	952	2773	997	3055	1040	3333
3800	750	1683	807	1954	863	2257	914	2571	936	2687	958	2834	1003	3114	1045	3387
3900	767	1805	822	2076	877	2386	928	2702	949	2793	972	2967	1015	3244	1057	3495
4000	783	1927	838	2206	891	2512	942	2833	964	2917	986	3121	1028	3373	1070	3603
4100	800	2067	854	2343	905	2645	956	2971	978	3044	1000	3251	1042	3495	1082	3713
4200	817	2197	869	2479	920	2783	970	3095	992	3258	1015	3380	1055	3614	1095	3811
4250	826	2275	877	2554	928	2854	977	3165	999	3306	1022	3445	1062	3676	1102	3860
4300	834	2343	885	2630	935	2925	984	3230	1006	3343	1029	3506	1069	3728	1108	3906

NOTES:

1. **Boldface** indicates a field-supplied drive is required (See Note 6)
2. **Shading** indicates a field-supplied motor and drive are required
3. Maximum usable watts input is 2615. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected
4. Values include losses for filters, unit casing, and wet coils

5. Use of a field-supplied motor may affect wire sizing. Contact your distributor to verify
6. Motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive
7. To convert watts to bhp:

$$\text{bhp} = \frac{\text{watts input} \times \text{motor efficiency}}{746}$$

Motor efficiency = 80

Table 8 – Fan Performance, 48HJ012 – Horizontal Discharge Units

AIRFLOW (Cfm)	BELT DRIVE MOTOR															
	External Static Pressure (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts
3000	552	661	632	810	701	956	761	1097	816	1216	871	1370	918	1482	967	1736
3100	565	708	644	859	711	1014	772	1173	825	1292	879	1447	928	1478	973	1778
3200	578	763	656	916	723	1081	782	1241	835	1378	887	1517	937	1745	981	1861
3300	591	818	668	973	734	1148	793	1310	845	1465	895	1595	946	1828	991	1963
3400	605	883	680	1047	745	1216	803	1387	856	1552	904	1691	953	1912	1000	2074
3500	619	948	691	1106	755	1284	813	1465	867	1648	914	1796	961	1997	1009	2177
3600	633	1022	703	1173	766	1353	824	1543	877	1744	924	1901	970	2099	1017	2282
3700	648	1106	714	1241	777	1430	835	1639	887	1831	935	2015	980	2212	1024	2380
3800	662	1190	726	1310	789	1526	846	1726	897	1927	946	2169	989	2326	1033	2487
3900	677	1284	738	1387	801	1613	857	1823	908	2023	956	2282	1000	2460	1042	2624
4000	692	1378	750	1473	813	1718	868	1919	918	2119	967	2397	1010	2587	1052	2763
4100	707	1482	762	1560	825	1814	878	2015	929	2282	977	2505	1021	2726	1062	2914
4200	722	1595	775	1656	837	1910	889	2119	941	2397	987	2624	1032	2866	1072	2971
4300	737	1718	787	1761	848	2006	900	2273	952	2523	999	2744	1042	3010	1081	3141
4400	752	1840	800	1875	860	2110	912	2397	962	2642	1008	2885	1054	3158	1091	3276
4500	768	1980	814	1989	871	2265	924	2523	973	2772	1019	3029	1067	3325	1101	3414
4600	783	2119	827	2110	883	2380	937	2661	983	2904	1030	3155	1079	3497	1111	3555
4700	799	2309	841	2291	894	2496	949	2800	994	3049	1042	3296	1092	3678	1122	3700
4800	814	2469	855	2424	906	2624	961	2952	1003	3186	1052	3440	1105	3835	1132	3848
4900	—	—	868	2578	918	2754	972	3088	1013	3333	1063	3589	1119	3991	1142	3995
5000	—	—	883	2735	931	2904	985	3226	1024	3489	1075	3741	1133	4253	1154	4154

NOTES:

1. **Boldface** indicates a field-supplied drive is required (See Note 6)
2. **Shading** indicates a field-supplied motor and drive are required
3. Maximum usable watts input is 3775. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected
4. Values include losses for filters, unit casing, and wet coils

5. Use of a field-supplied motor may affect wire sizing. Contact your distributor to verify
6. Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive
7. To convert watts to bhp:

$$\text{bhp} = \frac{\text{watts input} \times \text{motor efficiency}}{746}$$

Motor efficiency = 85

Table 9 – Fan Performance, 48HJ014 – Horizontal Discharge Units

AIRFLOW (Cfm)	BELT DRIVE MOTOR																			
	External Static Pressure (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts	Rpm	Watts
3700	677	1129	748	1316	810	1498	869	1700	928	1940	984	2166	1036	2387	1080	2548	1114	2737	1135	2828
3800	691	1194	761	1390	822	1582	880	1776	937	2035	993	2272	1046	2503	1092	2719	1129	2901	1156	3028
3900	705	1267	773	1473	834	1674	891	1862	947	2131	1002	2370	1055	2620	1102	2855	1143	3056	1174	3212
4000	720	1349	786	1548	847	1768	902	1957	957	2228	1011	2485	1064	2737	1112	2983	1155	3212	1190	3405
4100	734	1423	800	1641	860	1871	914	2061	967	2316	1021	2593	1072	2855	1121	3120	1165	3368	1203	3581
4200	749	1506	813	1725	873	1974	926	2175	978	2414	1030	2710	1081	2983	1130	3258	1175	3516	1215	3757
4300	764	1598	826	1828	886	2079	938	2290	989	2521	1040	2837	1090	3111	1139	3396	1185	3664	1226	3925
4400	779	1691	840	1931	899	2193	951	2414	1000	2638	1050	2955	1100	3248	1148	3535	1194	3822	1236	4093
4500	793	1785	854	2035	912	2307	963	2548	1012	2755	1061	3065	1109	3387	1157	3674	1203	3981	1246	4260
4600	808	1888	868	2158	925	2459	975	2674	1024	2901	1071	3184	1119	3525	1166	3832	1212	4130		
4700	822	2000	882	2281	937	2548	988	2819	1036	3056	1082	3313	1129	3674	1175	3990	1221	4298		
4800	837	2114	896	2414	950	2674	1001	2964	1048	3212	1093	3461	1139	3813	1185	4148				
4900	852	2237	910	2548	963	2810	1014	3111	1060	3368	1105	3609	1150	3943	1194	4307				
5000	867	2361	924	2683	977	2946	1027	3267	1073	3535	1117	3776	1161	4093						
5100	882	2485	938	2828	990	3092	1040	3424	1085	3702	1129	3962	1172	4251						
5200	896	2629	952	2973	1003	3248	1053	3590	1098	3869	1141	4148								
5300	911	2773	967	3129	1017	3405	1066	3757	1111	4055	1153	4335								
5400	926	2919	981	3294	1030	3572	1079	3916	1124	4270										
5500	940	3074	995	3461	1044	3748	1092	4093												
5600	955	3239	1010	3627	1058	3943	1105	4270												
5700	970	3405	1024	3804	1072	4139														
5800	985	3581	1039	3981	1086	4335														
5900	1000	3757	1053	4167																
6000	1015	3953	1068	4363																
6100	1030	4139																		
6200	1046	4344																		

NOTES:

- 1 **Boldface** indicates a field-supplied drive is required (See Note 6)
- 2 **Shaded** indicates a field-supplied motor and drive are required
- 3 Maximum usable watts input is 4400. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- 4 Values include losses for filters, unit casing, and wet coils

5 Use of a field-supplied motor may affect wire sizing. Contact your distributor to verify.

6 Motor drive range: 900 to 1260 rpm. All other rpms require field-supplied drive.

7 To convert watts to bhp:

$$\text{bhp} = \frac{\text{watts input} \times \text{motor efficiency}}{746}$$

Motor efficiency = 87

PRE-START-UP

⚠ WARNING

Failure to observe the following warnings could result in serious personal injury:

1. Follow recognized safety practices and wear protective goggles when checking or servicing refrigerant system.
2. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
3. Do not remove compressor terminal cover until all electrical sources are disconnected.
4. Relieve all pressure from system before touching or disturbing anything inside terminal box if refrigerant leak is suspected around compressor terminals.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
 - a. Shut off gas and then electrical power to unit.
 - b. Relieve all pressure from system using both high- and low-pressure ports.
 - c. Cut component connecting tubing with tubing cutter and remove component from unit.
 - d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Proceed as follows to inspect and prepare the unit for initial start-up.

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.
3. Make the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
 - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution.
 - c. Inspect all field- and factory-wiring connections. Be sure that connections are completed and tight.
 - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
 - a. Make sure that condenser fan blade is correctly positioned in fan orifice. See Condenser-Fan Adjustment section on page 20 for more details.
 - b. Make sure that air filter(s) is in place.
 - c. Make sure that condensate drain trap is filled with water to ensure proper drainage.
 - d. Make sure that all tools and miscellaneous loose parts have been removed.

START-UP

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

Return-Air Filters — Make sure 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 screen(s) must be in place before operating unit.

Compressor Mounting — Compressors are internally spring mounted. Do not loosen or remove compressor holddown bolts. On 48HJ014 units, remove the bands that secure the compressors together and remove the wood block separating the compressors.

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

Refrigerant Service Ports — Each refrigerant system has a total of 4 Schrader-type service gage ports: one on the suction line, and one on the compressor discharge line. Two additional Schrader-type valves are located underneath high-pressure and low-pressure switches. Be sure that caps on the ports are tight.

Compressor Rotation — It is important to be certain the compressors are rotating in the proper direction on units with scroll compressors. To determine whether or not compressors are rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Note that the evaporator and condenser fans are probably also rotating in the wrong direction.
2. Turn off power to the unit.
3. Reverse any two of the unit power leads.
4. Reapply power to the compressor.

The suction and discharge pressure levels should now move to their normal start-up levels.

NOTE: When compressors are rotating in the wrong direction, the unit will have increased noise levels and will not provide heating/cooling.

Cooling — To start unit, turn on main power supply. Set system selector switch at COOL position and fan switch at AUTO. position. Adjust thermostat to a setting below room temperature. Compressor starts on closure of contactor.

Check unit charge. Refer to Refrigerant Charge section on page 20.

Reset thermostat at a position above room temperature. Compressor will shut off. Evaporator fan will shut off after a 30-second delay.

TO SHUT OFF UNIT — Set system switch at OFF position. Resetting thermostat at a position above room temperature shuts unit off temporarily until space temperature exceeds thermostat setting. Units are equipped with Cycle-LOC™ protection device. Unit shuts down on any safety trip and remains off; an indicator light on the thermostat comes on. Check reason for safety trip.

Compressor restart is accomplished by manual reset at the thermostat by turning the selector switch to OFF position and then to ON position.

Main Burners — Main burners are factory set and should require no adjustment.

TO CHECK ignition of main burners and heating controls, move thermostat set point above room temperature and verify that the burners light and evaporator fan is energized. After ensuring that the unit continues to heat the building, lower the thermostat setting below room temperature and verify that the burners and evaporator fan shut off.

Refer to Table 10 for the correct orifice to use at high altitudes.

NOTE: Upon a call for heat the main burners will remain on for a minimum of 60 seconds.

Table 10 — Altitude Compensation*

ELEVATION (FT)	125,000, 180,000, AND 220,000 BTUH NOMINAL INPUT		250,000 BTUH NOMINAL INPUT	
	Natural Gas Orifice Size†	Liquid Propane Orifice Size†	Natural Gas Orifice Size†	Liquid Propane Orifice Size†
0-2,000	31	41	30	38
2,000	32	42	30	39
3,000	32	42	31	40
4,000	32	42	32	41
5,000	33	43	33	42
6,000	34	43	34	43
7,000	35	44	35	43
8,000	36	44	36	44
9,000	37	45	37	44
10,000	38	46	38	45
11,000	39	47	39	45
12,000	40	47	40	46
13,000	41	48	41	47
14,000	42	48	42	47

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes.

†Orifices available through your local Carrier distributor.

Heating

1. Purge gas supply line of air by opening union ahead of gas valve. If gas odor is detected, tighten union and wait 5 minutes before proceeding.
2. Turn on electrical supply and open manual gas valve.
3. Set system switch selector at HEAT position and fan switch at AUTO. or ON position. Set heating temperature lever above room temperature.
4. The induced-draft motor will start.
5. After a call for heating, the main burners should light within 5 seconds. If the burners do not light, then there is a 22-second delay before another 5-second try. If the burners still do not light, the time delay is repeated. If the burners do not light within 15 minutes, there is a lockout. To reset the control, break the 24-v power to W1.
6. The evaporator fan will turn on 45 seconds after a call for heating.
7. The evaporator fan will turn off 45 seconds after the thermostat temperature is satisfied.
8. Adjust airflow to obtain a temperature rise within the range specified on the unit nameplate and Table 1.

NOTE: The default value for the evaporator-fan motor ON/OFF delay is 45 seconds. The Integrated Gas Unit Controller (IGC) modifies this value when abnormal limit switch cycles occur. Based upon unit operating conditions, the ON delay can be reduced to 0 seconds and the OFF delay can be extended to 180 seconds. When one flash of the LED is observed, the evaporator-fan ON/OFF delay has been modified.

If the limit switch trips at the start of the heating cycle during the evaporator ON delay, the time period of the ON delay for the next cycle will be 5 seconds less than the time at which the switch tripped. (Example: If the limit switch trips at 30 seconds, the evaporator-fan ON delay for the next cycle will occur at 25 seconds.) To prevent short-cycling, a 5 second reduction will only occur if a minimum of 10 minutes has elapsed since the last call for heating.

The evaporator-fan OFF delay can also be modified. Once the call for heating has ended, there is a 10 minute period during which the modification can occur. If the limit switch trips during this period, the evaporator-fan OFF delay will increase by 15 seconds. A maximum of 9 trips can occur, extending the evaporator-fan OFF delay to 180 seconds.

To restore the original default value, reset the power to the unit.

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

Safety Relief — A soft-solder joint at the suction-line Schrader port provides pressure relief under abnormal temperature and pressure conditions.

Ventilation (Continuous Fan) — Set fan and system selector switches at ON and OFF positions, respectively. Evaporator fan operates continuously to provide constant air circulation. When the evaporator fan selector switch is turned to the OFF position, there is a 30-second delay before the fan turns off.

Operating Sequence

COOLING, UNITS WITHOUT ECONOMIZER — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized, and evaporator-fan motor, compressor no. 1, and condenser fan start. The condenser-fan motor runs continuously while unit is cooling. For units with 2 stages of cooling, if the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

When the thermostat is satisfied, C1 and C2 are deenergized and the compressors and outdoor (condenser) fan motor (OFM) shut off. After a 30-second delay, the indoor (evaporator) fan motor (IFM) shuts off. If the thermostat fan selector switch is in the ON position, the evaporator motor will run continuously.

HEATING, UNITS WITHOUT ECONOMIZER — When the thermostat calls for heating, terminal W1 is energized. In order to prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute when W1 is energized. The induced-draft motor (IDM) is then energized and the burner ignition sequence begins. The indoor (evaporator) fan motor (IFM) is energized 45 seconds after a flame is ignited. When additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve

(MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45-second time-off delay.

COOLING, UNITS WITH ECONOMIZER — When the outdoor-air temperature is above the OAT setting and the room thermostat calls for cooling, the compressor contactor no. 1 is energized to start compressor no. 1 and outdoor (condenser) fan motor. The indoor (evaporator) fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon a further call for cooling, compressor contactor no. 2 will be energized, starting compressor no. 2. After the thermostat is satisfied and the IFM is deenergized, the damper moves to the fully closed position.

When the outdoor-air temperature is below the OAT setting and the thermostat calls for Y1 and G, the economizer damper moves to the minimum position when the indoor (evaporator) fan starts. The first stage of cooling is provided by the economizer. If the supply-air temperature is above 57 F, a switch on the supply-air thermostat is closed between the T2 terminal and the 24 vac terminal. This causes the damper to continue to modulate open until the supply-air temperature falls below 55 F or the damper reaches the fully open position.

When the supply-air temperature is between 55 F and 52 F, the supply-air thermostat has open switches between the T2 and 24 vac terminals and between the T1 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the supply-air temperature falls below 52 F, a switch on the supply-air thermostat is closed between the T1 terminal and the 24 vac terminal. This causes the damper to modulate closed until the supply-air temperature rises above 55 F or the damper reaches the minimum position.

When the supply-air temperature is between 55 F and 57 F, the supply-air thermostat has open switches between the T2 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the outdoor air alone cannot satisfy the cooling requirements of the conditioned space, economizer cooling is integrated with mechanical cooling, providing second stage cooling. Compressor no. 1 and outdoor (condenser) fan will be energized, and the position of the economizer damper will be determined by the supply-air temperature. Compressor no. 2 is locked out.

When the second stage of cooling is satisfied, the compressor and outdoor (condenser) fan motor will be deenergized. The damper position will be determined by the supply-air temperature.

When the first stage of cooling is satisfied, the damper will move to fully closed position.

HEATING, UNITS WITH ECONOMIZER — When the thermostat calls for heating, terminal W1 is energized. In order to prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute when W1 is energized. The induced-draft motor is then energized and the burner ignition sequence begins. The indoor (evaporator) fan motor (IFM) is energized 45 seconds after a flame is ignited and the damper moves to the minimum position. When additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45 second time-off delay. The economizer damper then moves to the fully closed position. When using continuous fan, the damper will remain in the minimum position.

SERVICE

⚠ CAUTION

When servicing unit, shut off all electrical power to unit to avoid shock hazard or injury from rotating parts.

Cleaning — Inspect unit interior at the beginning of each heating and cooling season or as operating conditions require.

EVAPORATOR COIL

1. Turn unit power off. Remove evaporator coil access panel.
2. If economizer or two-position damper is installed, remove economizer or two-position damper by disconnecting Molex plug and removing mounting screws (see Fig. 14 or 15). Refer to Accessory Economizer or Two-Position Damper Installation Instructions or Optional Economizer or Two-Position Damper section on page 10 for more details.
3. Slide filters out of unit.
4. Clean coil using a commercial coil cleaner or dishwasher detergent in a pressurized spray canister. Wash both sides of coil and flush with clean water. For best result, backflush toward return-air section to remove foreign material.
5. Flush condensate pan after completion.
6. Reinstall economizer or two-position damper and filters
7. Reconnect wiring.
8. Replace access panels.

CONDENSER COIL

1. Turn off unit power.
2. Remove top panel screws on condenser end of unit.
3. Remove condenser coil corner post. See Fig. 24. To hold top panel open, place coil corner post between top panel and center post. See Fig. 25.
4. Remove screws securing coil to center post.
5. Remove fastener holding coil sections together at return end of condenser coil. Carefully separate the outer coil section 3 to 4 in. from the inner coil section. See Fig. 26.
6. Use a water hose or other suitable equipment to flush down between the 2 coil sections to remove dirt and debris. Clean the outer surfaces with a stiff brush in the normal manner.
7. Secure inner and outer coil rows together with a field-supplied fastener.
8. Reposition the outer coil section and remove the coil corner post from between the top panel and center post.
9. Reinstall the coil corner post and replace all screws.

CONDENSATE DRAIN — Check and clean each year at start of cooling season. In winter, keep drain 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 it. Replacement filters must be same dimensions as original filters.

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 correct amount of oil at the factory.

FAN-MOTOR BEARINGS — Fan-motor bearings are of the permanently lubricated type. No further lubrication is required. No lubrication of condenser or evaporator fan motors is required.

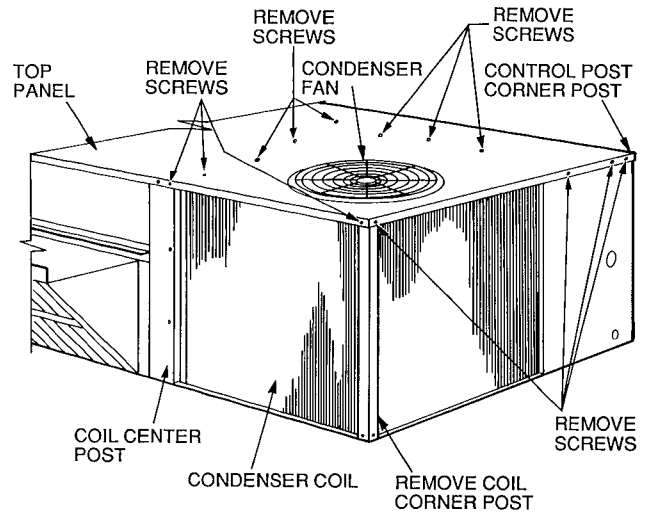


Fig. 24 — Cleaning Condenser coil

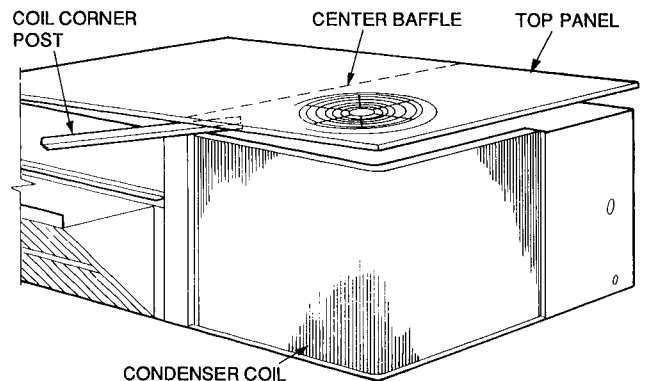


Fig. 25 — Propping Up Top Panel

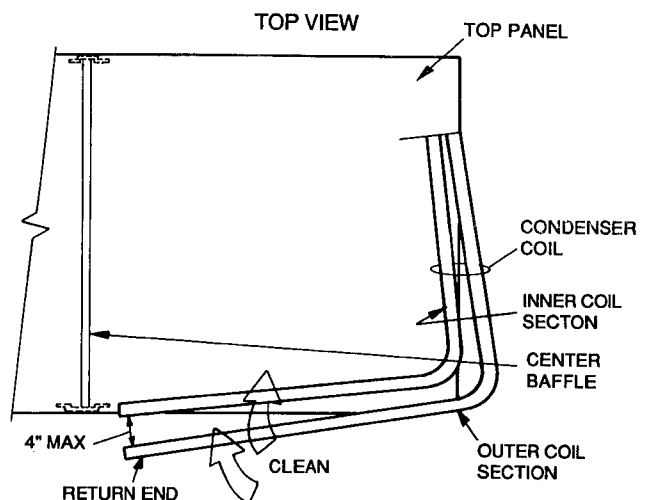


Fig. 26 — Separating Coil Sections

Condenser-Fan Adjustment (Fig. 27)

1. Shut off unit power supply.
2. Remove condenser-fan assembly (grille, motor, motor cover, and fan) and loosen fan hub setscrews.
3. Adjust fan height as shown in Fig. 27.
4. Tighten setscrews and replace condenser-fan assembly.

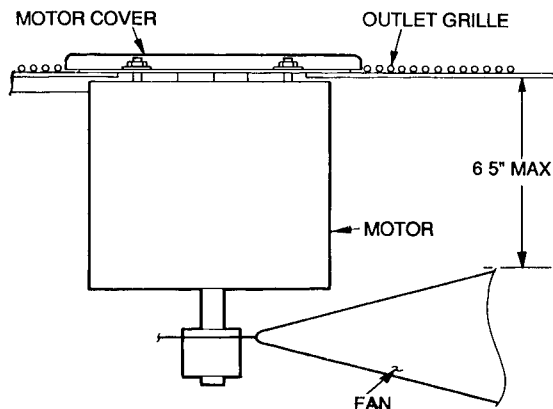


Fig. 27 — Condenser-Fan Adjustment

Economizer/Two-Position Damper Adjustment — Refer to Optional Economizer or Two-Position Damper section on page 10.

Refrigerant Charge — Amount of refrigerant charge is listed on unit nameplate (also refer to Table 1). Refer to Carrier GTAC2-5 Charging, Recovery, Recycling, and Reclamation training manual and the following procedures.

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 Charts, Fig. 28-31, vary refrigerant until the conditions of the charts are met. Note the charging charts are different from type normally used. Charts are based on charging the units to the correct superheat for the various operating conditions. Accurate pressure gage and temperature sensing device are required. Connect the pressure gage to the service port on the suction line. Mount the temperature sensing device on the suction line and insulate it so that outdoor ambient temperature does not affect the reading. Indoor-air cfm must be within the normal operating range of the unit.

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

Example: (Fig 30, Circuit 1)

Outdoor Temperature.....	85 F
Suction Pressure	70 psig
Suction Temperature should be.....	44 F
(Suction Temperature may vary ± 5 F.)	

If Chargemaster® charging device is used, temperature and pressure readings must be accomplished using the charging charts.

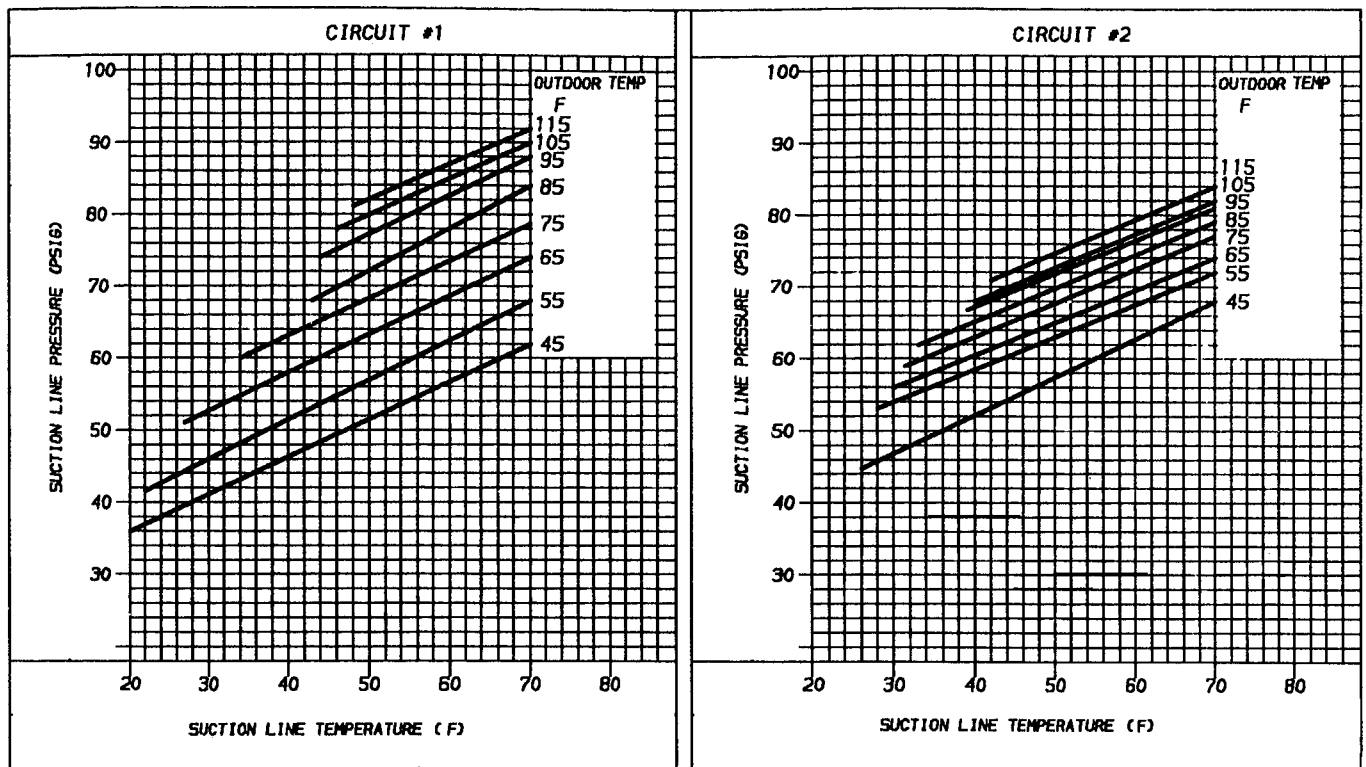


Fig. 28 – Cooling Charging Charts, 48HJ008

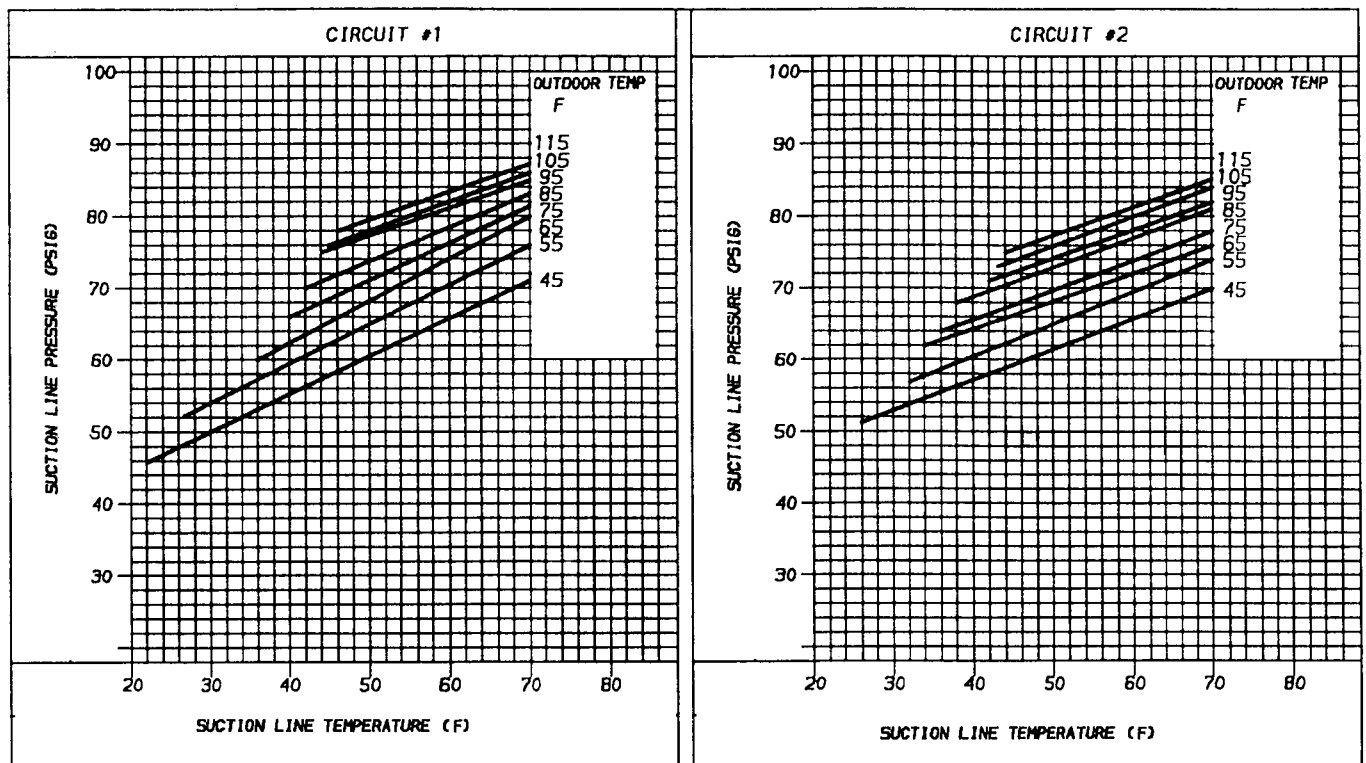


Fig. 29 – Cooling Charging Charts, 48HJ009

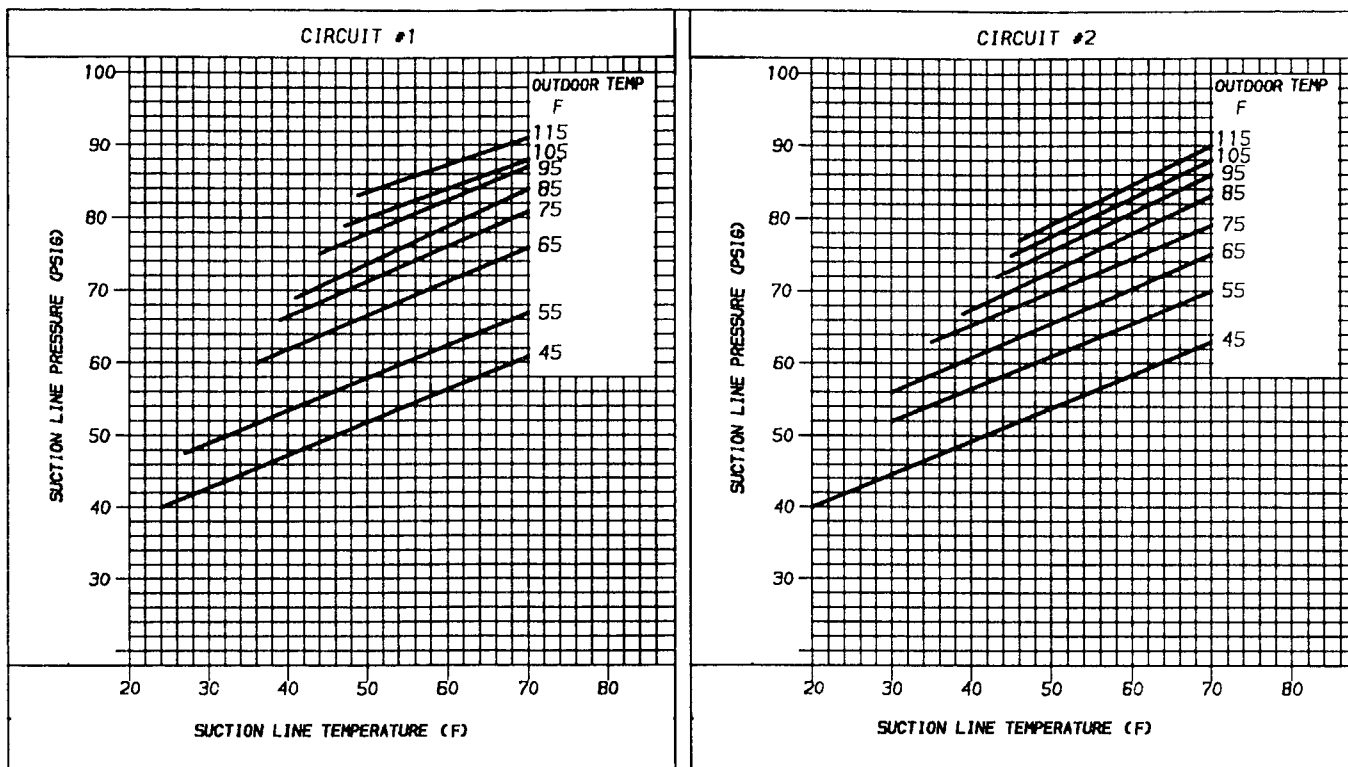


Fig. 30 — Cooling Charging Charts, 48HJ012

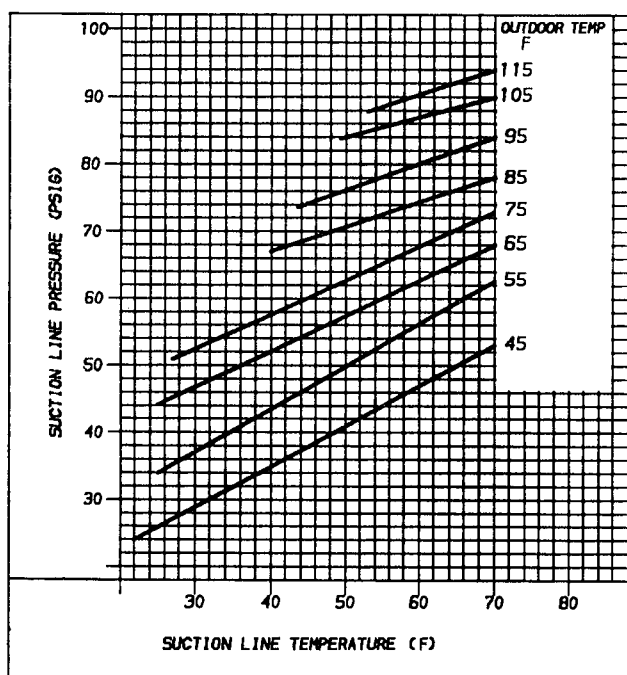


Fig. 31 — Cooling Charging Chart, 48HJ014

Main Burners — At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames and adjust if necessary.

⚠ CAUTION

When working on gas train, do not hit or plug orifice spuds.

Flue Gas Passageways — To inspect the flue collector box and upper areas of the heat exchanger:

1. Remove the combustion blower wheel and motor assembly according to directions in Combustion-Air Blower section below.
2. Remove the 3 screws holding the blower housing to the flue cover.
3. Remove the flue cover to inspect the heat exchanger.
4. Clean all surfaces as required using 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 bimonthly to determine proper cleaning frequency.

To inspect blower wheel, remove draft hood and screen. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel as follows:

1. Slide burner access panel out.
2. Remove the 2 screws which hold the heat shield in place, and remove heat shield.
3. Remove the 7 screws that attach induced-draft motor mounting plate to blower housing (see Fig. 32).
4. Slide the motor and blower wheel assembly out of the blower housing. The blower wheel can be cleaned at this point. If additional cleaning is required, continue with steps 5 and 6.
5. Remove blower by removing 2 setscrews.
6. Remove motor by removing 4 screws that hold blower housing to mounting plate. Remove the motor cooling fan by removing one setscrew. Then remove nuts that hold motor to mounting plate.
7. To reinstall, reverse the procedure outlined above.

Limit Switch — Remove blower access panel (see Fig. 6). Limit switch is located on the fan deck.

Burner Ignition — Unit is equipped with a direct-spark ignition, 100% lockout system. Integrated Gas Unit Controller (IGC) located in the control box (Fig. 11). The IGC contains a self-diagnostic LED (light-emitting diode) that can be observed through the viewport. During service, refer to the label on the control box cover or Table 11 for an explanation of LED error code descriptions.

A single LED on the Integrated Gas Unit Controller (IGC) provides a visual display of operational or sequential problems when the power supply is uninterrupted. When a break in power occurs, the IGC will be reset (resulting in a loss of fault history). The indoor (evaporator) fan ON/OFF time delay will also be reset. Refer to Start-Up, Heating section on page 17 for additional information.

If lockout occurs, unit may be reset by interrupting the power supply to unit for at least 5 seconds

Table 11 — LED Error Code Description*

LED INDICATION	ERROR CODE DESCRIPTION
ON	Normal Operation
OFF	Hardware Failure
1 Flash†	Evaporator Fan On/Off Delay Modified
2 Flashes	Limit Switch Fault
3 Flashes	Flame Sense Fault
4 Flashes	4 Consecutive Limit Switch Faults
5 Flashes	Ignition Lockout Fault
6 Flashes	Induced-Draft Motor Fault
7 Flashes	Rollout Switch Fault
8 Flashes	Internal Control Fault

LEGEND

LED — Light-Emitting Diode

*A 3-second pause exists between LED error code flashes. If more than one error code exists, all applicable codes will be displayed in numerical sequence.

†Indicates a code that is not an error. The unit will continue to operate when this code is displayed

IMPORTANT: Refer to Troubleshooting Tables 12-15 for additional information.

REMOVAL AND REPLACEMENT OF GAS TRAIN (See Fig. 32 and 33.)

1. Shut off manual gas valve.
2. Shut off power to unit.
3. Remove compressor access panel.
4. Slide out burner compartment side panel.
5. Remove heat shield.
6. Disconnect gas piping at unit gas valve.
7. Remove wires connected to gas valve. Mark each wire.
8. Remove induced-draft motor, ignitor, and sensor wires at the Integrated Gas Unit Controller (IGC)
9. Remove the 2 screws that attach the burner rack to the vestibule plate.
10. Remove the gas valve bracket.
11. Slide the burner tray out of the unit (see Fig. 33).
12. To reinstall, reverse the procedure outlined above.

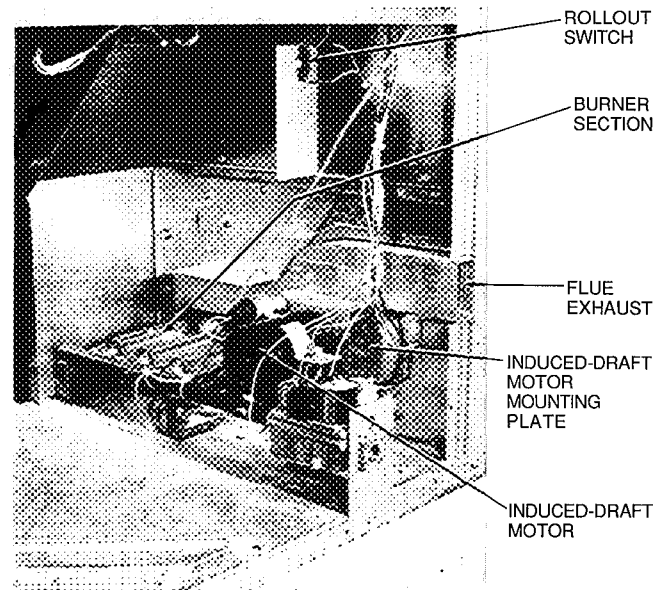


Fig. 32 — Burner Section Details

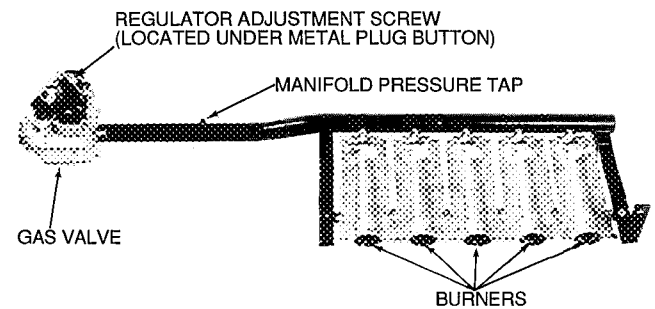
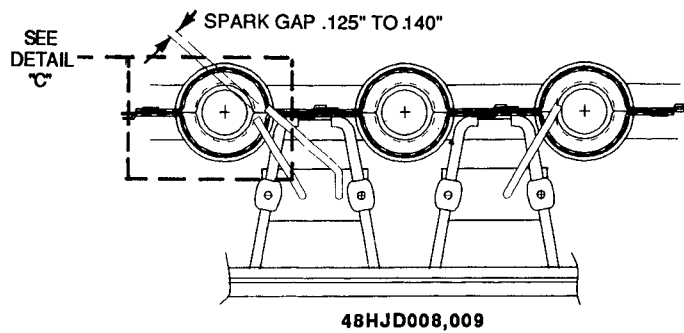


Fig. 33 — Burner Tray Details

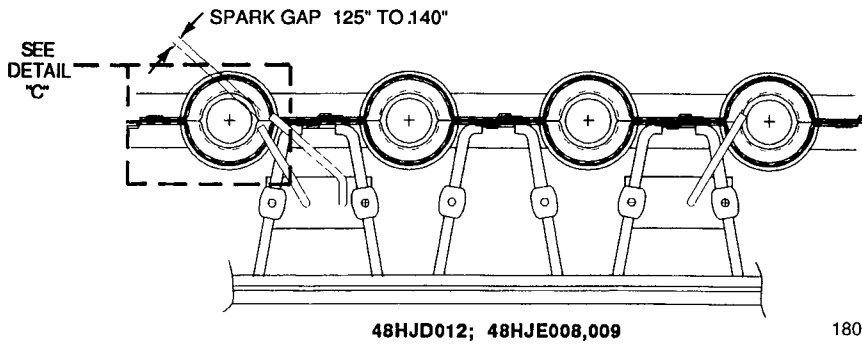
CLEANING AND ADJUSTMENT

1. Remove burner rack from unit as described in Removal and Replacement of Gas Train section above.
2. Inspect burners, and if dirty, remove burners from rack.
3. Using a soft brush, clean burners and crossover port as required.
4. Adjust spark gap. See Fig. 34.
5. Reinstall burners on rack.
6. Reinstall burner rack as described above.

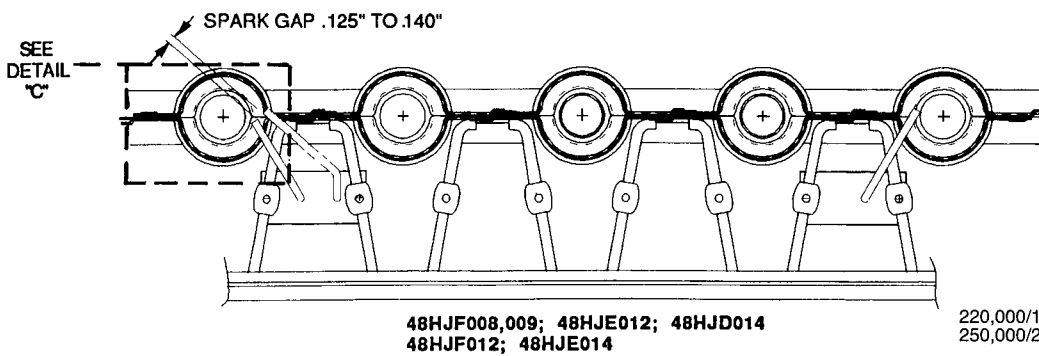
Replacement Parts — A complete list of replacement parts may be obtained from your Carrier distributor upon request.



125,000/90,000 BTUH INPUT

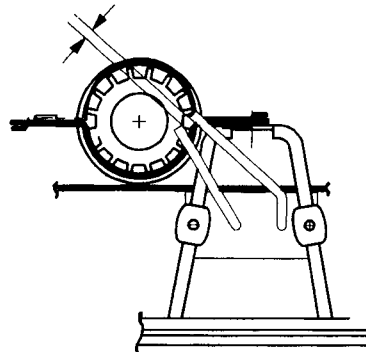


180,000/120,000 BTUH INPUT



220,000/180,000 BTUH INPUT
250,000/200,000 BTUH INPUT

SPARK GAP .125" TO .140"



DETAIL "C"

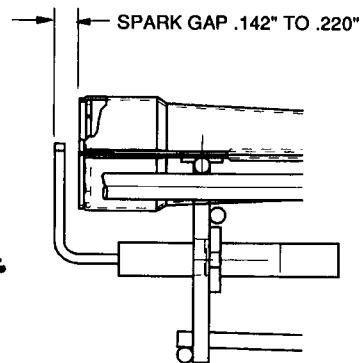


Fig. 34 — Spark Gap Adjustment

LEGEND FOR FIG. 35

IMPORTANT: Refer to unit wiring label for actual unit wiring.

AHA	— Adjustable Heat Anticipator	OFC	— Outdoor (Condenser) Fan Contactor
BM	— Blower Motor	OFM	— Outdoor (Condenser) Fan Motor
BR	— Blower Motor Relay	PL	— Plug Assembly
C	— Contactor, Compressor	R	— Relay
CB	— Circuit Breaker	RC	— 24 V Cooling
CC	— Cooling Compensator	RH	— 24 V Heating
CLO	— Compressor Lockout	RS	— Rollout Switch
COMP	— Compressor Motor	RT	— 24-V to IGC
CONN	— Connection	SAT	— Supply-Air Thermostat
CM	— Combustion Motor	SEN	— Sensor
CR	— Combustion Motor Relay	SW1	— Switch Fully Open
CS	— Centrifugal Switch	SW2	— Switch Fully Closed
D	— Diode	SW3	— Switch Minimum Vent Position
EC	— Enthalpy Control	SW4	— Switch Maximum Vent Position
EPS	— Emergency Power Supply	TC	— Thermostat-Cooling
EQUIP	— Equipment	TH	— Thermostat-Heating
ER	— Economizer Relay	TR	— 24-V from TRAN for EC
FPT	— Freeze-Protection Thermostat	TRAN	— Transformer
FS	— Flame Sensor		Field Splice
FSS	— Filter Status Switch		Terminal (Marked)
FU	— Fuse		Terminal (Unmarked)
GND	— Ground		Terminal Block
GV	— Gas Valve		Splice
GVR	— Gas Valve Relay		Splice (Marked)
HPS	— High-Pressure Switch		Factory Wiring
HV	— High Voltage		Field Control Wiring
I	— Ignitor		Field Power Wiring
IDM	— Induced Draft Motor		Accessory or Optional Wiring
IFC	— Indoor (Evaporator) Fan Contactor		To indicate common potential only, not to represent wiring
IFM	— Indoor (Evaporator) Fan Motor		
IGC	— Integrated Gas Unit Controller		
LED	— Light-Emitting Diode		
LPS	— Low-Pressure/Loss-of-Charge Switch		
LS	— Limit Switch		
MGV	— Main Gas Valve		
MTR	— Motor		
NC	— Normally Closed		
NO	— Normally Open		
OAT	— Outdoor-Air Thermostat		

NOTES FOR FIG. 35

- 1 If any of the original wire furnished must be replaced, it must be replaced with Type 90 C wire or its equivalent.
- 2 Three-phase motors are protected under primary single-phasing conditions.
- 3 Thermostats: HH07AT170, 172, 174, and P272-2783.
Subbases: HH93AZ176, 178, and P272-1882, 1883.
- 4 Set heat anticipator for first stage at 0.14 amp, second stage at 0.20 amp, except for 008 and 009 low heat. Set both first and second stage at 0.14 amp.
5. Use copper conductors only.

TROUBLESHOOTING

Table 12 – Cooling Service Analysis

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

Table 13 – Heating Service Analysis

PROBLEM	CAUSE	REMEDY
Burners will not ignite.	Misaligned spark electrodes	Check flame ignition and sensor electrode positioning. Adjust as needed.
	No gas at main burners.	Check gas line for air purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before attempting to relight unit. Check gas valve
	Water in gas line.	Drain water and install drip leg to trap water.
	No power to furnace.	Check power supply, fuses, wiring, and circuit breaker.
	No 24 v power supply to control circuit.	Check transformer. Transformers with internal overcurrent protection require a cool down period before resetting. Check 24-v circuit breaker, reset if necessary.
	Miswired or loose connections.	Check all wiring and wire nut connections.
	Burned-out heat anticipator in thermostat	Replace thermostat.
	Broken thermostat wires	Run continuity check. Replace wires, if necessary.
Inadequate heating.	Dirty air filter	Clean or replace filter as necessary.
	Gas input to unit too low.	Check gas pressure at manifold. Check gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.
	Unit undersized for application.	Replace with proper unit or add additional unit
	Restricted airflow	Clean filter, replace filter, or remove any restrictions.
	Blower speed too low	Install alternate motor, if applicable, or adjust pulley to increase fan speed.
	Limit switch cycles main burners	Check rotation of blower, thermostat heat anticipator settings, and temperature rise of unit. Adjust as needed.
	Too much outdoor air.	Adjust minimum position. Check economizer operation
Poor flame characteristics.	Incomplete combustion (lack of combustion air) results in: Aldehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary
		Cracked heat exchanger.
		Overfired unit — reduce input, change orifices, or adjust gas line or manifold pressure
		Check vent for restriction. Clean as necessary.
		Check orifice to burner alignment
Burners will not turn off.	Unit is locked into Heating mode for a one minute minimum.	Wait until mandatory one minute time period has elapsed or power to unit

LEGEND

GR — Ground

Table 14 – Economizer Troubleshooting

PROBLEM	CAUSE	REMEDY
Damper does not open.	Indoor (evaporator) fan is off.	1. Check to ensure that 24 vac is present at terminal C1 on the IFC or that 24 vac is present at the IFO terminal. Check whether 24 vac is present at PL6-1 (red wire) and/or PL6-3 (black wire). If 24 vac is not present, check wiring (see unit label diagram). 2. Check proper thermostat connection to G on the connection board.
	No power to economizer motor.	1. Check that SW3 is properly making contact with the damper blade. Check that SW1 is in the NC (normally closed) position. 2. Check diode D18. If diode is not functioning properly, replace economizer control board. 3. Confirm that the economizer control board is grounded properly at PL6-4 (brown wire) and at brown terminal of the economizer control board (brown wire). The economizer motor must also be grounded properly at the negative motor terminal (brown wire). 4. Verify SW1 and SW3 are working and wired properly (see unit label diagram). 5. Check for 24 vac input at both PL6-1 (red wire) and PL6-3 (black wire). If 24 vac not present, check unit wiring (see unit label diagram). If 24 vac is found in both places, check for 24 vac at the yellow terminal of the economizer control board (yellow wire). If 24 vac power is not present, replace the economizer control board.
	Economizer motor failure.	If the indoor (evaporator) fan and economizer motor are energized, verify that there is a minimum of 18 vdc at the positive motor terminal. If the motor is not operating, replace the motor.
Economizer operation limited to minimum position.	OAT or EC set too high.	1. Set at correct temperature (3 F below indoor space temperature). 2. Check OAT or EC by setting above outdoor temperature or humidity level. If the OAT or EC switches do not close, replace OAT or EC.
	Economizer control board incorrectly wired or not functioning.	1. Perform the following tests when OAT or EC is closed, Y1 is called for, and damper is at minimum position. Confirm 24 vac on gray terminal of the economizer control board (gray wire). If 24 vac is not present, check wiring (see unit label diagram). 2. Verify that SW1 and SW3 are wired correctly and working properly (see unit label diagram). 3. Check to ensure that 24 vac exists at PL6-2 (blue wire). If 24 vac is not present, check wiring (see unit wiring label diagram). 4. Check 24 vac output at PL6-10 (white wire). If 24 vac is not present, replace economizer control board.
	Incorrect SAT wiring or inoperative SAT	1. After verifying that the OAT and EC settings and the economizer control board wiring are correct, check to ensure that the 24 vac terminal of the SAT has 24 vac (white wire). If OAT, EC, and control board are functioning and wired properly and no 24 vac exists, check wiring (see unit label diagram). 2. If supply-air temperature is greater than 57 F, 24 vac should be found at terminal T2 on the SAT (pink wire). If 24 vac is not present, replace SAT.
Damper does not close.	Incorrect economizer wiring.	1. Verify that SW2 and SW4 are wired and working properly (see unit label diagram). 2. Check diode D19. If diode is not functioning properly, replace economizer control board.
	Incorrect damper actuator wiring or inoperative economizer circuit board.	1. After verifying that the wiring is correct, modulate the damper to the minimum position. Remove the calls for G. 2. If the damper does not move, check for 24 vac at PL6-1 (red wire). If 24 vac is not present, check wiring (see unit label diagram). 3. If damper still does not move, check for 24 vac at blue terminal of economizer control board (blue wire). If 24 vac is not present, replace the economizer control board.
	Incorrect SAT wiring or inoperative SAT.	1. After verifying that the wiring is correct and the economizer control board is functioning properly, place the OAT or EC switch in the closed position. Place a call for Y1 and open the damper to the fully open position. Confirm that the 24 vac terminal of the SAT has 24 vac (white wire). If 24 vac is not present, check wiring (see unit label diagram). 2. If supply-air temperature is less than 52 F, 24 vac should be found at terminal T1 on the SAT (violet wire). If 24 vac not found, replace SAT.
	Economizer motor failure	If economizer control board and SAT are functioning properly, verify that there is a minimum of 18 vdc at the positive motor terminal. If a minimum of 18 vdc is present and the motor is still not operating, replace the motor.
Economizer damper does not close on power loss.	Insufficient battery power, inoperative economizer control board	1. Check voltage potential across batteries. If lower than 14 vdc, replace close-on-power-loss power supply (9-v alkaline batteries). Check this emergency power supply on a regular basis or whenever the filters are changed. 2. If the close-on-power-loss and economizer control board are functioning properly, check for 14 vdc or higher at the blue terminal of the economizer control board (blue wire) when power is disconnected from unit. If 14 vdc is not present, replace the control board.

LEGEND

C1 — Common	OAT — Outdoor-Air Thermostat
EC — Enthalpy Control	PL — Plug
IFC — Indoor (Evaporator) Fan Contactor	SAT — Supply-Air Thermostat
IFO — Indoor (Evaporator) Fan On	SW — Economizer Position Switch

Table 15 — LED Error Code Service Analysis

PROBLEM	CAUSE	REMEDY
Hardware failure. (LED OFF)	Loss of power to control module (IGC).	Check 5 amp fuse on IGC, power to unit, 24-v circuit breaker, and transformer. Units without a 24-v circuit breaker have an internal overload in the 24-v transformer. If the overload trips, allow 10 minutes for automatic reset.
Limit switch fault. (LED 2 flashes)	High temperature limit switch is open.	Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is in accordance with the range on the unit nameplate.
Flame sense fault. (LED 3 flashes)	The IGC sensed flame that should not be present.	Reset unit. If problem persists, replace control board.
4 consecutive limit switch trips. (LED 4 flashes)	Inadequate airflow to unit.	Check operation of indoor (evaporator) fan motor and that supply-air temperature rise agrees with range on unit nameplate information.
Ignition lockout. (LED 5 flashes)	Unit unsuccessfully attempted ignition for 15 minutes.	Check ignitor and flame sensor electrode spacing, gaps, etc. Ensure that flame sense and ignition wires are properly terminated. Verify that unit is obtaining proper amount of gas.
Induced-draft motor fault. (LED 6 flashes)	IGC does not sense that induced-draft motor is operating.	Check for proper voltage. If motor is operating, check the speed sensor plug/IGC Terminal J2 connection. Proper connection: PIN 1 — White, PIN 2 — Red, PIN 3 — Black.
Rollout switch fault. (LED 7 flashes)	Rollout switch has opened.	Rollout switch will automatically reset, but IGC will continue to lock out unit. Check gas valve operation. Ensure that induced-draft blower wheel is properly secured to motor shaft. Reset unit at unit disconnect.
Internal control fault. (LED 8 flashes)	Microprocessor has sensed an error in the software or hardware.	If error code is not cleared by resetting unit power, replace the IGC.

LEGEND

IGC — Integrated Gas Unit Controller
LED — Light-Emitting Diode

⚠ WARNING

If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that may be present before handling new control board. The IGC is sensitive to static electricity and may be damaged if the necessary precautions are not taken.

IMPORTANT: Refer to Table 13 — Heating Service Analysis for additional troubleshooting information.

START-UP CHECKLIST
(Remove and Store in Job File)

I. PRELIMINARY INFORMATION

MODEL NO.: _____
DATE: _____

SERIAL NO.: _____
TECHNICIAN: _____

II. PRE-START-UP (insert checkmark in box as each item is completed)

- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ REMOVE ALL SHIPPING HOLDDOWN BOLTS AND BRACKETS PER INSTALLATION INSTRUCTIONS
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTALLATION INSTRUCTIONS
- ☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ☐ CHECK GAS PIPING FOR LEAKS
- ☐ CHECK THAT INDOOR-AIR FILTER IS CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT INSTALLATION IS LEVEL
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND SETSCREW TIGHTNESS

III. START-UP

ELECTRICAL

SUPPLY VOLTAGE	L1-L2	_____	L2-L3	_____	L3-L1	_____
COMPRESSOR AMPS	L1	_____	L2	_____	L3	_____
COMPRESSOR AMPS	L1	_____	L2	_____	L3	_____
INDOOR-FAN AMPS	L1	_____	L2	_____	L3	_____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ DB
RETURN-AIR TEMPERATURE _____ DB _____ WB
COOLING SUPPLY AIR _____
GAS HEAT SUPPLY AIR _____

PRESSURES

GAS INLET PRESSURE _____ IN. WG
GAS MANIFOLD PRESSURE _____ IN. WG
REFRIGERANT SUCTION _____ PSIG CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG
REFRIGERANT DISCHARGE _____ PSIG CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING TABLES
- ☐ VERIFY THAT 3-PHASE SCROLL COMPRESSOR ROTATING IN CORRECT DIRECTION

CUT ALONG DOTTED LINE