

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 accessory 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.

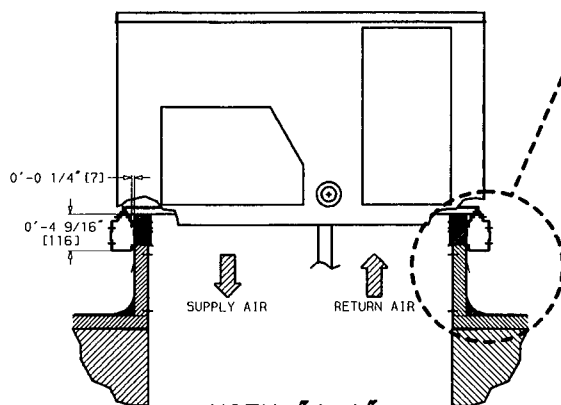
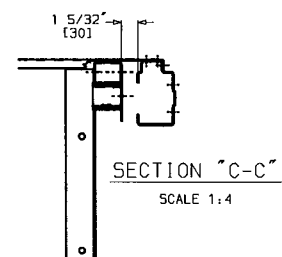
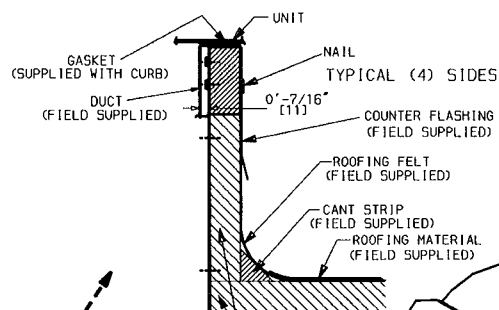
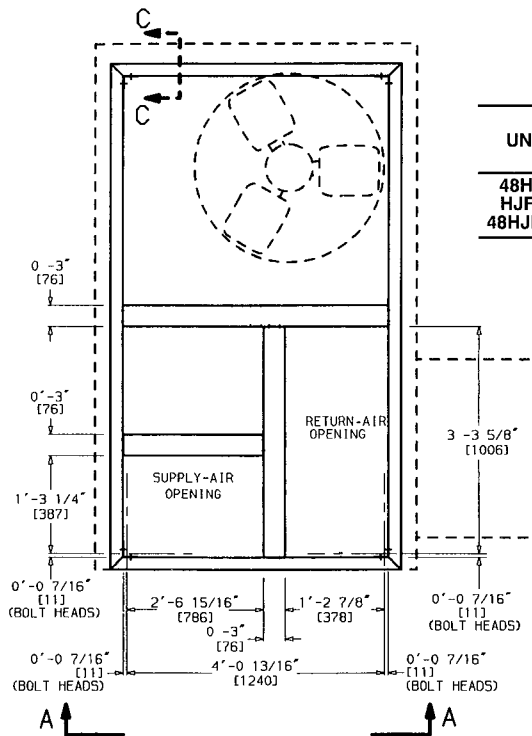
NOTE. Horizontal units may be installed on a roof curb if required.

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

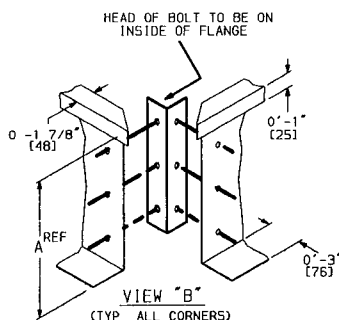
NOTES:

- 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 ⁵ / ₁₆ " [583]	1' 10 ⁵ / ₁₆ " [583]	1 ³ / ₄ " [45]	³ / ₄ " [19] NPT	1" [25] NPT	³ / ₄ " [19] NPT	50DJ901551



VIEW "A-A"



VIEW "B"
(TYP ALL CORNERS)

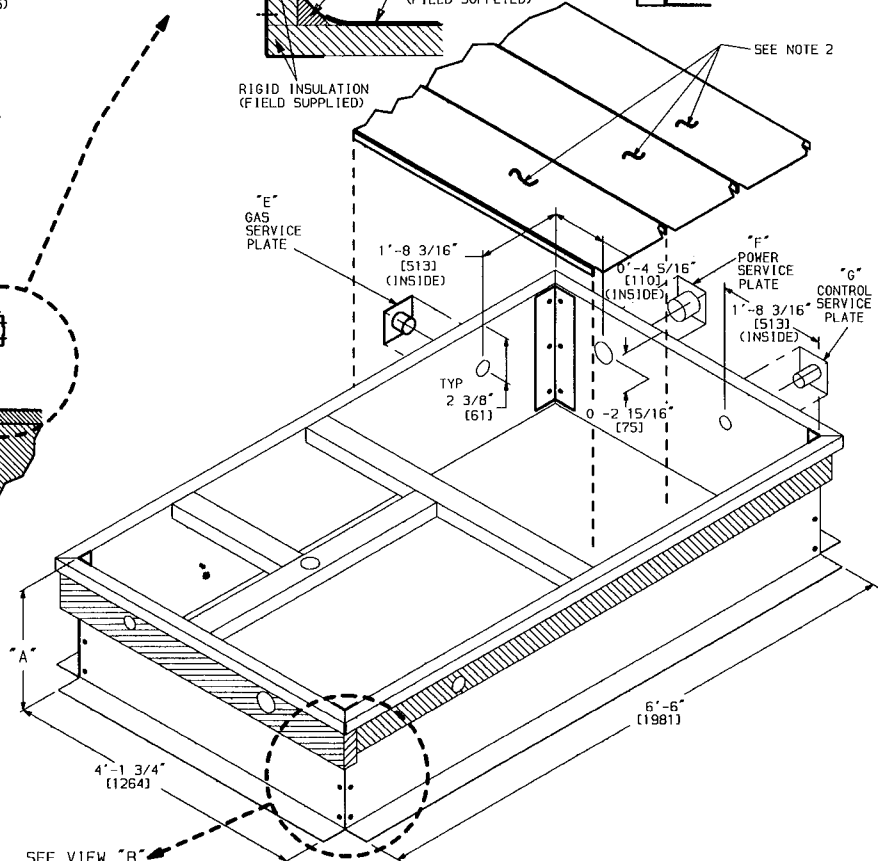
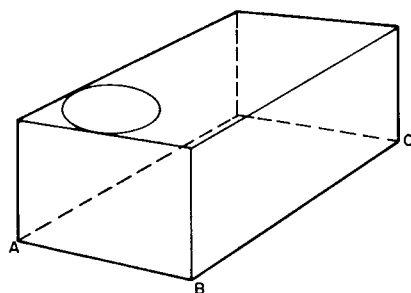


Fig. 1 — Roof Curb Details



MAXIMUM ALLOWABLE
DIFFERENCE (in)

A-B	B-C	A-C
0.5	1.0	1.0

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 $-.35$ in. wg with economizer or $-.45$ 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.

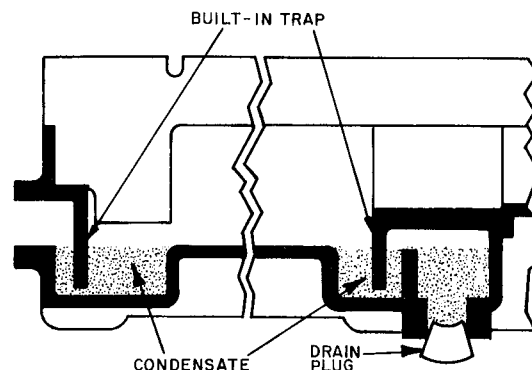
Step 3 — Determine Location of Drain Connection for Internally-Trapped Condensate Drain

— Units have internally-trapped condensate drains. (See Fig. 3.) The condensate can be drained through the basepan or through the side panel. A drain plug is shipped installed in the basepan drain connection. If condensate drain is to be through the bottom of unit, the plug must be relocated to the side panel drain connection before unit is placed on the roof curb. The piping for the condensate can be completed after the unit is in place. Unit discharge connections do not determine the location of drain connections. Either side panel or basepan drain may be used with either vertical or horizontal units.

NOTE: Before installing unit, be sure drain plug is tight.

IMPORTANT: The condensate pan is internally trapped. An external trap is not required. If an external trap is attached, an air lock may develop between the traps causing the condensate pan to overflow.

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



NOTE: Drain plug is shown in factory-installed position

Fig. 3 — Internally-Trapped Condensate Drain

used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 4 for additional information. Operating weight is shown in Table 1 and Fig. 4.

Lifting holes are provided in base rails as shown in Fig. 4 and 5. 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. 5.

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.

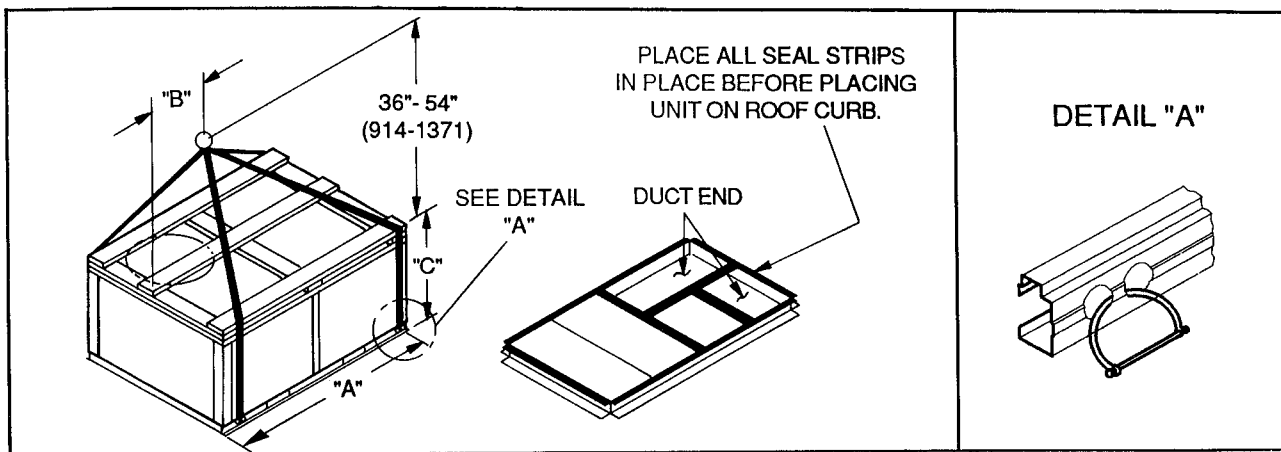
Table 1 — Physical Data

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
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	2.40	2.40	2.40	4.20
Motor Frame	56	56	56	56
Fan Rpm Range	590-840	590-840	690- 935	860-1080
Motor Bearing Type	Ball	Ball	Ball	Ball
Maximum Fan Rpm	2100	2100	2100	2100
Motor Pulley Pitch Diameter	2 4/3 4	2 4/3 4	2 8/3 8	4 0/5 0
A/B (in.)	3 4/4 4	3 4/4 4	4 0/5 0	3 1/4.1
Fan Pulley Pitch Diameter (in.)	7 0	7 0	7 0	8 0
Belt — Type...Length (in.)	A . 48	A . 48	A . 51	A . 57
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	45
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)	590	590	690	860
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				
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	90,000/120,000/180,000	90,000/120,000/180,000	120,000/180,000/200,000	180,000/200,000
Stage 1	125,000/180,000/220,000	125,000/180,000/220,000	180,000/220,000/250,000	220,000/250,000
Stage 2				
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.)	5/ 75/ 75	5/ 75/ 75	75/ 75/ 75	75/ 75
HIGH-PRESSURE SWITCH (psig)		450 ± 50		
Standard Compressor Internal Relief		428		
Cutout		320		
Reset (Auto.)				
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (psig)		7 ± 3		
Cutout		22 ± 7		
Reset (Auto.)				
FREEZE PROTECTION THERMOSTAT		30 ± 5		
Opens (F)		45 ± 5		
Closes (F)				
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

*Alternate evaporator-fan motor and drive will be available for the 48HJ014 in October 1993



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. 4 — Rigging Details

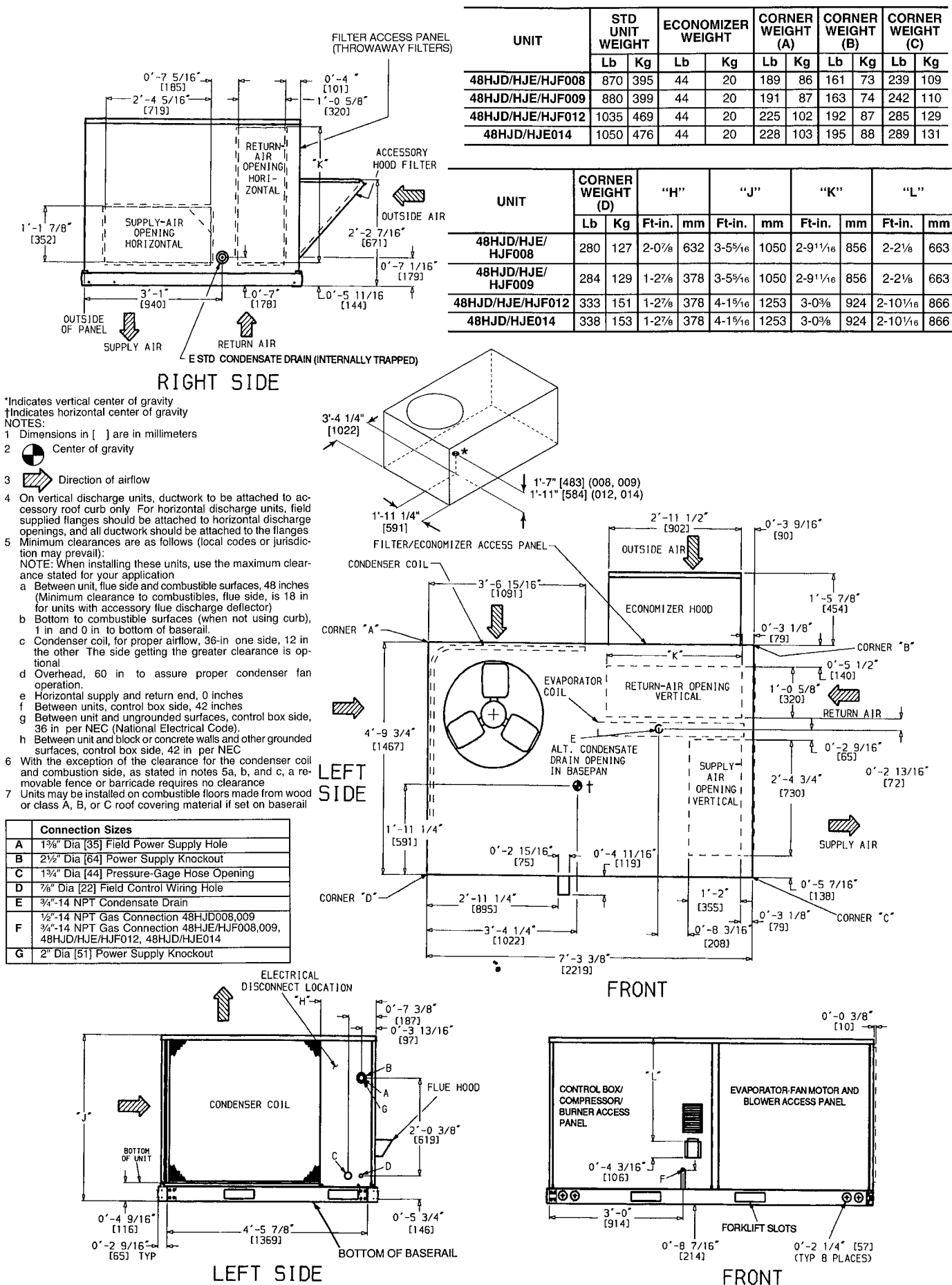
Step 5 — Install Flue Hood — Flue hood and screen are shipped screwed to the burner compartment access panel. Remove from shipping location and, using screws provided, install flue hood and screen in location shown in Fig. 5 and 6.

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. 7. 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 6 support beams. See Fig. 7 for typical pipe guide and locations of external manual gas shut-off valve.



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 1/4	1050	2-9 1/4	856	2-2 1/8	663
48HJD/HJE/HJF009	284	129	1-2 7/8	378	3-5 1/4	1050	2-9 1/4	856	2-2 1/8	663
48HJD/HJE/HJF012	333	151	1-2 7/8	378	4-1 1/4	1253	3-0 3/8	924	2-10 1/8	866
48HJD/HJE014	338	153	1-2 7/8	378	4-1 1/4	1253	3-0 3/8	924	2-10 1/8	866

- *Indicates vertical center of gravity
†Indicates horizontal center of gravity
- NOTES:
- Dimensions in [] are in millimeters
 - Center of gravity
 - Direction of airflow
 - 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.
 - Minimum clearances are as follows (local codes or jurisdiction may prevail):
NOTE: When installing these units, use the maximum clearance stated for your application.
 - 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)
 - Bottom to combustible surfaces (when not using curb), 1 in and 0 in, to bottom of baserail.
 - Condenser coil, for proper airflow, 36-in. one side, 12 in the other. The side getting the greater clearance is optional.
 - Overhead, 60 in. to assure proper condenser fan operation.
 - Horizontal supply and return end, 0 inches
 - Between units, control box side, 42 inches
 - Between unit and ungrounded surfaces, control box side, 36 in. per NEC (National Electrical Code).
 - Between unit and block or concrete walls and other grounded surfaces, control box side, 42 in. per NEC
 - 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.
 - Units may be installed on combustible floors made from wood or class A, B, or C roof covering material if set on baserail.

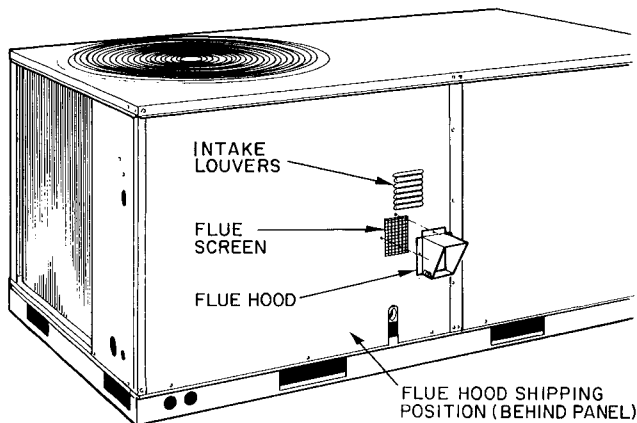
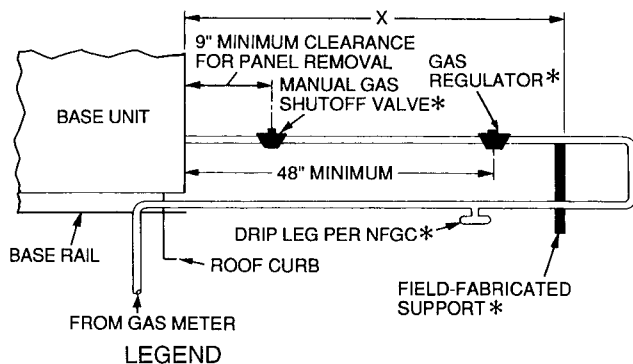


Fig. 6 — Flue Hood Details



LEGEND
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. 7 — 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. Pigtailed 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. 5. Route power lines through connector to terminal connections as shown in Fig. 8.

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.

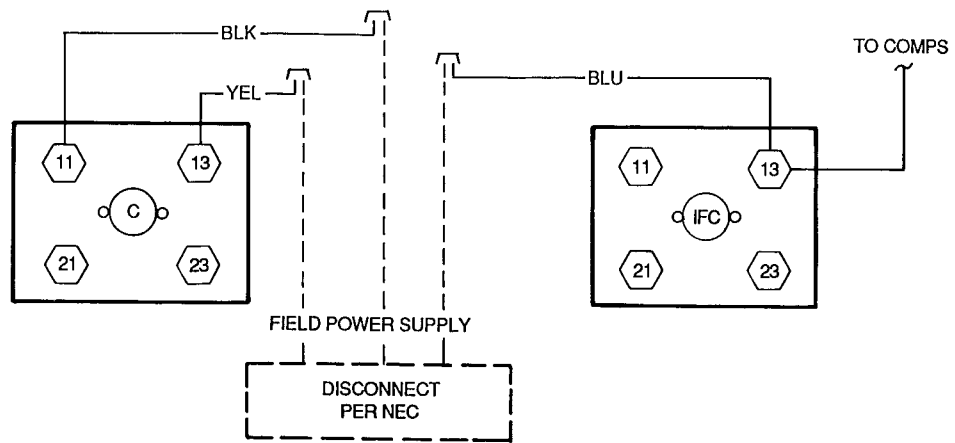
Route thermostat cable or equivalent single leads of colored wire from subbase terminals to low-voltage connections on unit (shown in Fig. 9) as described in Steps 1 - 4 below.

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. 5).
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. 10. 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. 9).

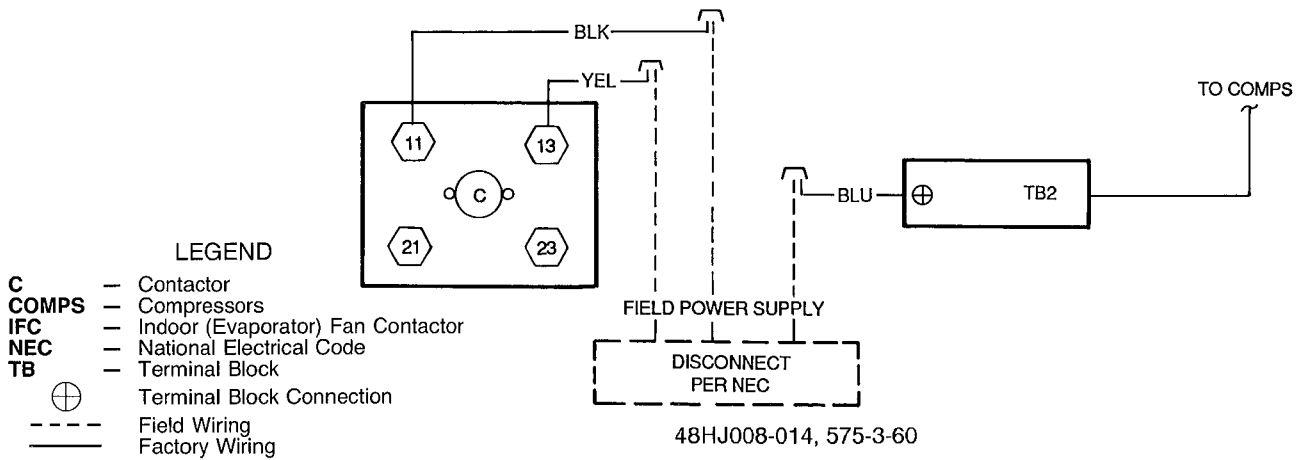
NOTE. For wire runs up to 50 ft, use no. 18 AWG (American Wire Gauge) insulated wire (35 C minimum). For 51 to 75 ft, use no. 16 AWG insulated wire (35 C minimum). For over 75 ft, use no. 14 AWG insulated wire (35 C minimum).

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. On 48HJ012,014 units, set heat anticipator settings at .14 amp for first stage and .20 amp for second-stage heating.

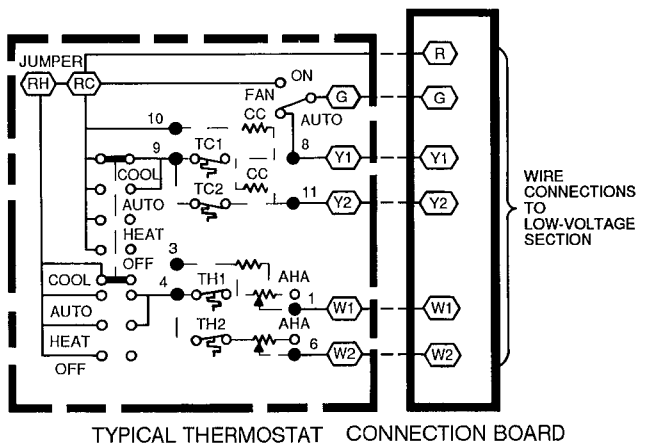


48HJ008-014, 208/230-3-60 AND 460-3-60



48HJ008-014, 575-3-60

Fig. 8 — Power Wiring Connections



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

Fig. 9 — Low-Voltage Connections With or Without Economizer or Two-Position Damper

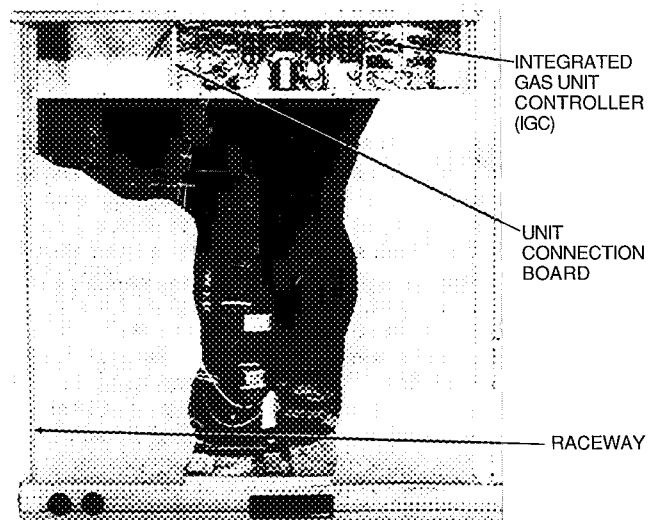


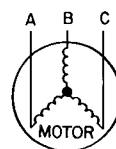
Fig. 10 — Field Control Wiring Raceway

Table 2 – Electrical Data

UNIT	NOMINAL V-PH-HZ	IFM TYPE	VOLTAGE RANGE		COMPR (each)		OFM	IFM	COMBUSTION FAN MOTOR	POWER SUPPLY		MINIMUM UNIT DISCONNECT SIZE	
			Min	Max	RLA	LRA	FLA	FLA	FLA	MCA	MOCP	FLA	LRA
48HJD/HJE/HJF 008 (7½ Tons)	208/230-3-60	Std	187	254	13.5	99.0	3.8	5.8	.57	40.0/40.0	45/45*	42/42	257/257
		Alt						7.5		41.7/41.7	50/50*	44/44	276/276
	460-3-60	Std	414	508	7.4	49.5	1.9	2.6	.30	21.2	25*	22	129
		Alt						3.4		22.0	25*	23	138
	575-3-60	Std	518	632	5.8	40.0	1.9	2.6	.30	16.7	20*	17	104
		Alt						3.4		17.3	20*	18	111
48HJD/HJE/HJF 009 (8½ Tons)	208/230-3-60	Std	187	254	13.5	99.0	3.8	5.8	.57	40.0/40.0	45/45*	42/42	257/257
		Alt						7.5		41.7/41.7	50/50*	44/44	276/276
	460-3-60	Std	414	508	7.4	49.5	1.9	2.6	.30	21.2	25*	22	129
		Alt						3.4		22.0	25*	23	138
	575-3-60	Std	518	632	5.8	40.0	1.9	2.6	.30	16.7	20*	17	104
		Alt						3.4		17.3	20*	18	111
48HJD/HJE/HJF 012 (10 Tons)	208/230-3-60	Std	187	254	17.3	123.0	3.8	5.8	.57	48.5/48.5	60/60*	51/51	305/305
		Alt						12.0		54.7/54.7	60/60*	58/58	348/348
	460-3-60	Std	414	508	9.0	62.0	1.9	2.6	.30	24.8	30*	26	154
		Alt						5.4		27.6	30*	29	175
	575-3-60	Std	518	632	7.1	50.0	1.9	2.6	.30	19.6	25*	20	124
		Alt						5.4		21.8	30*	23	141
48HJD/HJE 014 (12½ Tons)†	208/230-3-60	Std	187	254	22.3	142.0	3.8	12.0	.57	66.0/66.0	80/80	69/69	386/386
		Alt					3.0	15.0		68.2/68.2	80/80	72/72	410/410
	460-3-60	Std	414	508	10.4	72.0	1.9	5.4	.30	30.7	35*	32	195
		Alt					1.5	7.5		32.4	35*	34	207
	575-3-60	Std	518	632	9.6	58.5	1.9	5.4	.30	27.4	35*	29	158
		Alt					1.5	7.5		28.8	35*	30	167

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



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

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

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

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

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

*Fuse or HACR circuit breaker

†Alternate evaporator-fan motor and drive will be available in October 1993.

NOTES:

1. 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.

2. 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

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

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 OUTDOOR-AIR DAMPER — Optional outdoor-air damper hood is packaged and shipped strapped to the air filter tracks in the filter section.

To Assemble

1. Remove evaporator coil access panel. Save panel and screws. See Fig. 11.
2. Assemble outdoor-air hood top and side plates as shown in Fig. 12. Install seal strips on hood top and sides. Put aside screen retainer and retainer screw for later assembly. *Do not attach hood to unit at this time.*
3. Remove block-off panel from evaporator coil access panel and discard. Save screws. See Fig. 11. Replace evaporator-coil access panel.
4. Refer to Fig. 13. Adjust ventilation-air position setting of the outdoor damper blade by loosening the adjustable screws and sliding the metal panel until in the position determined by Fig. 14.
5. Fasten hood top and side plate assembly and bottom stop (Fig. 15) to unit with screws saved from Step 3.
6. Slide outdoor-air inlet screens into screen track on hood side plate. Using clasp provided, clamp screens together. While holding screens in place, fasten screen retainer to hood using screws provided. (See Fig. 15.)

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. 11.
3. Assemble outdoor-air hood top and side plates as shown in Fig. 12. Install seal strips on hood top and sides. Put aside screen retainer and retainer screw 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. 11.

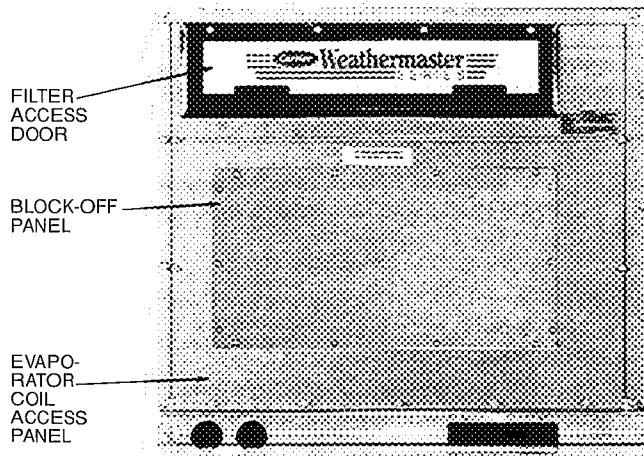
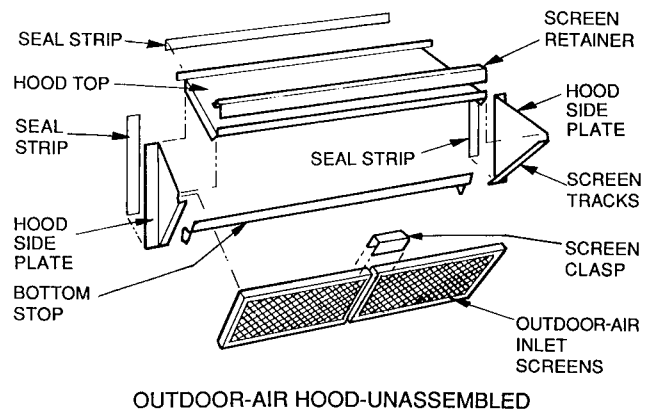
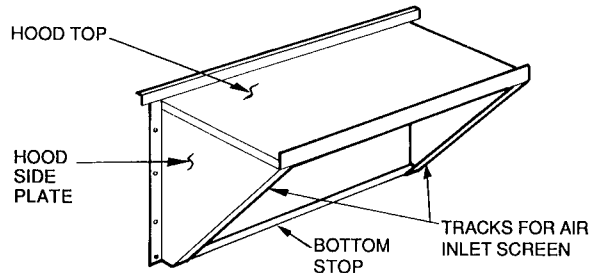


Fig. 11 — Access Panel Location



OUTDOOR-AIR HOOD-UNASSEMBLED



HOOD SIDES AND TOP-ASSEMBLED

Fig. 12 — Outdoor-Air Hood Details

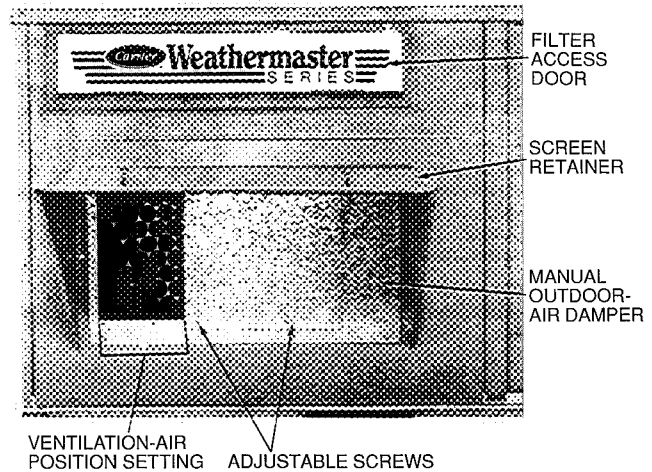


Fig. 13 — Manual Outdoor-Air Damper

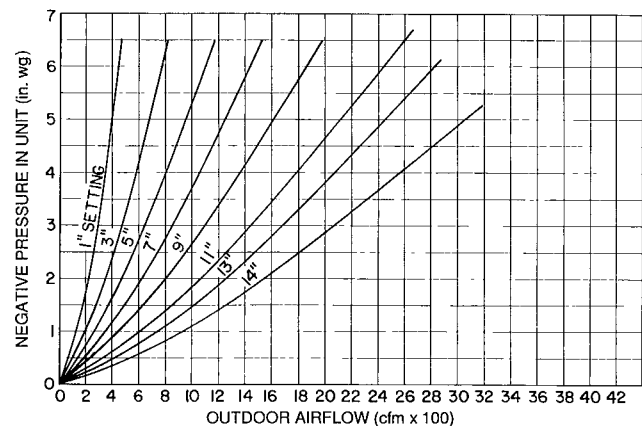


Fig. 14 — Outdoor-Air Intake Position Setting

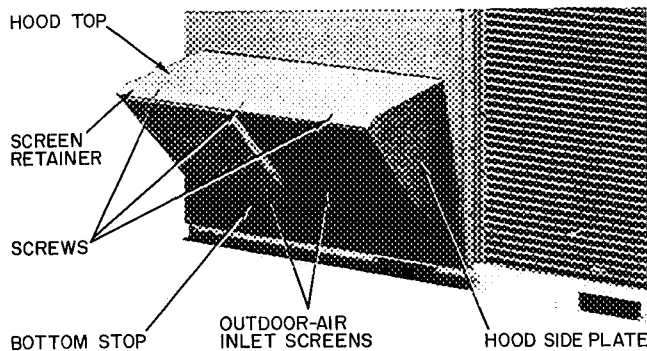


Fig. 15 - Air Hood Details

5. Slide economizer or two-position damper into unit and secure with screws. See Fig. 16. To convert to horizontal discharge application:
 - a. Rotate economizer/two-position damper clockwise 90 degrees until the economizer motor faces the condenser section (see Fig. 17).
 - b. 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/two-position damper harness. Remove tape from barometric relief damper. See Fig. 16.
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. 18.

Adjust minimum position setting by adjusting the screws on the position setting bracket. (See Fig. 16.) Slide bracket

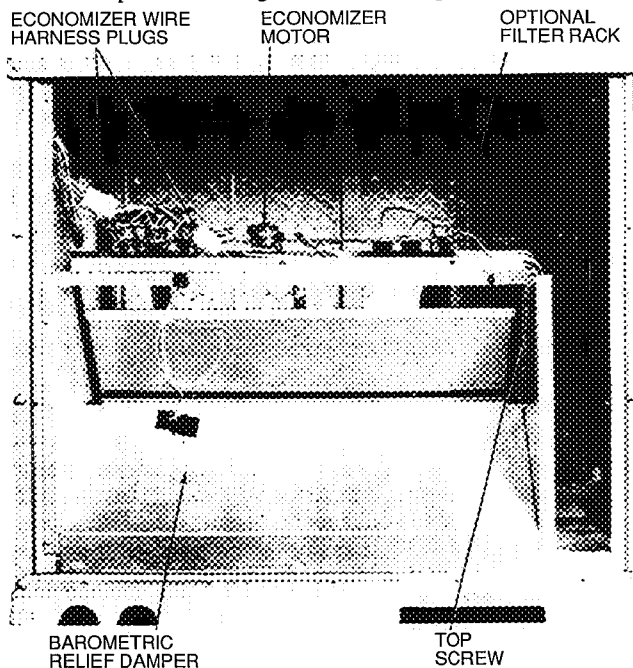


Fig. 16 - Economizer Installed in Unit

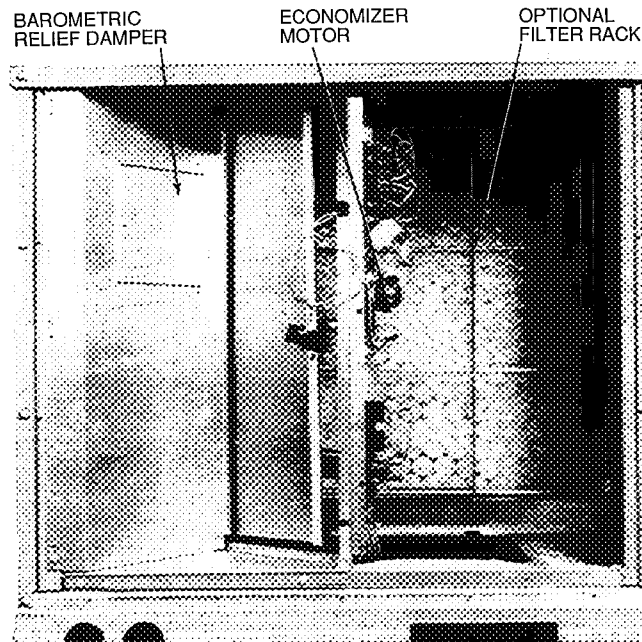
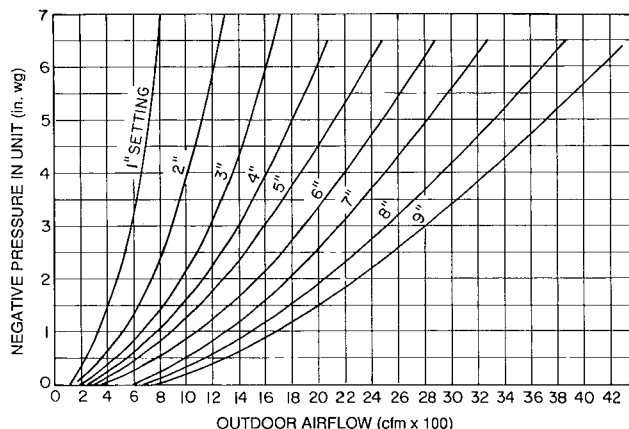


Fig. 17 - Horizontal Economizer Installation



Example:

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

Fig. 18 - Minimum Position Setting

until the top screw is in the position determined by Fig. 18. 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. 19. 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. 15) to unit with screws saved from Step 4.
11. *Units with economizer only:* Place knob supplied with economizer on OAT. See Fig. 19. 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. 19. Make wiring connections for OAT (see Fig. 20).

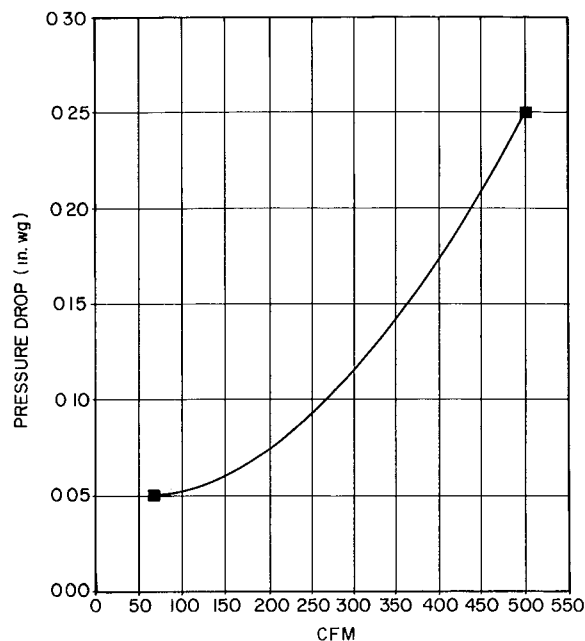
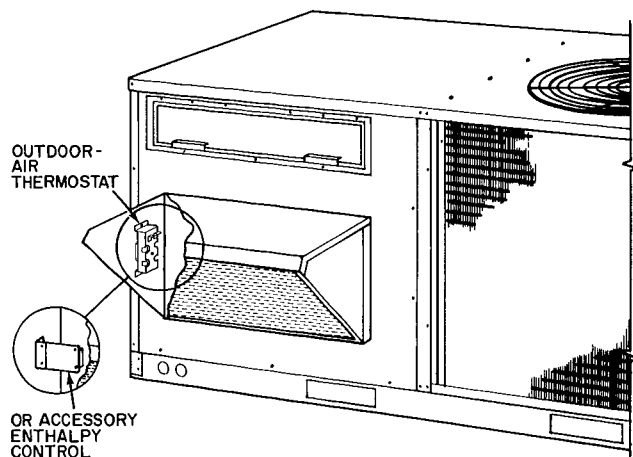


Fig. 21 — Economizer/Two-Position Damper Barometric Relief Damper Characteristics — 48HJ008-014

- 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. 21 for economizer/two-position damper barometric relief 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:

- Shut off unit power supply.
- Loosen belt by loosening fan motor mounting nuts. See Fig. 22A and 22B.
- Loosen movable pulley flange setscrew (see Fig. 23).
- 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.
- 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:

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

To adjust belt tension:

- Loosen fan motor mounting nuts.
- Sizes 008, 009 — Slide motor mounting plate away from fan scroll for proper belt tension (1/2-in. deflection with one finger) and tighten mounting nuts (see Fig. 22A). Sizes 012, 014 — Slide motor mounting plate downward to tighten belt tension. Secure motor mounting plate nuts. See Fig. 22B.
- Adjust bolt and nut on mounting plate to secure motor in fixed position.

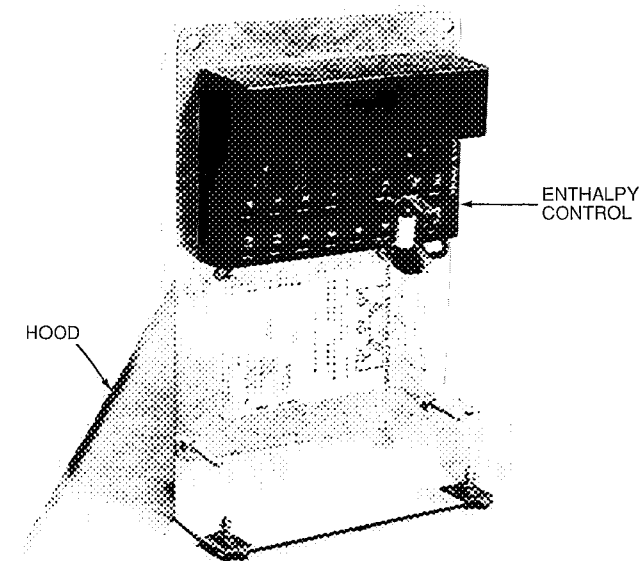
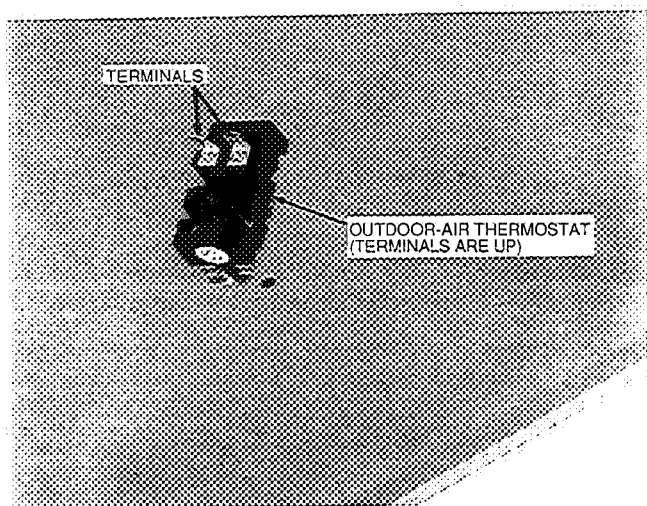


Fig. 19 — Outdoor-Air Thermostat/ Enthalpy Control Installation

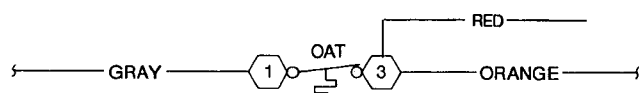


Fig. 20 — Wiring Connections for Outdoor-Air Thermostat

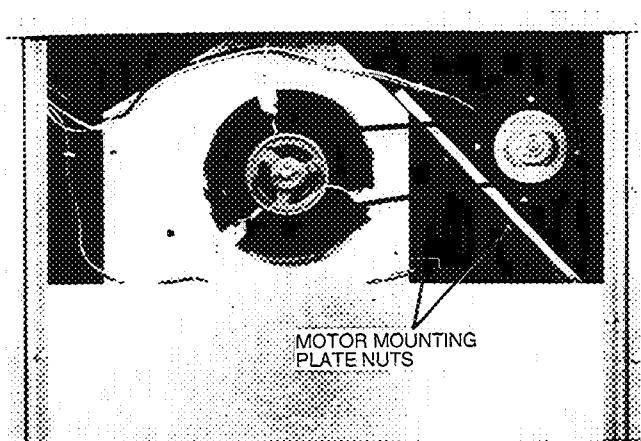


Fig. 22A — Typical Belt-Drive Motor Mounting for Sizes 008,009

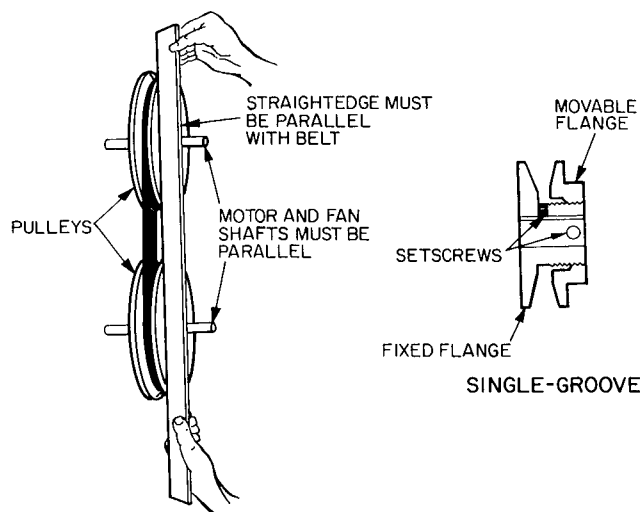


Fig. 23 — Evaporator-Fan Pulley Adjustment

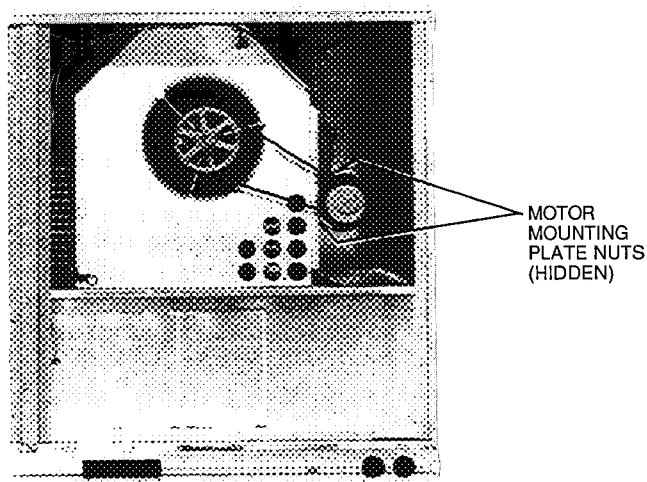


Fig. 22B — Typical Belt-Drive Motor Mounting for Sizes 012,014

Table 3 — Fan Rpm at Motor Pulley Settings

UNIT 48	MOTOR/ DRIVE	MOTOR PULLEY TURNS OPEN												
		0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
HJD/HJE/HJF 008,009	Std	840	815	790	765	740	715	690	665	640	615	590	—	—
	Alt	1085	1060	1035	1010	985	960	935	910	890	865	840	—	—
HJD/HJE/HJF 012	Std	935	910	890	865	840	815	790	765	740	715	690	—	—
	Alt	1080	1060	1035	1015	990	970	950	930	905	885	860	—	—
HJD/HJE014	Std	1080	1060	1035	1015	990	970	950	925	905	885	860	—	—
	Alt	1260	1220	1185	1155	1130	1100	1075	1045	1015	990	960	930	900

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

48HJD/HJE/HJF008,009 (7½ AND 8½ TONS)																		
AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2		0.4		0.6		0.8		0.9		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
2200	499	0.50	580	0.70	652	0.94	717	1.17	748	1.30	779	1.43	839	1.78	905	2.21	951	2.57
2250	507	0.53	586	0.73	658	0.97	722	1.22	752	1.34	783	1.46	843	1.81	908	2.25	955	2.59
2300	513	0.55	592	0.76	663	1.00	727	1.26	756	1.37	786	1.49	846	1.84	910	2.28	959	2.61
2400	528	0.60	606	0.83	674	1.06	738	1.34	766	1.46	795	1.58	853	1.88	912	2.31	957	2.68
2500	542	0.66	619	0.90	686	1.13	748	1.41	777	1.54	806	1.68	859	1.94	919	2.37	971	2.73
2550	550	0.69	627	0.94	692	1.17	754	1.45	783	1.59	812	1.74	864	1.99	920	2.39	974	2.76
2600	557	0.72	634	0.97	698	1.21	759	1.49	787	1.64	816	1.79	868	2.04	921	2.37	976	2.78
2700	573	0.79	648	1.05	711	1.29	770	1.58	798	1.73	827	1.88	878	2.16	928	2.45	983	2.88
2800	588	0.86	662	1.13	723	1.38	782	1.66	809	1.82	837	1.98	889	2.29	937	2.57	988	2.93
2900	604	0.94	676	1.21	737	1.48	794	1.76	821	1.92	848	2.08	900	2.41	947	2.70	995	3.03
3000	620	1.02	690	1.30	750	1.58	806	1.86	832	2.02	859	2.18	910	2.52	958	2.85	1002	3.18
3100	636	1.11	704	1.39	764	1.69	818	1.97	844	2.13	870	2.29	920	2.64	968	2.96	1012	3.26
3200	652	1.21	718	1.49	778	1.80	831	2.09	856	2.24	882	2.40	931	2.76	979	3.12	1023	3.37
3300	668	1.31	732	1.59	793	1.92	844	2.21	869	2.37	894	2.53	942	2.89	989	3.25	1034	3.63
3400	684	1.41	747	1.70	807	2.04	857	2.35	882	2.50	907	2.66	954	3.02	1000	3.40	1044	3.73
3500	701	1.53	762	1.82	821	2.16	871	2.48	895	2.64	919	2.80	966	3.15	1013	3.55	1054	3.84
3600	717	1.65	777	1.94	835	2.29	885	2.63	908	2.79	932	2.96	978	3.30	1022	3.69	1065	4.10
3700	733	1.77	792	2.07	849	2.42	899	2.78	923	2.94	945	3.11	990	3.45	1034	3.84	1075	4.26
3750	742	1.84	800	2.14	856	2.49	907	2.86	929	3.03	952	3.20	997	3.54	1040	3.93	1082	4.27
3800	750	1.90	807	2.21	863	2.56	914	2.93	936	3.10	958	3.28	1003	3.62	1045	4.01	1087	4.33
3900	767	2.04	822	2.35	877	2.71	928	3.09	950	3.27	972	3.45	1015	3.80	1057	4.18	1098	4.60
4000	783	2.18	838	2.50	891	2.86	942	3.25	964	3.44	986	3.63	1028	3.98	1070	4.36	1110	4.78
4100	800	2.34	854	2.66	905	3.02	956	3.43	978	3.62	1000	3.81	1042	4.18	1082	4.56	1122	4.93
4200	817	2.49	869	2.82	920	3.19	970	3.60	992	3.80	1015	4.00	1055	4.36	1095	4.78	1134	5.16
4250	826	2.58	877	2.91	928	3.28	977	3.69	999	3.89	1022	4.10	1062	4.48	1102	4.87	1140	5.27
4300	834	2.66	885	3.00	935	3.37	984	3.78	1006	3.90	1028	4.20	1069	4.59	1108	4.98	1147	5.38

LEGEND

Bhp — Brake Horsepower

NOTES:

- 1 **Shading** indicates alternate motor required (See Note 7)
- 2 **Boldface** indicates field-supplied drive required (See Note 7)
- 3 **Shading** indicates field-supplied motor and drive required
- 4 **Maximum usable bhp is 2.4 with the standard motor and 2.9 with the alternate motor.** Extensive motor and electrical testing on the Weathermaster® units ensures that the full horsepower range of the motor can be

utilized with confidence. Using your fan motors up to the horsepower ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

- 5 Use of field-supplied motor may affect wire sizing. Contact Carrier representative to verify.
- 6 Values include losses for filters, unit casing, and wet coils.
- 7 Standard motor drive range: 590 to 840 rpm. Alternate drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.

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

48HJD/HJE/HJF012 (10 TONS)																		
AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3000	552	0.68	632	0.87	701	1.05	761	1.22	816	1.36	871	1.54	918	1.67	967	1.89	1010	2.09
3100	565	0.74	644	0.93	711	1.12	772	1.31	825	1.45	879	1.63	928	1.79	973	1.94	1018	2.17
3200	578	0.81	656	1.00	723	1.20	782	1.39	835	1.55	887	1.71	937	1.90	981	2.04	1026	2.26
3300	591	0.88	668	1.08	734	1.28	793	1.47	845	1.65	895	1.80	946	2.00	991	2.16	1032	2.32
3400	605	0.96	680	1.16	745	1.36	803	1.56	856	1.75	904	1.91	953	2.10	1000	2.29	1041	2.44
3500	619	1.04	691	1.23	755	1.44	813	1.65	867	1.86	914	2.03	961	2.22	1009	2.41	1051	2.57
3600	633	1.13	703	1.31	766	1.52	824	1.74	877	1.97	924	2.15	970	2.32	1017	2.53	1060	2.72
3700	648	1.23	714	1.39	777	1.61	835	1.85	887	2.07	935	2.28	980	2.45	1024	2.64	1069	2.87
3800	662	1.33	726	1.47	789	1.72	846	1.95	897	2.18	946	2.40	993	2.56	1033	2.76	1077	2.99
3900	677	1.44	738	1.56	801	1.82	857	2.06	908	2.29	956	2.53	1000	2.73	1042	2.91	1085	3.12
4000	692	1.55	750	1.66	813	1.94	868	2.17	918	2.40	967	2.66	1010	2.87	1052	3.06	1093	3.24
4100	707	1.67	762	1.76	825	2.05	878	2.28	929	2.53	977	2.78	1021	3.02	1062	3.22	1102	3.41
4200	722	1.80	775	1.87	837	2.16	889	2.40	941	2.65	987	2.91	1032	3.17	1072	3.38	—	—
4300	737	1.94	787	1.99	848	2.27	900	2.52	952	2.80	999	3.04	1042	3.32	—	—	—	—
4400	752	2.08	800	2.12	860	2.39	912	2.66	962	2.93	1006	3.19	—	—	—	—	—	—
4500	768	2.24	814	2.25	871	2.51	924	2.80	973	3.07	1019	3.34	—	—	—	—	—	—
4600	783	2.40	827	2.39	883	2.64	937	2.95	983	3.21	—	—	—	—	—	—	—	—
4700	799	2.56	841	2.54	894	2.77	949	3.10	994	3.36	—	—	—	—	—	—	—	—
4800	814	2.74	855	2.69	906	2.91	961	3.28	—	—	—	—	—	—	—	—	—	—
4900	830	2.92	869	2.86	918	3.05	972	3.40	—	—	—	—	—	—	—	—	—	—
5000	—	—	883	3.03	931	3.21	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

- 1 **Boldface** indicates field-supplied drive required (See Note 6)
- 2 **Shading** indicates alternate motor and drive required
- 3 **Maximum usable bhp is 2.4 with standard motor and 4.2 with alternate motor.** Extensive motor and electrical testing on the Weathermaster units ensures that the full horsepower range of the motor can be utilized with

confidence. Using your fan motors up to the horsepower ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

- 4 Use of a field-supplied motor may affect wire sizing. Contact Carrier representative to verify.
- 5 Values include losses for filters, unit casing, and wet coils.
- 6 Standard motor drive range: 690 to 935 rpm. Alternate motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 6 — Fan Performance, 48HJ014* — Vertical Discharge Units

48HJD/HJE014 (1½ TONS)

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3700	729	1.36	790	1.58	847	1.79	902	2.06	955	2.29	1008	2.55	1060	2.80	1108	3.05
3800	745	1.46	805	1.69	861	1.89	915	2.17	967	2.41	1019	2.67	1070	2.94	1118	3.19
3900	761	1.56	820	1.80	875	2.01	928	2.29	979	2.55	1029	2.80	1079	3.07	1128	3.34
4000	777	1.67	836	1.92	889	2.14	941	2.40	991	2.68	1040	2.94	1089	3.22	1137	3.49
4100	793	1.79	851	2.05	904	2.27	955	2.52	1004	2.82	1052	3.08	1100	3.36	1147	3.65
4200	810	1.91	867	2.18	918	2.41	968	2.65	1017	2.96	1064	3.23	1110	3.51	1157	3.81
4300	826	2.04	883	2.32	933	2.55	982	2.79	1030	3.11	1076	3.40	1121	3.67	1167	3.97
4400	842	2.17	898	2.46	948	2.70	996	2.93	1043	3.25	1088	3.56	1133	3.84	1178	4.14
4500	859	2.31	914	2.60	962	2.85	1010	3.09	1056	3.40	1101	3.73	1144	4.00	1188	4.31
4600	876	2.45	930	2.76	977	3.01	1024	3.26	1070	3.55	1114	3.90	1157	4.19	1199	4.49
4700	892	2.60	945	2.91	992	3.18	1039	3.43	1083	3.71	1126	4.07	1169	4.38	1210	4.68
4800	909	2.77	961	3.07	1008	3.36	1053	3.61	1097	3.88	1140	4.25	1181	4.58	1222	4.87
4900	926	2.93	977	3.24	1024	3.54	1068	3.80	1111	4.06	1153	4.41	1194	4.77	1234	5.08
5000	942	3.11	993	3.41	1039	3.73	1080	3.99	1125	4.25	1166	4.59	1207	4.97	1247	5.30
5100	959	3.29	1009	3.60	1055	3.92	1097	4.19	1139	4.46	1180	4.78	1220	5.18	1259	5.52
5200	976	3.47	1025	3.78	1071	4.12	1112	4.40	1153	4.67	1194	4.98	1233	5.28	1272	5.74
5300	993	3.67	1041	3.98	1086	4.33	1127	4.61	1168	4.90	1208	5.19	1246	5.48	1285	5.96
5400	1010	3.87	1057	4.18	1102	4.54	1142	4.84	1182	5.13	1221	5.44	1260	5.78	1300	6.30
5500	1027	4.07	1073	4.39	1118	4.76	1157	5.07	1197	5.36	1235	5.64	1273	5.98	1313	6.60
5600	1043	4.29	1090	4.61	1133	4.99	1173	5.29	1213	5.61	1251	5.94	1289	6.28	1326	6.90
5700	1060	4.51	1106	4.83	1149	5.22	1189	5.55	1229	5.94	1267	6.28	1305	6.62	1340	7.20
5800	1077	4.74	1122	5.07	1165	5.45	1205	5.78	1245	6.17	1283	6.56	1319	6.96	1355	7.60
5900	1094	4.96	1139	5.30	1182	5.70	1222	6.01	1262	6.40	1300	6.79	1336	7.15	1372	7.80
6000	1111	5.22	1156	5.56	1200	5.96	1239	6.35	1279	6.74	1317	7.18	1353	7.57	1390	8.20
6100	1128	5.46	1173	5.80	1217	6.20	1257	6.59	1297	7.03	1335	7.47	1371	7.91	1408	8.60
6200	1145	5.74	1190	6.04	1234	6.44	1274	6.83	1314	7.27	1351	7.71	1387	8.15	1424	8.90

LEGEND

Bhp — Brake Horsepower

*Alternate evaporator-fan motor and drive will be available in October 1993

NOTES:

1. Shading indicates alternate motor and drive required
2. **Boldface** indicates field-supplied drive required (See Note 7)
3. **Shading** indicates field-supplied motor and drive required
4. Maximum usable bhp is 4.2 with standard motor; 5.25 with alternate motor. Extensive motor and electrical testing on the Weathermaster® units ensures that the full horsepower range of the motor can be utilized with

confidence. Using your fan motors up to the horsepower ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

5. Values include losses for filters, unit casing, and wet coils
6. Use of a field-supplied motor may affect wire sizing. Contact Carrier representative to verify.
7. Standard motor drive range: 860 to 1080 rpm. Alternate motor drive range: 900 to 1260 rpm. All other rpms require field-supplied drive.

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

48HJD/HJE/HJF008,009 (7½ AND 8½ TONS)

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)											
	0.2		0.4		0.6		0.8		1.0		1.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
2200	506	0.52	586	0.72	656	0.95	718	1.18	776	1.43	838	1.78
2250	514	0.55	593	0.76	662	0.99	724	1.22	781	1.78	841	1.81
2300	521	0.57	600	0.79	668	1.02	730	1.26	786	1.50	843	1.83
2400	536	0.63	613	0.85	680	1.09	741	1.34	796	1.59	849	1.88
2500	551	0.69	626	0.93	693	1.17	753	1.43	808	1.69	859	1.96
2550	559	0.72	634	0.97	700	1.21	759	1.48	814	1.74	864	2.01
2600	567	0.75	641	1.00	706	1.25	764	1.52	819	1.79	869	2.06
2700	582	0.83	655	1.08	719	1.34	776	1.61	831	1.89	880	2.17
2800	598	0.90	670	1.17	732	1.43	789	1.71	842	2.00	892	2.29
2900	614	0.98	684	1.25	745	1.53	802	1.81	854	2.11	903	2.42
3000	630	1.07	699	1.35	759	1.63	815	1.92	866	2.23	915	2.54
3100	646	1.16	714	1.45	773	1.74	828	2.04	878	2.35	926	2.67
3200	662	1.26	729	1.55	787	1.86	841	2.16	891	2.48	938	2.81
3300	679	1.36	744	1.66	801	1.98	854	2.29	904	2.61	950	2.95
3400	695	1.47	759	1.78	816	2.10	867	2.42	917	2.75	963	3.10
3500	712	1.59	774	1.90	830	2.23	881	2.56	930	2.90	976	3.25
3600	729	1.71	790	2.03	845	2.37	895	2.71	943	3.05	989	3.41
3700	745	1.84	805	2.17	860	2.52	909	2.87	956	3.22	1000	3.58
3750	754	1.91	813	2.24	868	2.59	917	2.96	963	3.30	1007	3.64
3800	762	1.98	821	2.31	875	2.66	924	3.03	970	3.38	1014	3.71
3900	779	2.12	836	2.46	890	2.82	939	3.19	985	3.54	1029	3.87
4000	796	2.27	852	2.61	905	2.98	953	3.37	1000	3.72	1044	4.04
4100	813	2.42	868	2.78	920	3.15	968	3.55	1015	3.90	1059	4.21
4200	830	2.59	884	2.96	935	3.33	983	3.73	1030	4.08	1074	4.39
4250	839	2.68	892	3.04	943	3.41	991	3.81	1038	4.16	1082	4.47
4300	847	2.76	900	3.12	951	3.49	1000	3.89	1046	4.24	1090	4.55

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Shading indicates alternate motor required (See Note 7)
2. **Boldface** indicates field-supplied drive required (See Note 7)
3. **Shading** indicates field-supplied motor and drive required
4. Maximum usable bhp is 2.4 with the standard motor and 2.9 with the alternate motor. Extensive motor and electrical testing on the Weathermaster® units ensures that the full horsepower range of the motor can be utilized

with confidence. Using your fan motors up to the horsepower ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

5. Use of field-supplied motor may affect wire sizing. Contact Carrier representative to verify.
6. Values include losses for filters, unit casing, and wet coils
7. Standard motor drive range: 590 to 840 rpm. Alternate motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.

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

48HJD/HJE/HJF012 (10 TONS)																						
AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)																					
	0.2		0.4		0.6		0.8		0.9		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3000	592	0.76	661	0.93	722	1.09	779	1.26	804	1.34	829	1.42	880	1.58	924	1.73	970	1.89	1019	2.00	1066	2.30
3100	607	0.83	676	1.01	734	1.17	791	1.34	816	1.42	840	1.51	890	1.68	935	1.84	977	2.00	1026	2.17	1073	2.37
3200	622	0.90	690	1.09	746	1.25	803	1.43	827	1.52	852	1.60	900	1.77	946	1.95	987	2.11	1029	2.28	1075	2.58
3300	638	0.98	705	1.17	759	1.33	815	1.52	839	1.61	864	1.70	910	1.88	957	2.06	998	2.23	1037	2.40	1082	2.58
3400	653	1.06	719	1.26	772	1.43	826	1.62	851	1.71	876	1.81	921	1.98	967	2.17	1009	2.35	1047	2.53	1087	2.70
3500	669	1.15	733	1.35	786	1.53	838	1.72	863	1.81	888	1.91	933	2.10	976	2.29	1020	2.48	1058	2.66	1095	2.84
3600	684	1.24	747	1.44	800	1.64	850	1.82	875	1.92	900	2.03	945	2.22	988	2.41	1030	2.61	1068	2.80	1106	2.98
3700	700	1.33	760	1.54	814	1.75	863	1.92	887	2.03	912	2.14	957	2.34	999	2.54	1039	2.74	1076	2.94	1117	3.13
3800	715	1.43	774	1.64	828	1.86	875	2.04	899	2.15	924	2.26	969	2.47	1010	2.67	1049	2.87	1086	3.08	1128	3.29
3900	731	1.54	787	1.74	843	1.98	888	2.16	912	2.27	936	2.38	981	2.59	1022	2.81	1061	3.02	1100	3.23	—	—
4000	747	1.64	801	1.85	857	2.10	902	2.30	925	2.40	948	2.51	993	2.72	1034	2.95	1072	3.17	1110	3.38	—	—
4100	763	1.76	816	1.97	872	2.23	916	2.44	939	2.54	962	2.64	1005	2.86	1045	3.11	1084	3.32	—	—	—	—
4200	778	1.88	831	2.10	886	2.36	929	2.58	950	2.68	972	2.78	1015	3.00	1055	3.26	—	—	—	—	—	—
4300	794	2.00	846	2.23	900	2.50	943	2.73	964	2.83	985	2.93	1028	3.17	—	—	—	—	—	—	—	—
4400	810	2.13	861	2.37	913	2.64	956	2.88	977	2.99	998	3.09	1040	3.32	—	—	—	—	—	—	—	—
4500	826	2.27	876	2.52	927	2.79	970	3.04	992	3.15	1012	3.26	—	—	—	—	—	—	—	—	—	—
4600	842	2.41	892	2.67	940	2.90	983	3.21	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4700	858	2.55	907	2.82	954	3.05	1002	3.38	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4800	874	2.70	922	2.99	969	3.22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4900	890	2.86	938	3.16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5000	906	3.03	953	3.33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

- Boldface** indicates field-supplied drive required
- Shading** indicates alternate motor and drive required (See Note 6)
- Maximum usable bhp is 2.4 with the standard motor and 4.2 with the alternate motor. Extensive motor and electrical testing on the Weathermaster® units ensures that the full horsepower range of the motor can be

- utilized with confidence. Using your fan motors up to the horsepower ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Use of a field-supplied motor may affect wire sizing. Contact Carrier representative to verify.
 - Values include losses for filters, unit casing, and wet coils.
 - Standard motor drive range: 690 to 935 rpm. Alternate motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

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

48HJD/HJE014 (12½ TONS)																						
AIRFLOW (Cfm)	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	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3700	677	1.20	748	1.43	810	1.65	869	1.89	928	2.17	984	2.43	1036	2.68	1080	2.90	1114	3.07	1135	3.17	—	—
3800	691	1.28	761	1.52	822	1.75	880	1.98	937	2.28	993	2.55	1046	2.81	1092	3.05	1129	3.25	1156	3.39	—	—
3900	705	1.37	773	1.62	834	1.86	891	2.08	947	2.39	1002	2.66	1055	2.94	1102	3.20	1143	3.42	1174	3.59	—	—
4000	720	1.47	786	1.71	847	1.97	902	2.19	957	2.50	1011	2.79	1064	3.07	1112	3.34	1155	3.59	1190	3.80	—	—
4100	734	1.56	800	1.82	860	2.09	914	2.31	967	2.60	1021	2.91	1072	3.20	1121	3.49	1165	3.76	1203	3.99	—	—
4200	749	1.66	813	1.92	873	2.21	926	2.44	978	2.71	1030	3.04	1081	3.34	1130	3.64	1175	3.92	1215	4.18	—	—
4300	764	1.77	826	2.04	886	2.33	938	2.57	989	2.83	1040	3.18	1090	3.48	1139	3.79	1185	4.08	1226	4.36	—	—
4400	778	1.88	840	2.16	899	2.46	951	2.71	1000	2.96	1050	3.31	1100	3.63	1148	3.94	1194	4.25	1236	4.54	—	—
4500	793	1.99	854	2.28	912	2.59	963	2.86	1012	3.09	1061	3.43	1109	3.78	1157	4.09	1203	4.42	1246	4.72	—	—
4600	808	2.11	868	2.42	925	2.73	975	3.00	1024	3.25	1071	3.56	1119	3.93	1166	4.26	1212	4.58	1255	4.91	—	—
4700	822	2.24	882	2.56	937	2.86	988	3.16	1036	3.42	1082	3.70	1129	4.09	1175	4.43	1221	4.76	1264	5.09	—	—
4800	837	2.37	896	2.71	950	3.00	1001	3.32	1048	3.59	1093	3.86	1139	4.24	1185	4.60	1230	4.93	1273	5.28	—	—
4900	852	2.51	910	2.86	963	3.15	1014	3.48	1060	3.76	1105	4.02	1150	4.38	1194	4.77	1239	5.12	1282	5.44	—	—
5000	867	2.65	924	3.01	977	3.30	1027	3.65	1073	3.94	1117	4.20	1161	4.54	1204	4.95	1248	5.31	1291	5.66	—	—
5100	882	2.79	938	3.17	990	3.46	1040	3.82	1085	4.12	1129	4.40	1172	4.71	1214	5.13	1257	5.51	—	—	—	—
5200	896	2.95	952	3.33	1003	3.63	1053	4.00	1098	4.30	1141	4.60	1183	4.89	1225	5.28	1267	5.70	—	—	—	—
5300	911	3.11	967	3.50	1017	3.80	1066	4.18	1111	4.50	1153	4.80	1194	5.08	1236	5.47	—	—	—	—	—	—
5400	926	3.27	981	3.68	1030	3.98	1079	4.35	1124	4.70	1166	5.01	1206	5.28	1247	5.65	—	—	—	—	—	—
5500	940	3.44	995	3.86	1044	4.17	1092	4.54	1137	4.91	1178	5.22	1218	5.52	—	—	—	—	—	—	—	—
5600	955	3.62	1010	4.04	1058	4.38	1105	4.73	1150	5.12	1190	5.42	1229	5.75	—	—	—	—	—	—	—	—
5700	970	3.80	1024	4.23	1072	4.59	1118	4.93	1163	5.32	1203	5.62	—	—	—	—	—	—	—	—	—	—
5800	985	3.99	1039	4.42	1086	4.80	1131	5.14	1176	5.52	—	—	—	—	—	—	—	—	—	—	—	—
5900	1000	4.19	1053	4.62	1100	5.02	1144	5.33	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	1015	4.39	1068	4.83	1114	5.25	1158	5.58	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6100	1030	4.59	1083	5.04	1128	5.46	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	1046	4.81	1097	5.25	1142	5.71	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	1061	5.03	1112	5.49	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

*Alternate evaporator-fan motor and drive will be available in October 1993

NOTES:

- Shading** indicates alternate motor and drive required
- Boldface** indicates field-supplied drive required (See Note 7)
- Shading** indicates field-supplied motor and drive required
- Maximum usable bhp is 4.2 with standard motor; 5.25 with alternate motor. Extensive motor and electrical testing on the Weathermaster® units ensures that the full horsepower range of the motor can be utilized with

- confidence. Using your fan motors up to the horsepower ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Values include losses for filters, unit casing, and wet coils.
 - Use of a field-supplied motor may affect wire sizing. Contact Carrier representative to verify.
 - Standard motor drive range: 860 to 1080 rpm. Alternate motor drive range: 900 to 1260 rpm. All other rpms require field-supplied drive.

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 hold-down 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 5 Schrader-type service gage ports: one on the suction line, one on the liquid line, and one on the compressor discharge line. Be sure that caps on the ports are tight. Two additional Schrader-type valves are located underneath high-pressure and low-pressure switches.

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 (outdoor-air thermostat) setting and the room thermostat calls for cooling, compressor contactor no. 1 is energized to start compressor no. 1 and the outdoor (condenser) fan motor (OFM). 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, the damper moves to the fully closed position when using an auto. fan or to the minimum position when using a continuous fan

When the outdoor-air temperature is below the OAT setting and the thermostat calls for cooling, the economizer dampers move to the minimum position. If the supply-air temperature is above 57 F, the damper continues to open until it reaches the fully open position or until the supply-air temperature drops below 52 F.

When the supply-air temperature falls to between 57 F and 52 F, the damper will remain at an intermediate open position. If the supply-air temperature falls below 52 F, the damper will modulate closed until it reaches the minimum position or until the supply-air temperature is above 52 F. When the thermostat is satisfied, the damper will move to the fully closed position when using an auto. fan or to the minimum position when using a continuous fan

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 the 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 OFM will be deenergized. The damper position will be determined by the supply-air temperature.

After a 30-second delay, the IFM shuts off. If the thermostat fan selector switch is in the ON position, the IFM will run continuously.

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. 16 or 17). Refer to Accessory Economizer 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.

2-Row Coils — Clean coil as follows:

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

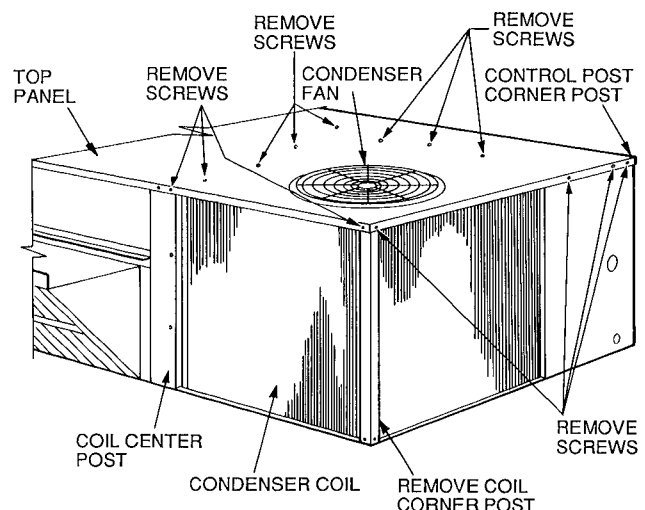


Fig. 24 — Cleaning Condenser Coil

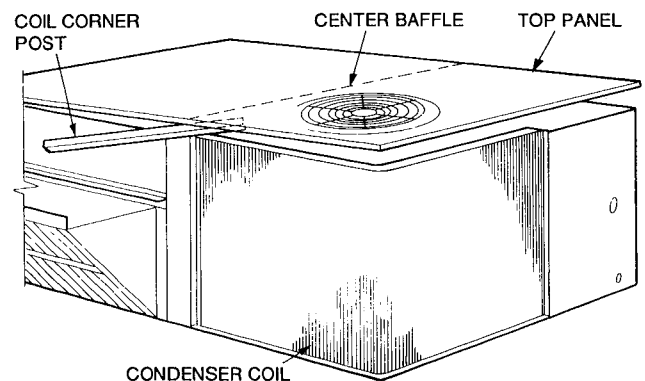


Fig. 25 — Propping Up Top Panel

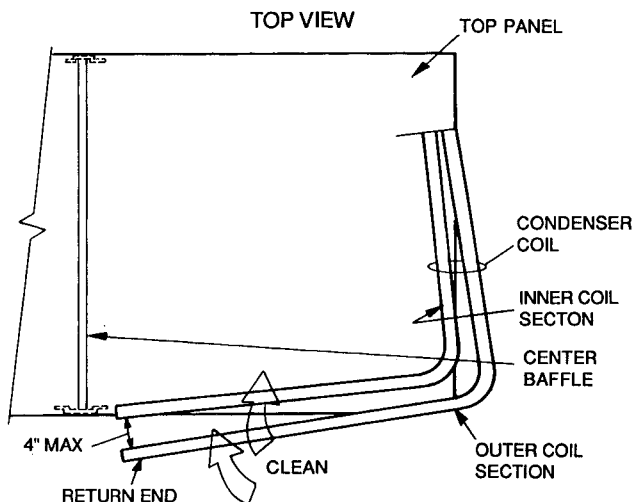


Fig. 26 — Separating Coil Sections

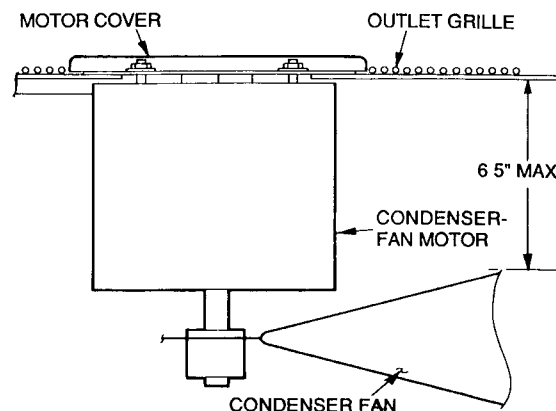


Fig. 27 — Condenser-Fan Adjustment

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.

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.

Manual Outdoor-Air Damper — If outdoor-air damper blade adjustment is required, see Optional Outdoor-Air Damper section on page 10.

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.

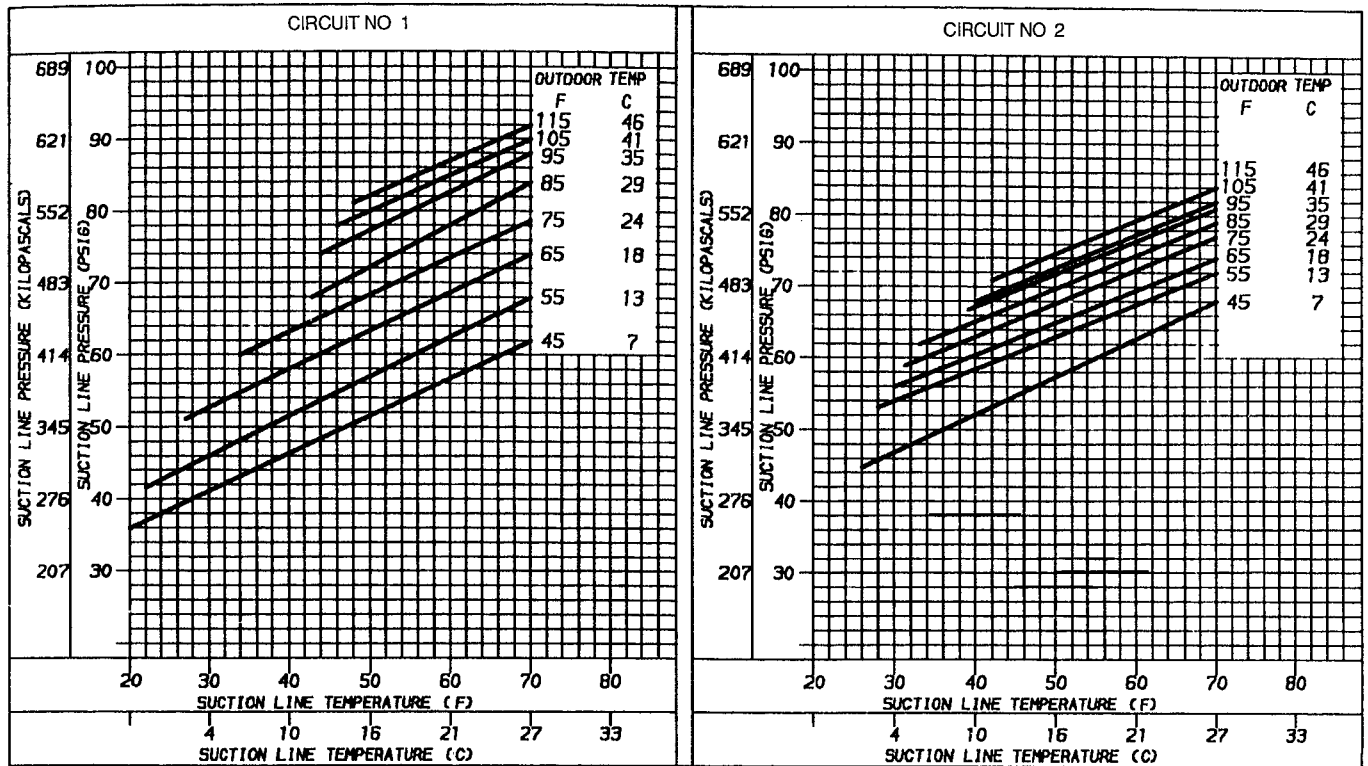


Fig. 28 – Cooling Charging Charts, 48HJ008

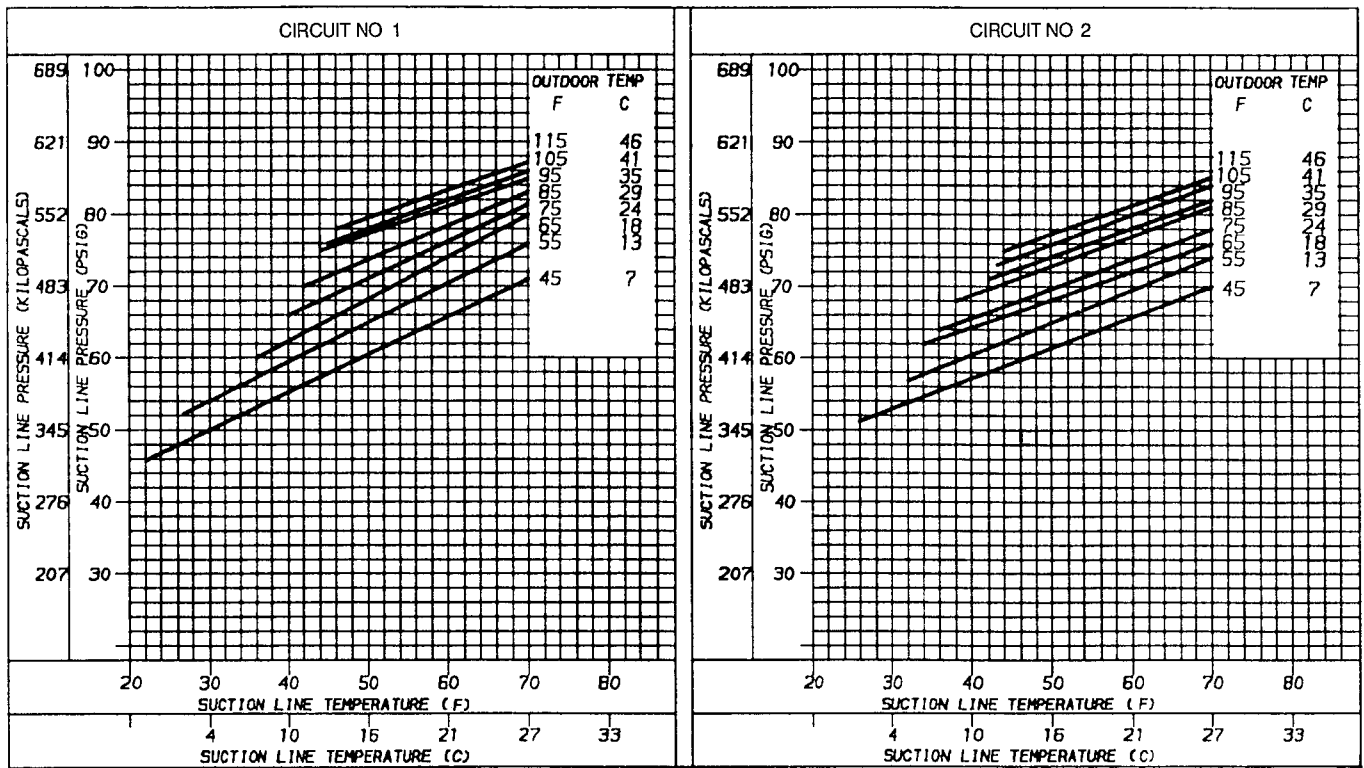


Fig. 29 – Cooling Charging Charts, 48HJ009

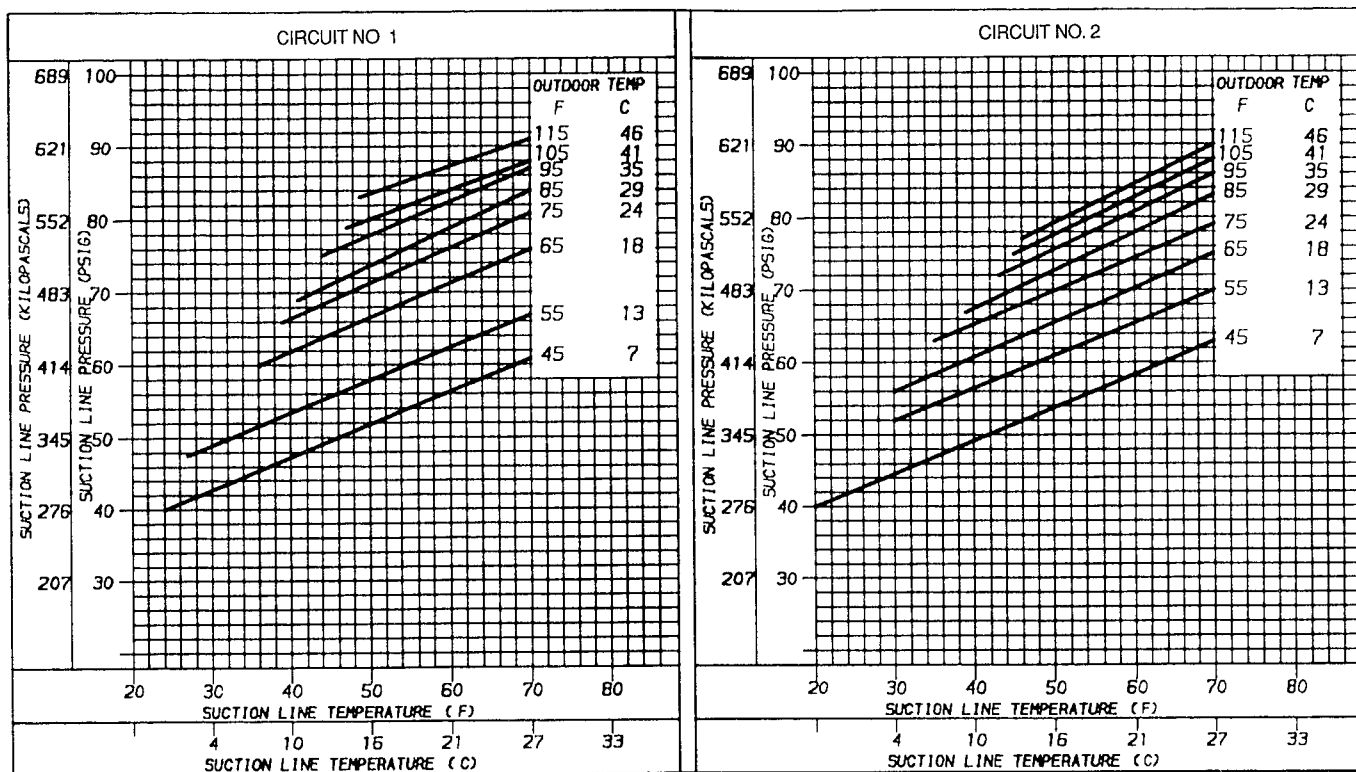


Fig. 30 — Cooling Charging Charts, 48HJ012

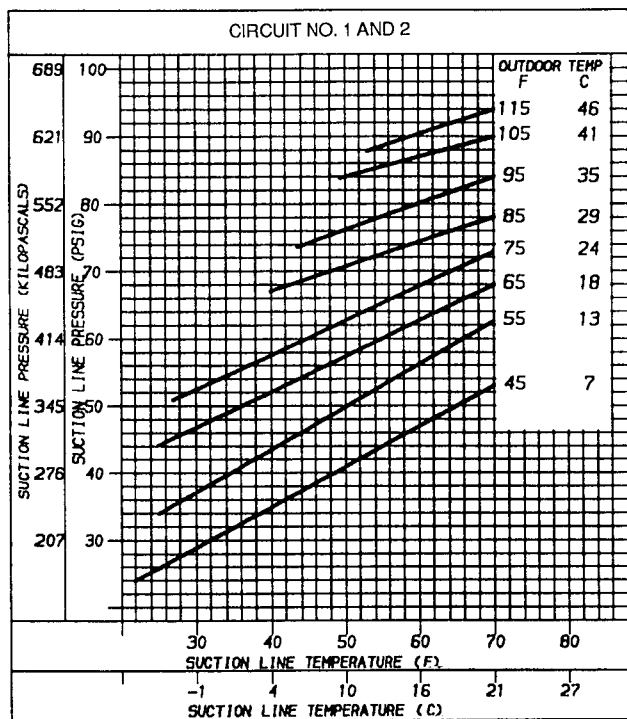


Fig. 31 — Cooling Charging Chart, 48HJ014

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. 5). 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. 10). 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 18 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

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.

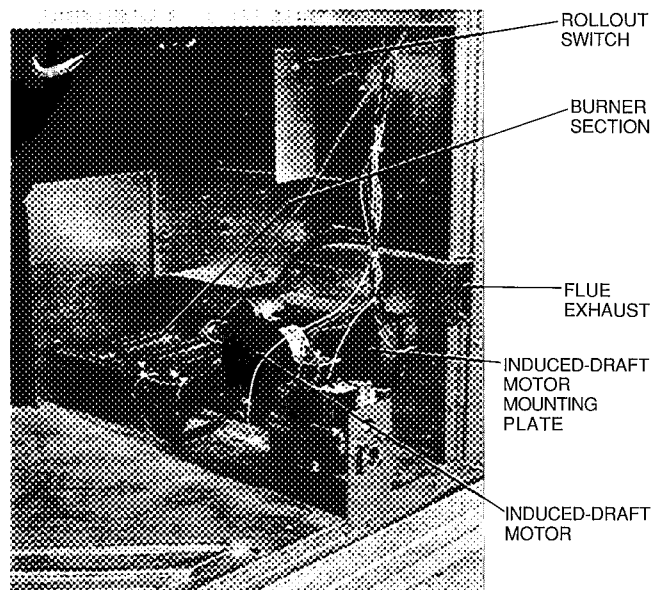


Fig. 32 — Burner Section Details

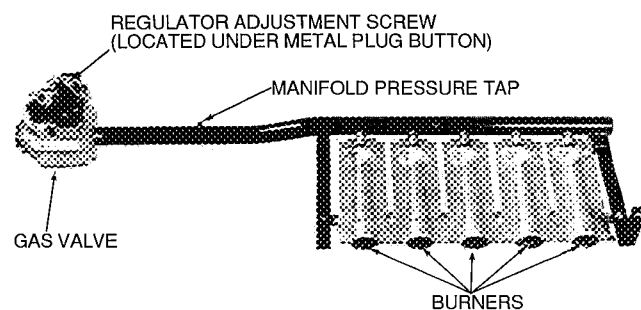
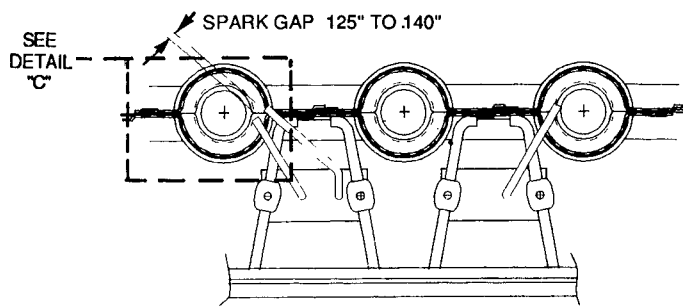


Fig. 33 — Burner Tray Details

CLEANING AND ADJUSTMENT

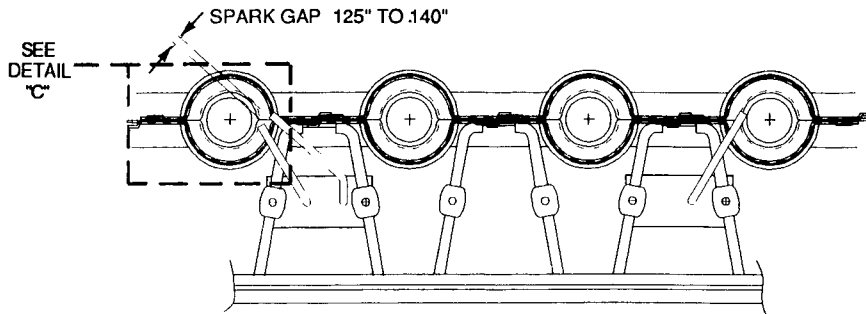
1. Remove burner rack from unit as described in Removal and Replacement of Gas Train section above.
2. Inspect burners, and if dirty, remove burners from rack.
3. Using a soft brush, clean burners and crossover port as required.
4. Adjust spark gap. See Fig. 34
5. Reinstall burners on rack.
6. Reinstall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

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



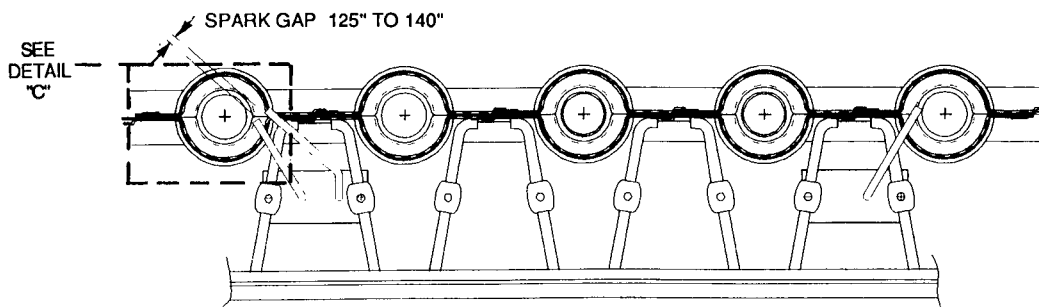
48HJD008,009

125,00/90,00 BTUH INPUT



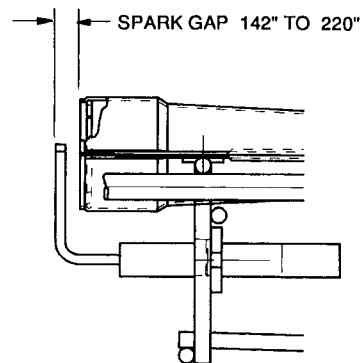
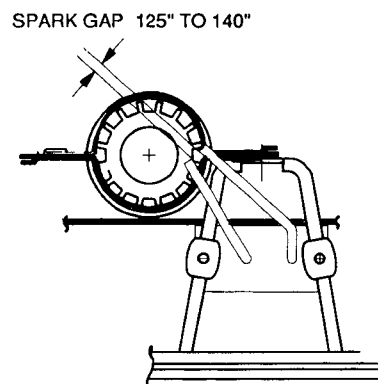
48HJD012; 48HJE008,009

180,000/120,000 BTUH INPUT



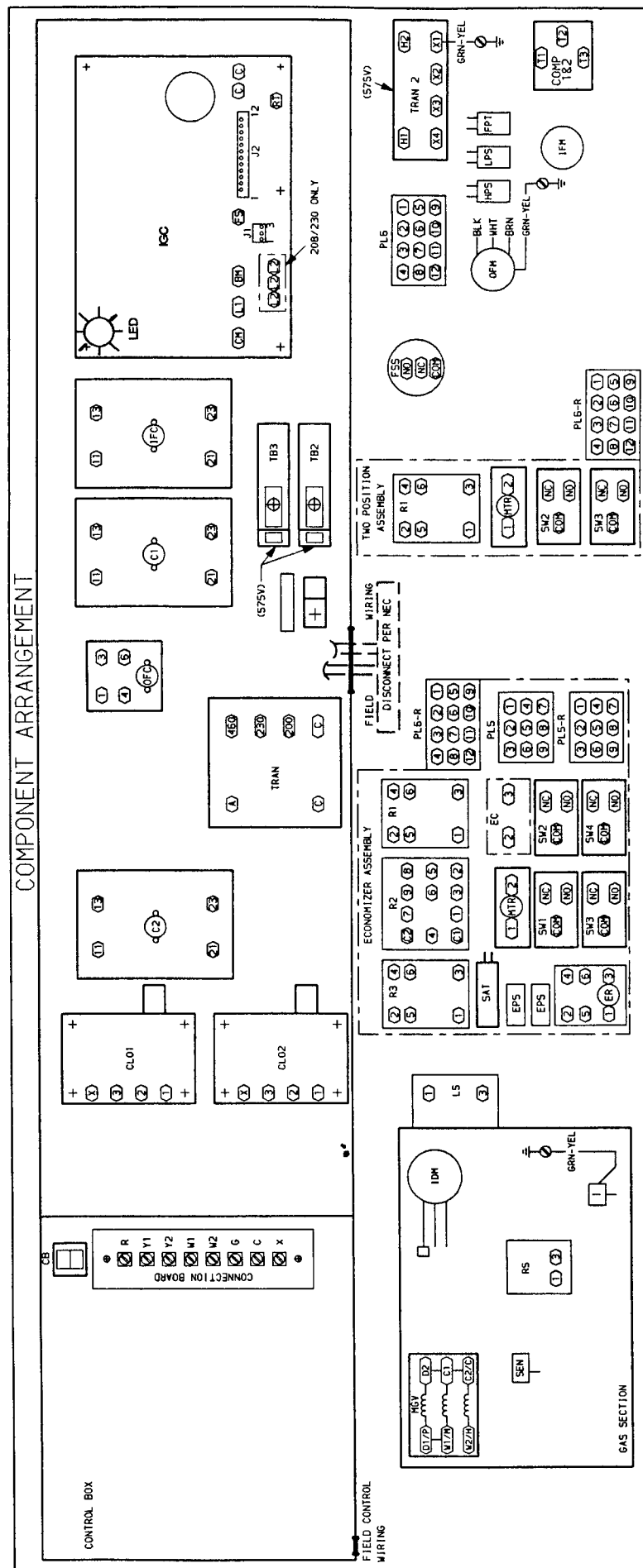
48HJF008,009; 48HJE012; 48HJD014
48HJF012; 48HJE014

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



DETAIL "C"

Fig. 34 — Spark Gap Adjustment



LEGEND FOR FIG. 35 AND 36

IMPORTANT: Refer to unit wiring label for actual unit wiring

AHA	— Adjustable Heat Anticipator
C	— Contactor, Compressor
CB	— Circuit Breaker
CC	— Cooling Compensator
CLO	— Compressor Lockout
COMP	— Compressor Motor
D	— Diode
EC	— Enthalpy Control
ECON	— Economizer
EPS	— Emergency Power Supply
EQUIP	— Equipment
ER	— Economizer Relay
FPT	— Freeze-Protection Thermostat
GND	— Ground
HPS	— High-Pressure Switch
HS	— Hall Effect Sensor
I	— Ignitor
IDM	— Induced Draft Motor
IFC	— Indoor (Evaporator) Fan Contactor
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
OAT	— Outdoor-Air Thermostat
OFC	— Outdoor (Condenser) Fan Contactor
OFCM	— Outdoor (Condenser) Fan Motor
P	— Plug
PL	— Plug Assembly
QT	— Quadruple Terminal
R	— Relay

RS	— Rollout Switch
SAT	— Supply-Air Thermostat
SEN	— Sensor
SW1	— Switch Fully Open
SW2	— Switch Fully Closed
SW3	— Switch Minimum Vent Position
SW4	— Switch Maximum Vent Position
TC	— Thermostat-Cooling
TH	— Thermostat-Heating
TRAN	— Transformer

	Field Splice
	Marked Wire
	Terminal (Marked)
	Terminal (Unmarked)
	Terminal Block
	Splice
	Splice (Marked)
	Factory Wiring
	Field Control Wiring
	Field Power Wiring
	Accessory or Optional Wiring
	To indicate common potential only, not to represent wiring

NOTES:

1. If any of the original wire furnished must be replaced, it must be replaced with Type 90 C wire or its equivalent
2. Numbers indicate the line location of contacts, a bracket over 2 numbers signifies Single-Pole Double-Throw contacts. An underlined number signifies a normally closed contact. Plain numbers (no lines) signify a normally open contact.
3. Three-phase motors are protected under primary single-phasing conditions.
4. Thermostat
HH07AT170, 172, 174 and P272-2783
Subbase
HH93AZ176, 178 and P272-1882, 1883.
5. 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
6. Use copper conductors only

TROUBLESHOOTING

Table 12 — Economizer Troubleshooting

PROBLEM	CAUSE	REMEDY
Damper does not open.	Indoor (evaporator) fan not on	Check wiring between G on connection board and indoor (evaporator) fan contactor
	No power to economizer motor.	1. Check that SW3 is making proper contact with the damper blade. 2. Check continuity across R1 coil. If not connected, replace relay R1 3. Check diode D1. If diode is not functioning properly, replace 4. Check wiring in economizer relay pack (see unit label diagram)
	Economizer motor failure.	If there is 24 vac power at the motor terminals, but motor is not operating, replace 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 set point above outdoor temperature or humidity level. If switch does not close, replace OAT or EC
	Check wiring of economizer relay packs.	1. Check continuity across relay R2 coil. If not connected, replace R2 relay. 2. Check continuity across relay R3 coil. If not connected, replace R3 relay
	Check SAT.	If supply-air temperature is over 57 F, switch T2 should be closed. If not, replace SAT
Damper does not close.	Incorrect wiring or wiring defect	1. Check switches 2 and 4. If non-operational, replace. 2. Check diode D2. If diode is not functioning properly, replace 3. Check wiring on economizer and on economizer relay pack (see unit label diagram)
	Check SAT	If supply-air temperature is below 52 F, switch T1 should be closed. If not, replace SAT.
	Economizer motor failure	If there is 24 vac power at the motor terminals, but motor is not operating, replace motor

LEGEND

EC — Enthalpy Control
OAT — Outdoor-Air Thermostat
SAT — Supply-Air Thermostat
SW — Switch

Table 13 — 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.

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 14 — Heating Service Analysis for additional troubleshooting information.

Table 14 — 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. Clock 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
Burners will not turn off.	Unit is locked into Heating mode for a one minute minimum	Check orifice to burner alignment
		Wait until mandatory one minute time period has elapsed or power to unit.

GR — Ground

Table 15 – 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
	Thermostat setting too high.	Lower thermostat setting below room temperature
Compressor will not start but condenser fan runs.	Faulty wiring or loose connections in compressor circuit	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor
	Defective run/start capacitor, overload, or start relay.	Determine cause and replace
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker 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 run/start capacitor, overload, or start relay.	Determine cause and replace
	Defective thermostat	Replace thermostat.
	Faulty condenser-fan motor or capacitor	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

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