



Single-Package Rooftop Heating/Cooling Units 50 Hz



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 3.4 kPa (½ psig). Pressures greater than 3.4 kPa (½ psig) will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 3.4 kPa (½ psig), it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of 3.4 kPa (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.

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 electric or control power is to be routed through the basepan, attach the accessory thru-the-bottom service connections to the basepan in accordance with the accessory installation instructions. Connections must be installed before unit is set on roof curb.

IMPORTANT: The gasketing of the unit to the roof curb is critical for a watertight seal. 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. This is necessary for unit drain to function properly. Unit leveling tolerances are shown in Fig. 2. 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 152 mm (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.

UNIT SIZE 48HJ	"B"	"C"	"D" ALT DRAIN HOLE	"E" GAS	POWER CONNECTION	CONTROL CONNECTION	CONNECTOR ACCESSORY PACKAGE
008-014	2'-8 ⁷ / ₁₆ " [827]	1'-10 ¹⁵ / ₁₆ " [583]	1 ³ / ₄ " [45]	3/4" NPT [19]	3/4" NPT [19]	1/2" NPT [13]	CRBTMPWR00A100 (THRU-THE-BOTTOM)
				3/4" NPT [19]	1 1/4" NPT [32]	1/2" NPT [13]	CRBTMPWR00A200 (THRU-THE-BOTTOM)

UNIT SIZE 48HJ	"A"	ROOF CURB ACCESSORY
008-014	1'-2" [356]	CRRFCURB003A00
	2'-0" [610]	CRRFCURB004A00

- 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 1.2 m (4 ft) on each side.
 7.  Direction of airflow.
 8. Either accessory connector package can be used with either roof curb.

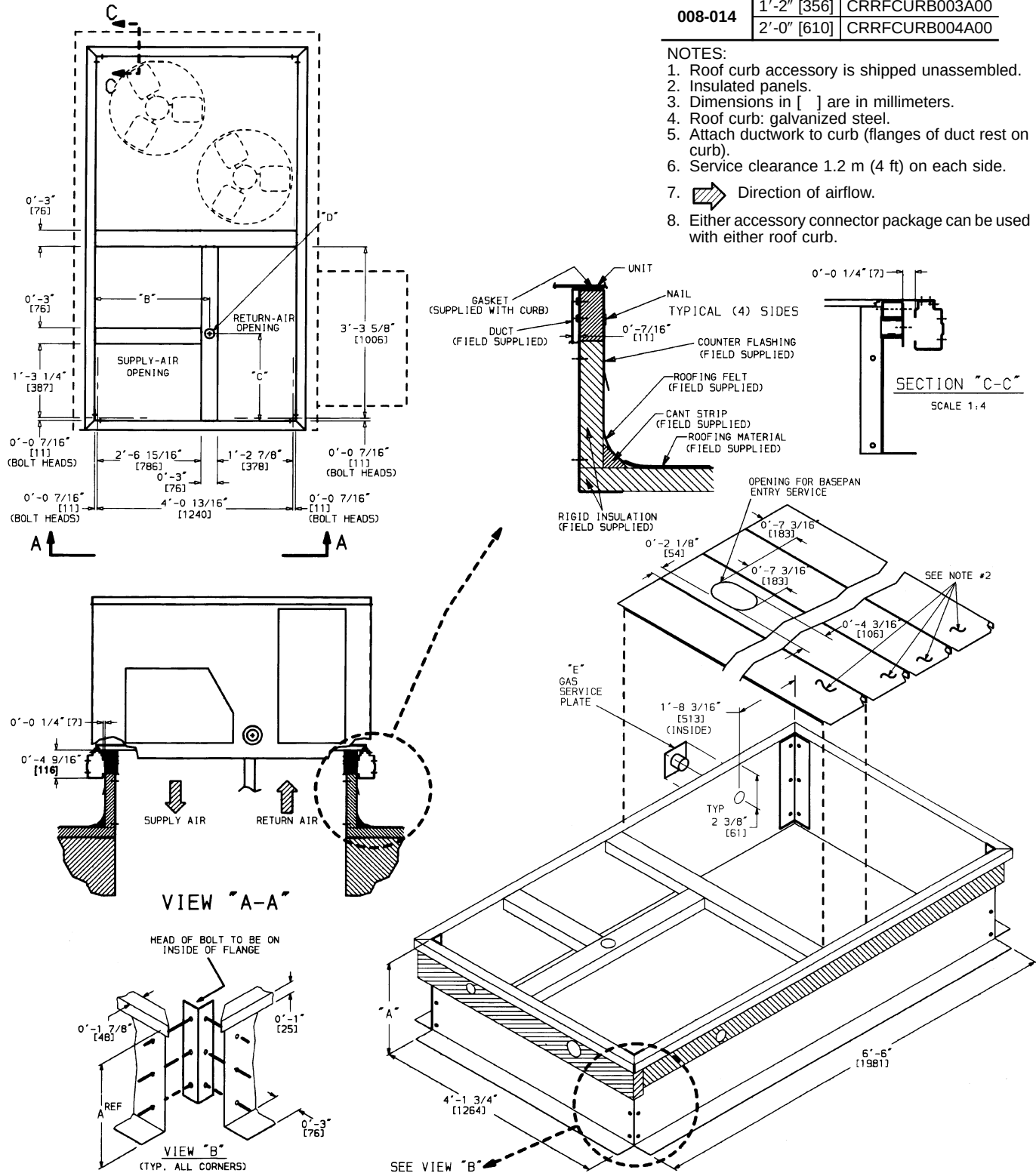


Fig. 1 — Roof Curb Details

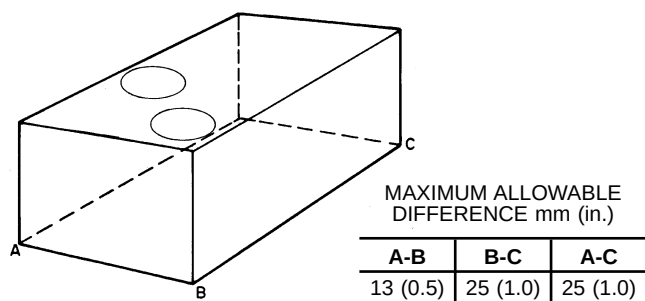


Fig. 2 — Unit Leveling Tolerances

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

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

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

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -87 Pa (-.35 in. wg) with Durablade economizer or -112 Pa (-.45 in. wg) without economizer.

These units are designed for a minimum continuous return-air temperature in heating of 10 C (50 F) (dry bulb) or an intermittent operation down to 7 C (45 F) (dry bulb), such as when used with a night setback thermostat.

Step 3 — Determine Location of Drain Line and External Trap — The unit's 19 mm (3/4-in.) condensate drain connections are located at the bottom and end of the unit. Unit discharge connections do not determine the use of drain connections; either drain connection can be used with vertical or horizontal applications.

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

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

All units must have an external trap for condensate drainage. Install a trap at least 102 mm (4 in.) deep and protect against freeze-up. See Fig. 4. If drain line is installed downstream from the external trap, pitch the line away from the unit at 25 mm (1 in.) per 3 m (10 ft) of run. Do not use a pipe size smaller than the unit connection.

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

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

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

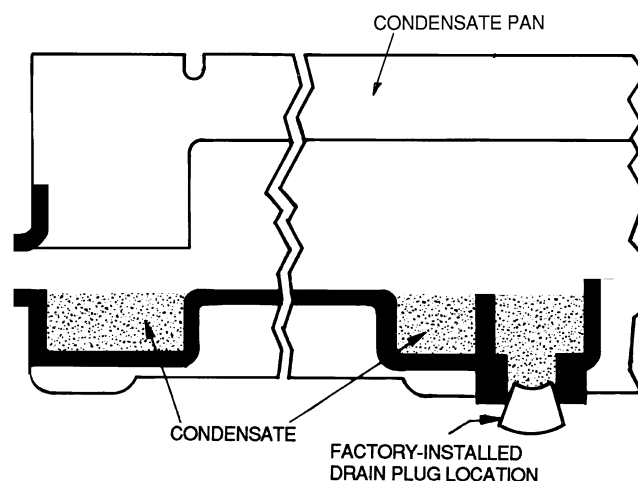
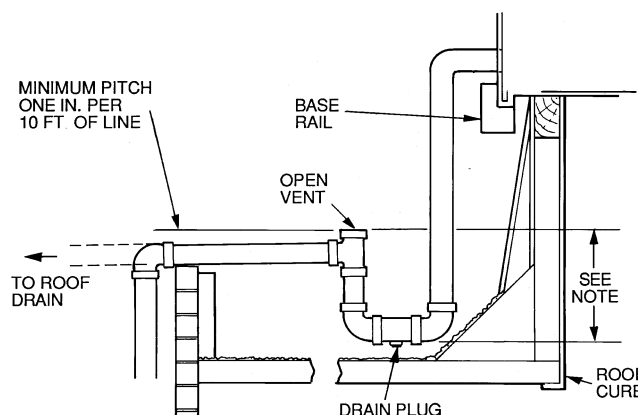


Fig. 3 — Condensate Drain Pan



NOTE: Trap should be deep enough to offset maximum unit static difference. A 102 mm (4-in.) trap is recommended.

Fig. 4 — External Trap Condensate Drain

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

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

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

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

Position unit on roof curb so that the following clearances are maintained: 7 mm (1/4-in.) clearance between roof curb and base rails on each side and in front of unit; 30 mm (1 1/2-in.) clearance between roof curb and rear of unit. (See Fig. 1, section C-C.)

Locate mechanical draft system flue assembly at least 1219 mm (48 in.) from any opening through which combustion products could enter the building, and at least 1219 mm (48 in.) from an adjacent building or combustible material. Units having accessory flue discharge deflector require only 457 mm (18 in.) clearance. When unit is located adjacent to public walkways, flue assembly must be at least 2.1 m (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, latest revision and Addendum Z223.1A-1987, latest revision, (U.S.A. Standard).

Flue vent discharge must have a minimum horizontal clearance of 1.2 m (4 ft) from electric and gas meters, gas regulators, and gas relief equipment.

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

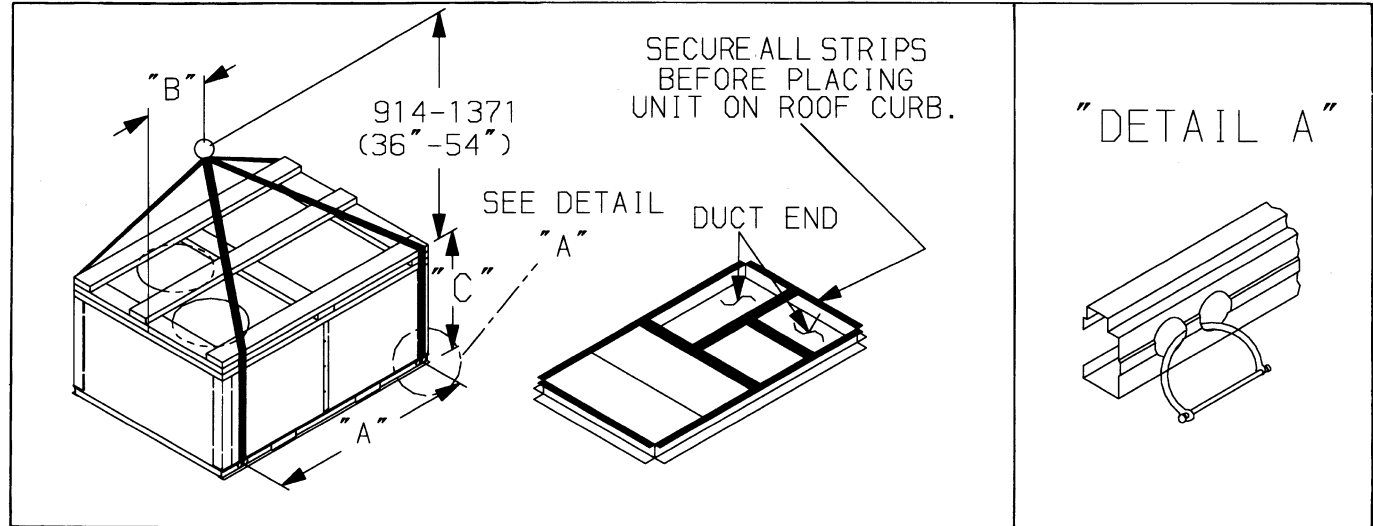
Step 5 — Install Flue Hood — Flue hood is shipped screwed to the burner compartment access panel. Remove from shipping location and, using screws provided, install flue hood in location shown in Fig. 6 and 7.

Step 6 — Install Gas Piping — Unit is equipped for use with type of gas shown on nameplate. Refer to local building codes, or in the absence of local codes, to ANSI Z223.1-1984 and Addendum Z223.1A-1987 entitled NFGC (U.S.A. Standards).

For natural gas applications, gas pressure at unit gas connection must not be less than 13.5 kPa (4.0 in. wg) or greater than 44.0 kPa (13.0 in. wg) while unit is operating. For liquid propane and high heat applications, the gas pressure must not be less than 17.0 kPa (5.0 in. wg) or greater than 44.0 kPa (13.0 in. wg) at the unit connection.

Size gas supply piping for 1.7 kPa (0.5-in. wg) maximum pressure drop. Do not use supply pipe smaller than unit gas connection.

Support gas piping as shown in the table in Fig. 8. For example, a 19 mm (¾-in.) gas pipe must have one field-fabricated support beam every 1.6 m (8 ft). Therefore, a 5.4 m (18-ft) long gas pipe would have a minimum of 3 support beams. See Fig. 8 for typical pipe guide and locations of external manual gas shutoff valve.



- NOTES:
- 1. Dimensions 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 Tables 1A and 1B for unit operating weights with accessory economizer.

48HJ	MAX WEIGHT		A		B		C	
	Lb	Kg	in.	mm	in.	mm	in.	mm
008	870	395	77.42	1967	41.5	1054	42.12	1070
012	1035	469	77.42	1967	41.5	1054	50.12	1273
014	1050	476	77.42	1967	41.5	1054	50.12	1273

⚠ CAUTION

All panels must be in place when rigging.

Fig. 5 — Rigging Details

Table 1A — Physical Data (SI)

BASE UNIT 48HJ	D/E/F008	D/E/F012	D/E014
NOMINAL CAPACITY (kW)	22.9	29.2	35.9
OPERATING WEIGHT (kg)			
Unit	395	469	476
With Durablade Economizer	20	20	20
Roof Curb	65	65	65
COMPRESSOR		Scroll	
Quantity	2	2	2
Oil (ml) (each compr)	1567	1479	1774
REFRIGERANT TYPE		HCFC-22	
Operating Charge (kg)			
Circuit 1	2.9	4.4	4.2
Circuit 2	3.0	4.1	3.9
CONDENSER FAN		Propeller Type	
Qty...Diameter (mm)	2...559	2...559	2...559
Nominal Airflow Rate (L/s)	2600	2645	2645
Motor Output...Speed (kW...r/s)	.34...16	.34...16	.34...16
CONDENSER COIL		Enhanced Copper Tubes, Aluminum Lanced Fin	
Rows...Fins/m	2...670	2...670	2...670
Total Face Area (sq m)	1.90	2.32	2.32
EVAPORATOR FAN		Centrifugal Type	
Size (mm)	381 x 381	381 x 381	381 x 381
Type Drive	Belt	Belt	Belt
Nominal Airflow Rate (L/s)	1180	1700	1980
Maximum Continuous BkW	2.16	2.76	2.76
Motor Frame	56	56	56
Fan Speed Range (r/s)	11.7 to 15.0	11.8 to 14.8	11.8 to 14.9
Motor Bearing Type	Ball	Ball	Ball
Maximum Fan Speed (r/s)	35	35	35
Motor Pulley Pitch Diameter A/B (mm)	86.4-171.8	101.6-127.0	101.6-127.0
Fan Pulley Pitch Diameter (mm)	178	203	203
Belt — Type...Length (mm)	A...1295	A...1295	A...1295
Pulley Center Line Distance (mm)	425.5-489.0	402.6-444.5	402.6-444.5
Speed Change per Full Turn of Movable Pulley Flange (r/s)	.667	.600	.600
Movable Pulley Maximum Full Turns From Closed Position	5	5	5
Factory Setting — Full Turns Open	5	5	5
Factory Speed Setting (r/s)	11.7	11.8	11.8
Fan Shaft Diameter at Pulley (mm)	25.4	25.4	25.4
EVAPORATOR COIL		Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Acutrol™ Feed Device	
Rows...Fins/m	3...591	3...591	3...591
Total Face Area (sq m)	.83	1.03	1.03
FURNACE SECTION			
Rollout Switch Cutout (Temp C)	90.6	90.6	90.6
Burner Orifice Diameter (mm)			
Natural Gas — Std	3.05	3.05	3.05
Liquid Propane — Alt	2.44	2.44	2.44
Thermostat Heat Anticipator Setting (amps)			
400-v Stage 1	.14	.14	.14
Stage 2	.20	.20	.20
Gas Input (kW) Stage 1	21.1/31.9/39.8	31.9/39.8/43.9	39.8/43.9
Stage 2	31.4/50.4/59.8	50.4/59.8/65.6	59.8/65.6
Efficiency (Steady State) (%)	82/80/80	80/80/80	80/80
Temperature Rise Range (C)	-6-10/2-18/7-24	2-18/7-24/4-21	7-24/4-21
Manifold Pressure (kPa)			
Natural Gas — Std	8.3	8.3	8.3
Liquid Propane — Alt	8.3	8.3	8.3
Field Gas Connection Size (mm)	13/19/19	19/19/19	19/19
HIGH-PRESSURE SWITCH (kPa)			
Cutout		2950	
Reset (Auto.)		2205	
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (kPa)			
Cutout		48.3 ± 20.7	
Reset (Auto.)		151.7 ± 48.3	
FREEZE PROTECTION THERMOSTAT (C)			
Cutout		7	
Reset (Auto.)		-1	
OUTDOOR-AIR INLET SCREENS		Cleanable	
Qty...Size (mm)		1...508 × 635 × 25	
		1...406 × 635 × 25	
RETURN-AIR FILTERS		Disposable	
Qty...Size (mm)	4...406 × 508 × 51	4...508 × 508 × 51	

Table 1B — Physical Data (English)

BASE UNIT 48HJ	D/E/F008	D/E/F012	D/E014
NOMINAL CAPACITY (tons)	6½	8	10½
OPERATING WEIGHT (lb)			
Unit	870	1035	1050
With Durablade Economizer	44	44	44
Roof Curb	143	143	143
COMPRESSOR		Scroll	
Quantity	2	2	2
Oil (oz) (each compr)	53	50	60
REFRIGERANT TYPE		HCFC-22	
Operating Charge (lb)			
Circuit 1	6.3	9.6	9.3
Circuit 2	6.6	9.1	8.6
CONDENSER FAN		Propeller Type	
Qty...Diameter (in.)	2...22	2...22	2...22
Nominal Cfm	5500	5600	5600
Motor Hp...Rpm	¼...920	¼...920	¼...920
CONDENSER COIL		Enhanced Copper Tubes, Aluminum Lanced Fin	
Rows...Fins/in.	2...17	2...17	2...17
Total Face Area (sq ft)	20.5	25.0	25.0
EVAPORATOR FAN		Centrifugal Type	
Size (in.)	15 x 15	15 x 15	15 x 15
Type Drive	Belt	Belt	Belt
Nominal Cfm	2500	3600	4200
Maximum Continuous Bhp	2.9	3.7	3.7
Motor Frame	56	56	56
Fan Rpm Range	697 to 900	713 to 896	713 to 896
Motor Bearing Type	Ball	Ball	Ball
Maximum Fan Rpm	2100	2100	2100
Motor Pulley Pitch Diameter A/B (in.)	3.4/4.4	4.0/5.0	4.0/5.0
Fan Pulley Pitch Diameter (in.)	7.0	8.0	8.0
Belt — Type...Length (in.)	A...51	A...51	A...51
Pulley Center Line Distance (in.)	16.75-19.25	15.85-17.50	15.85-17.50
Speed Change per Full Turn of Movable Pulley Flange (rpm)	40	36	36
Movable Pulley Maximum Full Turns From Closed Position	5	5	5
Factory Setting — Full Turns Open	5	5	5
Factory Speed Setting (rpm)	700	717	717
Fan Shaft Diameter at Pulley (in.)	1	1	1
EVAPORATOR COIL		Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Acutrol™ Feed Device	
Rows...Fins/in.	3...15	4...15	4...15
Total Face Area (sq ft)	8.9	11.1	11.1
FURNACE SECTION			
Rollout Switch Cutout (Temp F)	195	195	195
Burner Orifice Diameter (in. ...drill size)			
Natural Gas — Std	.120...31	.120...31/.120...31/.129...30	.120...31/.129...30
Liquid Propane — Alt	.096...41	.096...41/.096...41/.102...38	.096...41/.102...38
Thermostat Heat Anticipator Setting (amps)			
400-v			
Stage 1	.14	.14	.14
Stage 2	.20	.20	.20
Gas Input (Btuh) Stage 1	72,000/109,000/136,000	109,000/136,000/150,000	136,000/150,000
Stage 2	107,000/172,000/204,000	172,000/204,000/224,000	204,000/224,000
Efficiency (Steady State) (%)	82/80/80	80/80/80	80/80
Temperature Rise Range (F)	20-50/35-65/45-75	35-65/45-75/40-70	45-75/40-70
Manifold Pressure (in. wg)			
Natural Gas — Std	3.5	3.5	3.5
Liquid Propane — Alt	3.5	3.5	3.5
Field Gas Connection Size (in.)	.50/.75/.75	.75/.75/.75	.75/.75
HIGH-PRESSURE SWITCH (psig)			
Cutout		428	
Reset (Auto.)		320	
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (psig)			
Cutout		7 ± 3	
Reset (Auto.)		22 ± 7	
FREEZE PROTECTION THERMOSTAT (F)			
Cutout		45	
Reset (Auto.)		30	
OUTDOOR-AIR INLET SCREENS			
Qty...Size (in.)		Cleanable 1...20 × 25 × 1 1...16 × 25 × 1	
RETURN-AIR FILTERS			
Qty...Size (in.)	4...16 × 20 × 2	Disposable 4...20 × 20 × 2	

Bhp — Brake Horsepower

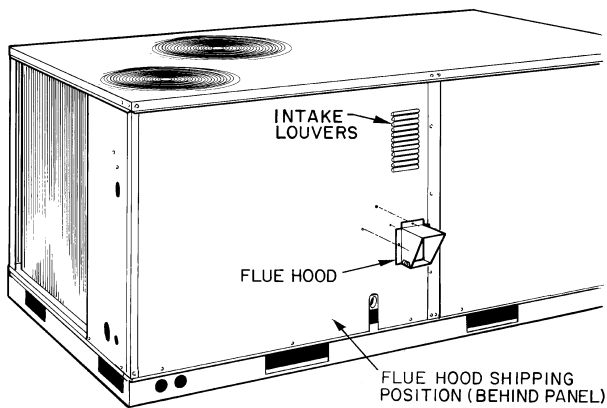
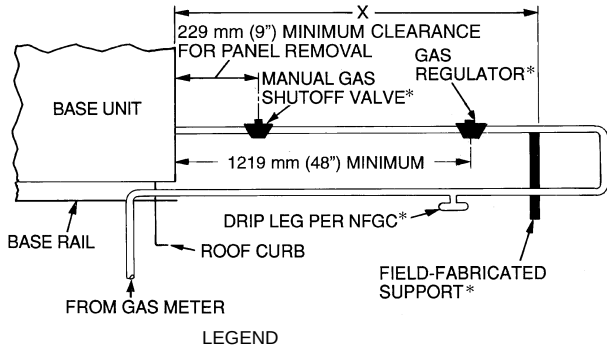


Fig. 7 — Flue Hood Details



NFGC — National Fuel Gas Code (U.S.A. Standard)

*Field Supplied.

NOTE: Follow all local codes.

STEEL PIPE NOMINAL DIAMETER mm (in.)	SPACING OF SUPPORTS X DIMENSION m (ft)
13 (½)	1.8 (6)
19 or 25 (¾ or 1)	2.4 (8)
32 or Larger (1¼ or Larger)	3.0 (10)

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

Step 7 — Make Electrical Connections

⚠ WARNING

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code) ANSI/NFPA (National Fire Protection Association) U.S.A. Standards, 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 are factory wired for the voltage shown on the nameplate.

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

When installing units, provide a disconnect per NEC.

All field wiring must comply with local requirements. For wire conversion data, refer to Table 2.

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

Voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in Note 3 under Table 3 to determine the percentage of 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.

NOTE: If thru-the-bottom accessory connections are used, refer to the thru-the-bottom accessory installation instructions for power wiring. Refer to Fig. 6 for location to drill holes in basepan.

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

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

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

NOTE: For wire runs up to 15 m (50 ft), use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 15 to 23 m (51 to 75 ft), use no. 16 AWG insulated wire (35 C minimum). For over 23 m (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.

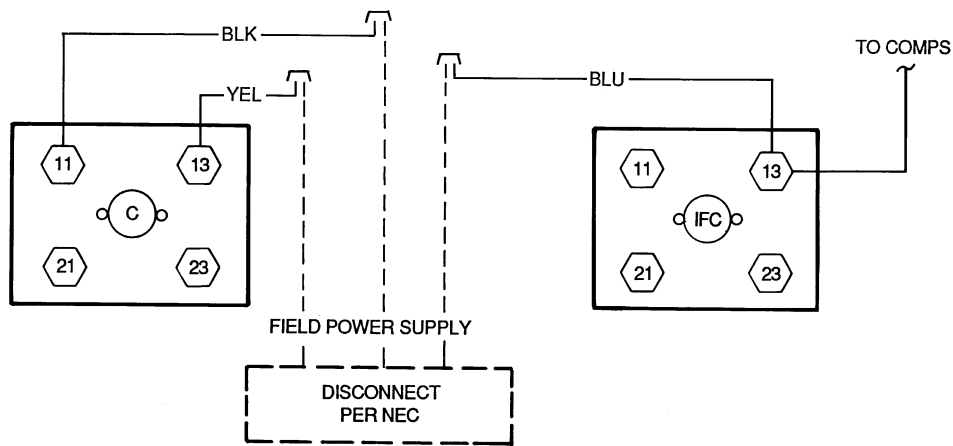
HEAT ANTICIPATOR SETTINGS — On 48HJ008 units, set heat anticipator settings at .14 amp for both first and second stage heating for low heat. For all other stages and unit sizes, set heat anticipator settings at .14 amp for first stage and .20 amp for second-stage heating.

Table 2 — American/European Wire Conversions

AMERICAN		EUROPEAN
Industry Standard Size	American Conversion (mm ²)	Industry Standard Size (mm ²)
18 AWG	0.82	1.0
16 AWG	1.30	1.5
14 AWG	2.08	2.5
12 AWG	3.30	4.0
10 AWG	5.25	6.0
8 AWG	6.36	10.0
6 AWG	13.29	16.0
4 AWG	21.14	25.0
3 AWG	26.65	—
2 AWG	33.61	35.0
1 AWG	42.39	50.0
1/0 AWG	53.49	—
2/0 AWG	67.42	70.0
3/0 AWG	85.00	95.0
4/0 AWG	107.19	120.0
250 kcmil	126.64	150.0
300 kcmil	151.97	—
350 kcmil	177.90	185.0
400 kcmil	202.63	240.0
500 kcmil	253.29	300.0
600 kcmil	303.95	—

LEGEND

AWG — American Wire Gage
kcmil — Thousand Circular Mils

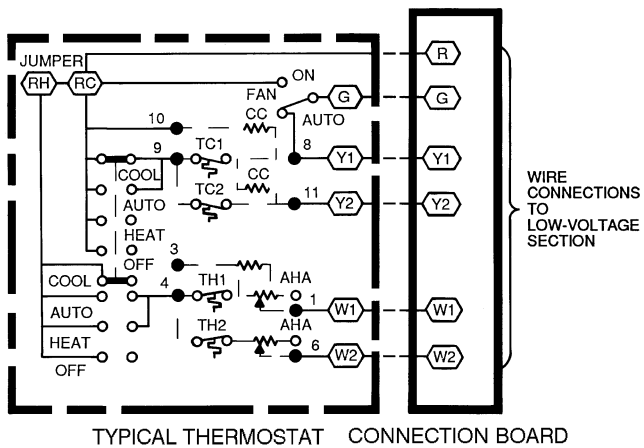


48HJ008-014, 400-3-50

LEGEND

- | | |
|--------------|--|
| C | — Contactor |
| COMPS | — Compressors |
| IFC | — Indoor (Evaporator) Fan Contactor |
| NEC | — National Electrical Code (U.S.A. Standard) |
| --- | Field Wiring |
| — | Factory Wiring |

Fig. 9 — Power Wiring Connections



LEGEND

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

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

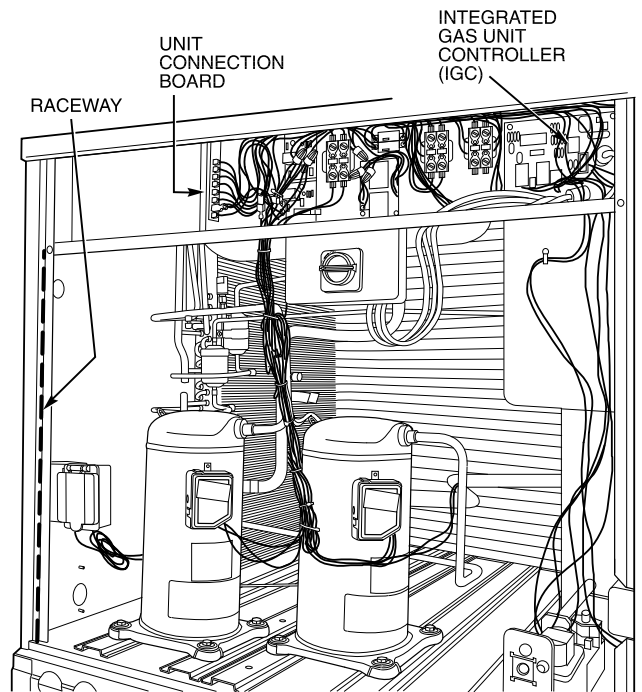


Fig. 11 — Field Control Wiring Raceway

Table 3 — Electrical Data

UNIT 48HJ	NOMINAL VOLTAGE (50 Hz)	VOLTAGE RANGE		COMPR (Each)		OFM (Each)	IFM	POWER SUPPLY		DISCONNECT SIZE*	
		Min	Max	RLA	LRA	FLA	FLA	MCA	MOCP†	FLA	LRA
008	400 (3-phase)	360	440	6.4	44.0	0.6	3.4	19.0	25	20	121
012	400 (3-phase)	360	440	9.0	62.5	0.6	4.8	26.3	30	28	171
014	400 (3-phase)	360	440	12.9	72.0	0.6	4.8	35.0	40	37	190

LEGEND

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
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Used to determine minimum disconnect size per NEC (U.S.A. standard).
 †Fuse or HACR circuit breaker.

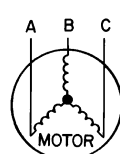
NOTES:

1. MCA and MOCP values are calculated in accordance with NEC (National Electric Code) (U.S.A. standard), Article 440.
2. Motor RLA and FLA values are established in accordance with UL (Underwriters' Laboratories) Standard 465 (U.S.A. standard).
3. **Unbalanced 3-Phase Supply Voltage**
Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

% Voltage Imbalance

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

EXAMPLE: Supply voltage is 400-3-50.



$$\begin{aligned}
 &AB = 393 \text{ v} \\
 &BC = 403 \text{ v} \\
 &AC = 396 \text{ v} \\
 &\text{Average Voltage} = \frac{393 + 403 + 396}{3} \\
 &= \frac{1192}{3} \\
 &= 397
 \end{aligned}$$

Determine maximum deviation from average voltage.

$$\begin{aligned}
 (AB) &397 - 393 = 4 \text{ v} \\
 (BC) &403 - 397 = 6 \text{ v} \\
 (AC) &397 - 396 = 1 \text{ v}
 \end{aligned}$$

Maximum deviation is 6 v.

Determine percentage of voltage imbalance.

$$\begin{aligned}
 \% \text{ Voltage Imbalance} &= 100 \times \frac{6}{397} \\
 &= 1.5\%
 \end{aligned}$$

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

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

Step 8 — Adjust Factory-Installed Options

APOLLO CONTROL — The optional Apollo control is used to actively monitor all modes of operation as well as indoor (evaporator) fan status, filter status, and indoor-air quality. The Apollo control is designed to work with Carrier TEMP and VVT® systems.

The thermostat must be wired to the Apollo control before starting the unit. Refer to the Apollo control installation instructions for information on installing the thermostat. See Fig. 12 for Apollo control location.

DISCONNECT SWITCH — The optional disconnect switch is non-fused. The switch has the capability of being locked in place for safety purposes.

OPTIONAL DURABLADE ECONOMIZER — The optional economizer hood assembly is packaged and shipped in the filter section. Damper blades and control boards are installed at the factory and the economizer 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.

Assembly

1. Determine if ventilation air is required in building. If so, determine the minimum amount to be supplied by each unit and record quantity of ventilation air needed for use in Step 8.
2. Remove filter access panel by raising panel and swinging panel outward. Panel is now disengaged from track and can be removed. No tools are required to remove filter access panel. Remove outdoor-air opening panel. Save panels and screws. See Fig. 13. Remove economizer, and remove optional outdoor-air damper hood package from filter section (hood package is located behind economizer).
3. Assemble outdoor-air hood top and side plates as shown in Fig. 14. 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. On 008-014 units, install vertical discharge block-off plate over duct openings (if not factory installed). See Fig. 15.

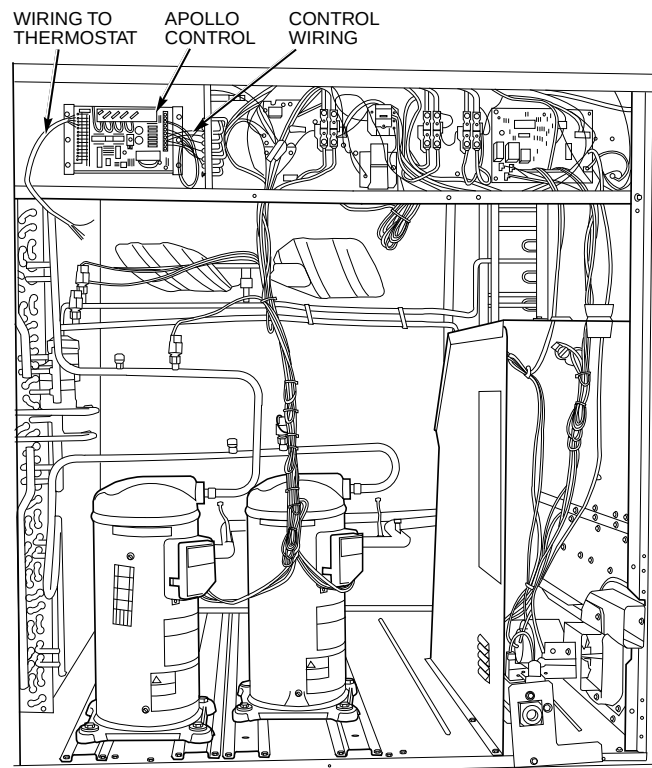


Fig. 12 — Apollo Control Factory-Installed in Typical Unit

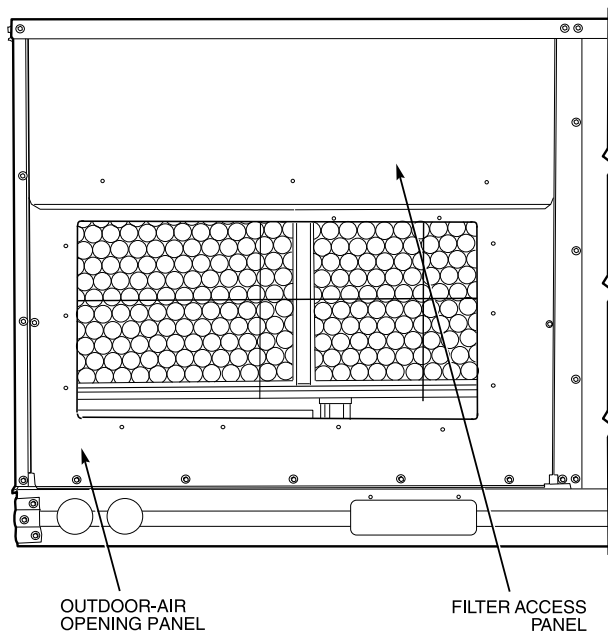


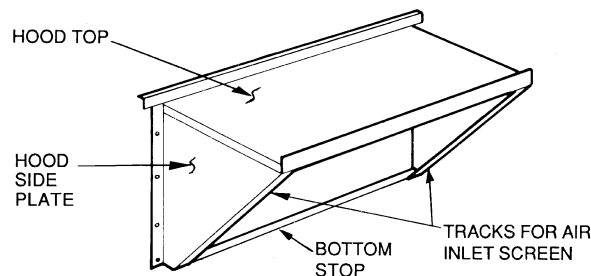
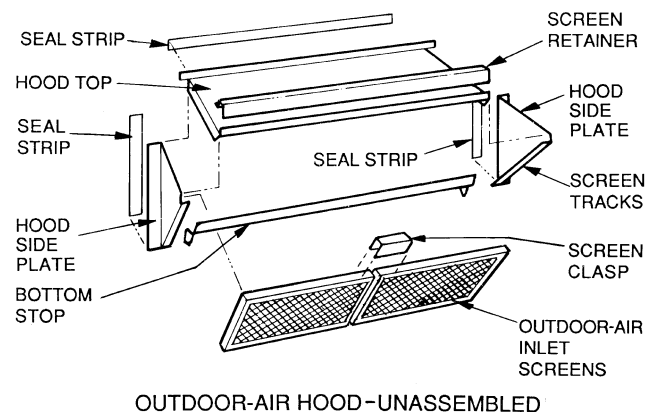
Fig. 13 — Access Panel Locations

5. Slide economizer into unit and secure with screws. See Fig. 16.

NOTE: Be sure to engage rear economizer flange under tabs in vertical return-air opening.

6. To convert to horizontal discharge application:
 - a. Rotate the economizer 90 degrees until the economizer motor faces the condenser section (see Fig. 17).
 - b. Remove screws along right side of barometric relief damper and relocate them across top of damper so damper opens freely at the bottom.
 - c. Install horizontal discharge block-off plate over the opening on the access panel. (Block-off plate MUST be installed before installing hood assembly.) See Fig. 18.
7. Insert economizer plug into economizer harness. Remove tape from barometric relief damper. See Fig. 16.
8. If ventilation air is not required, proceed to Step 9. If ventilation air is required, determine the minimum position setting for required airflow. See Fig. 19. Adjust minimum position setting by adjusting the screws on the position setting bracket. Slide bracket until the top screw is in the position determined by Fig. 19. Tighten screws.
9. Remove tape from outdoor-air thermostat (OAT). Fasten OAT to inside of hood using screws and speed clips provided. See Fig. 20. Make sure OAT terminals are positioned up.
10. Replace outdoor-air opening panel using screws from Step 2. Replace filter access panel. Ensure the filter access panel slides along the tracks and is securely engaged.
11. Fasten hood top and side plate assembly to outdoor-air opening panel with screws provided.
12. Place knob supplied with economizer on OAT. See Fig. 20. 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. 20.
13. Connect OAT per Fig. 21.
14. Slide outdoor-air inlet screen into screen track on hood side plate. While holding screen in place, fasten screen retainer to hood using screws provided.

NOTE: Refer to Fig. 22 for economizer barometric relief damper characteristics.



HOOD SIDES AND TOP ASSEMBLED

Fig. 14 — Outdoor-Air Hood Details

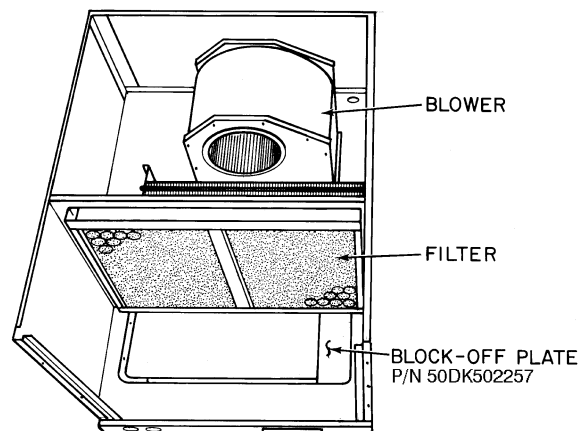


Fig. 15 — Vertical Discharge Block-Off Plate (Sizes 012,014 Only)

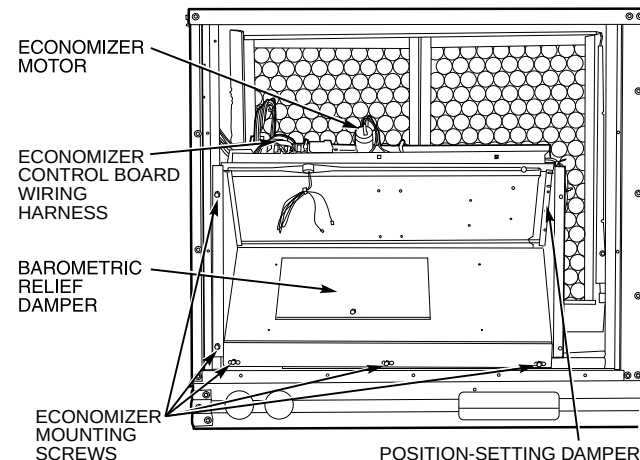


Fig. 16 — Durablade Economizer Installed in Unit

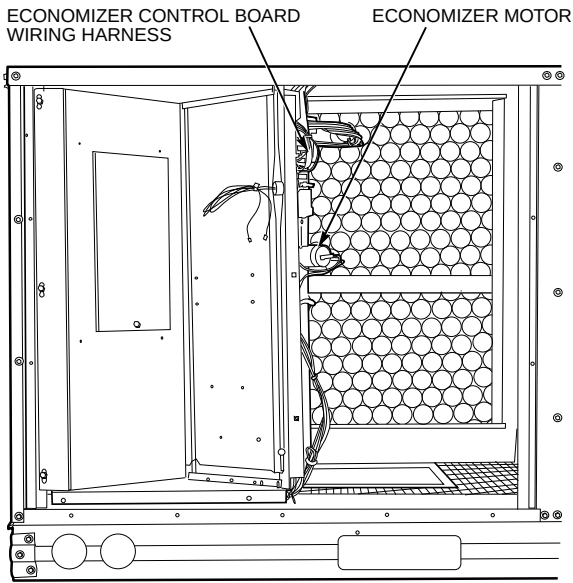


Fig. 17 — Durablade Horizontal Economizer Installation (90 Degree Rotation)

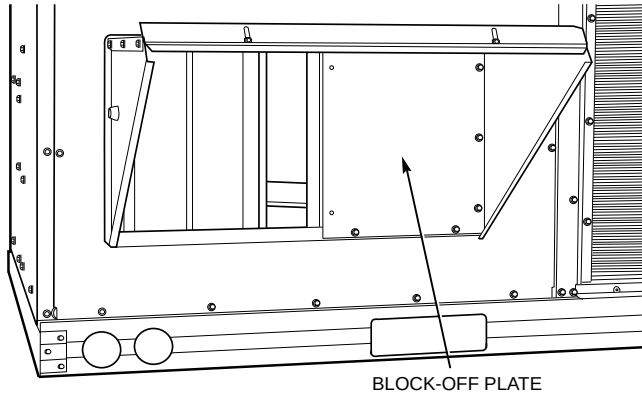


Fig. 18 — Horizontal Discharge Block-Off Plate

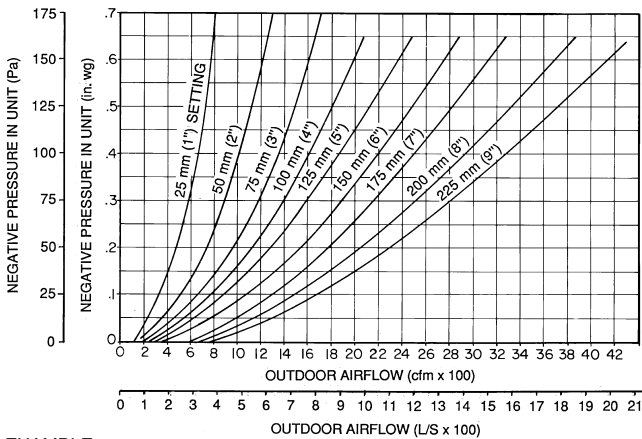
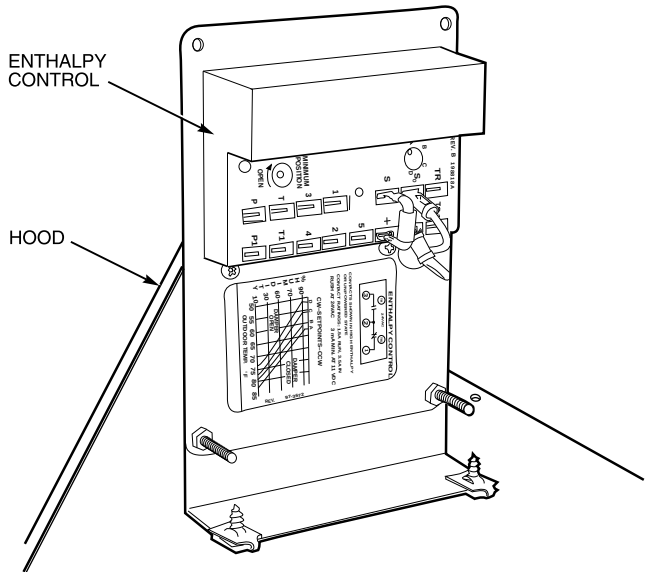
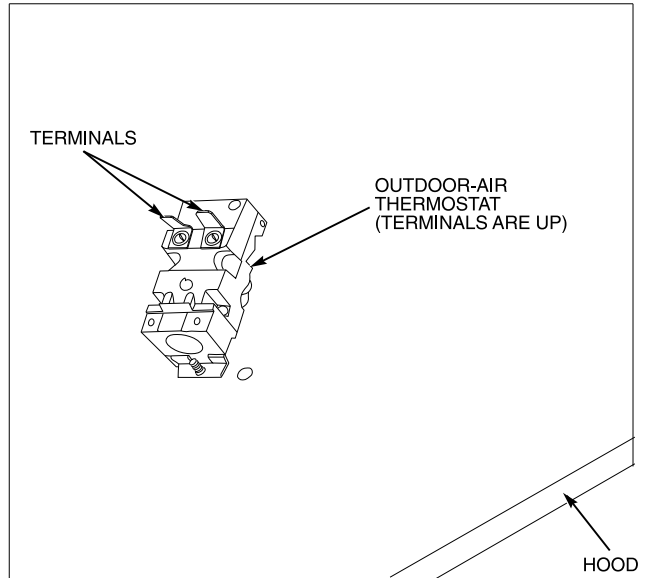
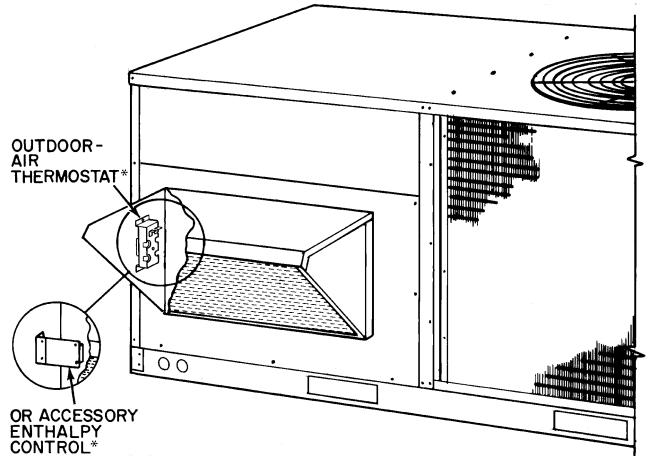


Fig. 19 — Economizer Damper Minimum Position Setting



*Outdoor Air Thermostat or Enthalpy Control can be attached to either side inside hood.

Fig. 20 — Durablade Economizer Outdoor-Air Thermostat/Enthalpy Control Installation

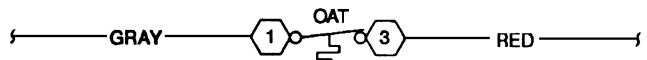


Fig. 21 — Wiring Connections for Outdoor-Air Thermostat

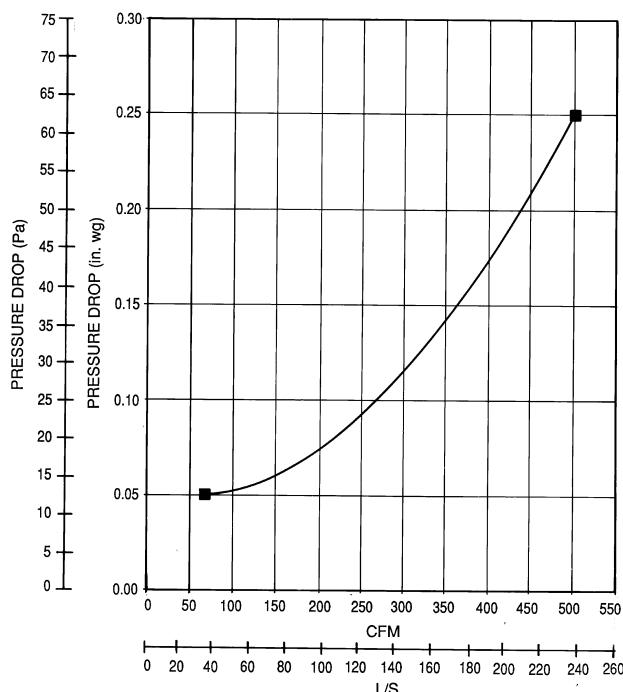


Fig. 22 — Durablade Economizer Damper Barometric Relief Damper Characteristics

Step 9 — Adjust Evaporator-Fan Speed —

Adjust evaporator-fan speed to meet jobsite conditions. Table 4 shows evaporator-fan motor performance. Tables 5 and 6 show fan r/s and rpm at motor pulley settings for standard motors. Refer to Tables 7-18 to determine fan speed settings, and see Tables 19 and 20 for accessory and option static pressure drops. Fan motor pulleys are factory set for speed shown in Tables 1A and 1B.

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

To change fan speeds:

1. Shut off unit power supply.
2. Loosen belt by loosening fan motor mounting nuts. See Fig. 23 and 24.
3. Loosen movable pulley flange setscrew (see Fig. 25).
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Tables 1A and 1B.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Tables 1A and 1B for speed change for each full turn of pulley flange.)

To align fan and motor pulleys:

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

To adjust belt tension:

1. Loosen fan motor mounting nuts.
2. *Size 008* — Slide motor mounting plate away from fan scroll for proper belt tension (13 mm [$\frac{1}{2}$ -in.] deflection with one finger) and tighten mounting nuts (see Fig. 23).
Sizes 012, 014 — Slide motor mounting plate downward to tighten belt tension. Secure motor mounting plate nuts. See Fig. 24.
3. Adjust bolt and nut on mounting plate to secure motor in fixed position.

Table 4 — Evaporator-Fan Motor Performance

UNIT 48TJ	UNIT RATED VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BkW*	MAXIMUM ACCEPTABLE CONTINUOUS BHP*	MAXIMUM ACCEPTABLE OPERATING WATTS	MAXIMUM AMP DRAW
008	400	1.79	2.40	2120	2.7
012	400	1.79	2.40	2120	2.7
014	400	2.76	3.70	3326	5.7

LEGEND

BHP — Brake Horsepower
BkW — kW x Motor Efficiency

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

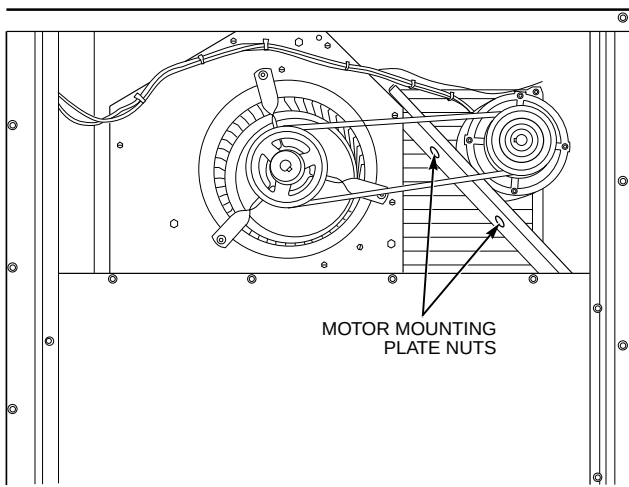


Fig. 23 — Typical Belt-Drive Motor Mounting for Size 008

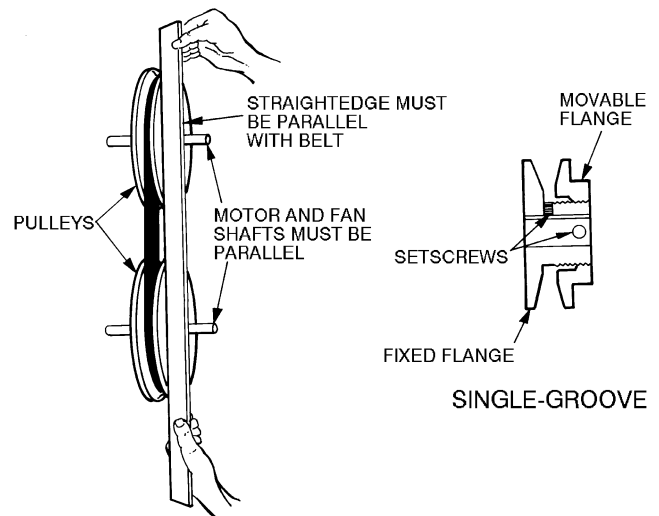


Fig. 25 — Evaporator-Fan Pulley Adjustment

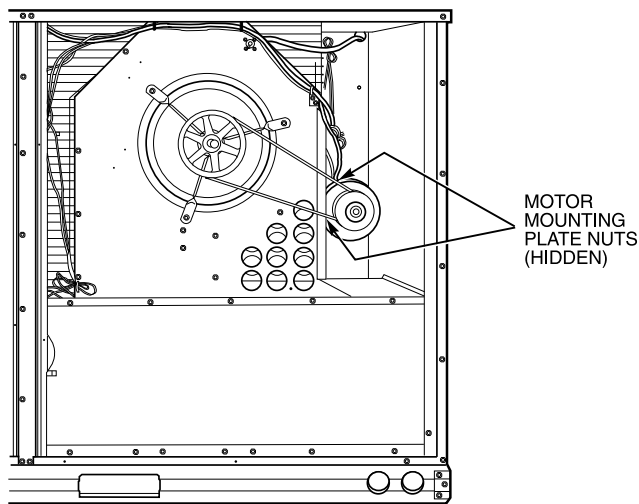


Fig. 24 — Typical Belt-Drive Motor Mounting for Sizes 012,014

Table 5 — Fan R/s at Fan Pulley Settings, 48HJ008-012 (SI)

UNIT 48HJ	MOTOR/DRIVE	MOTOR PULLEY TURNS OPEN										
		0	½	1	1½	2	2½	3	3½	4	4½	5
008	Std	15.0	14.5	14.1	13.8	13.5	13.2	12.9	12.6	12.3	12.0	11.7
012	Std	14.8	14.5	14.1	13.8	13.5	13.2	12.9	12.6	12.3	12.0	11.8
014	Std	14.9	14.5	14.2	13.9	13.6	13.3	13.0	12.7	12.4	12.1	11.8

Table 6 — Fan Rpm at Fan Pulley Settings, 48HJ008-012 (English)

UNIT 48HJ	MOTOR/DRIVE	MOTOR PULLEY TURNS OPEN										
		0	½	1	1½	2	2½	3	3½	4	4½	5
008	Std	900	878	859	839	818	798	778	758	737	717	697
012	Std	896	878	859	841	823	804	786	768	749	731	713
014	Std	896	878	859	841	823	804	786	768	749	731	713

Table 7 — Fan Performance, 48HJ008 — Vertical Discharge Units (SI)

AIRFLOW (L/s)	EXTERNAL STATIC PRESSURE (Pa)															
	50		100		150		200		250		300		350		400	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1150	8.8	0.45	10.1	0.62	11.2	0.79	12.2	0.96	13.2	1.15	14.1	1.39	15.1	1.73	15.8	1.96
1200	9.0	0.47	10.3	0.65	11.4	0.82	12.4	1.02	13.3	1.21	14.1	1.41	15.2	1.76	15.9	2.00
1275	9.3	0.53	10.5	0.70	11.6	0.89	12.6	1.08	13.5	1.28	14.3	1.46	15.3	1.76	16.1	2.17
1325	9.6	0.58	10.8	0.78	11.9	0.96	12.8	1.17	13.8	1.37	14.6	1.55	15.2	1.72	16.3	2.17
1400	9.9	0.63	11.1	0.85	12.1	1.02	13.1	1.26	14.0	1.45	14.7	1.65	15.5	1.84	16.5	2.10
1450	10.1	0.68	11.3	0.86	12.3	1.09	13.2	1.29	14.1	1.53	14.9	1.73	15.6	1.88	16.7	2.10
1500	10.4	0.78	11.5	0.96	12.6	1.18	13.5	1.38	14.4	1.61	15.2	1.84	15.8	2.04	16.4	2.18
1550	10.7	0.81	11.8	1.06	12.8	1.25	13.7	1.48	14.5	1.72	15.4	1.95	16.1	2.15	16.7	2.34
1600	11.0	0.90	12.0	1.10	13.0	1.35	14.0	1.56	14.8	1.80	15.6	2.07	16.3	2.29	17.0	2.49
1650	11.3	0.99	12.4	1.22	13.3	1.43	14.2	1.67	15.0	1.92	15.8	2.15	16.6	2.42	17.2	2.66
1700	11.5	1.06	12.6	1.30	13.6	1.54	14.4	1.78	15.2	2.01	16.0	2.27	16.7	2.56	17.5	2.80
1750	11.8	1.16	12.9	1.38	13.8	1.65	14.7	1.88	15.5	2.14	16.2	2.41	16.9	2.65	17.6	2.92
1800	12.2	1.24	13.2	1.49	14.1	1.75	14.9	2.00	15.7	2.24	16.4	2.52	17.2	2.82	—	—
1850	12.4	1.35	13.4	1.60	14.4	1.84	15.1	2.10	15.9	2.37	16.7	2.66	17.4	2.92	—	—
1900	12.8	1.47	13.7	1.70	14.6	1.97	15.4	2.24	16.2	2.51	16.9	2.78	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum usable output power (BkW) is 2.16. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 11.7 to 15.0 r/s. All other r/s's require field-supplied drive.

Table 8 — Fan Performance, 48HJ012 — Vertical Discharge Units (SI)

AIRFLOW (L/s)	EXTERNAL STATIC PRESSURE (Pa)																	
	50		100		150		200		250		300		350		400		450	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1500	9.2	0.47	10.3	0.59	11.3	0.69	12.2	0.72	12.4	0.76	12.5	0.82	13.2	0.89	13.1	1.01	14.7	1.08
1550	9.4	0.51	10.5	0.63	11.5	0.74	12.4	0.79	12.4	0.80	12.6	0.86	14.2	1.00	14.7	1.07	15.5	1.34
1600	9.7	0.56	10.8	0.69	11.7	0.79	12.6	0.85	12.8	0.96	13.0	1.00	14.9	1.08	16.1	1.35	16.3	1.60
1650	9.9	0.61	11.0	0.74	11.9	0.86	12.8	0.95	12.9	1.01	13.5	1.04	16.0	1.32	16.5	1.53	16.6	1.76
1700	10.2	0.67	11.2	0.80	12.1	0.91	13.0	1.05	13.4	1.11	13.8	1.20	16.5	1.55	16.9	1.80	17.1	1.95
1750	10.4	0.72	11.5	0.86	12.4	0.98	13.2	1.11	14.0	1.22	14.3	1.37	16.8	1.82	17.1	1.95	17.9	2.04
1800	10.7	0.78	11.7	0.92	12.6	1.06	13.4	1.18	14.2	1.40	14.9	1.65	17.1	1.91	17.7	2.06	18.3	2.16
1850	12.2	1.02	13.2	1.18	14.1	1.34	15.0	1.54	15.9	1.72	16.8	1.91	17.7	2.10	18.5	2.28	19.2	2.45
1900	12.5	1.10	13.5	1.27	14.4	1.42	15.3	1.63	16.1	1.81	17.0	2.00	17.9	2.21	18.7	2.39	19.4	2.58
1950	12.7	1.18	13.7	1.36	14.6	1.52	15.5	1.72	16.4	1.92	17.2	2.11	18.0	2.31	18.8	2.51	19.6	2.71
2000	13.0	1.27	14.0	1.46	14.9	1.62	15.7	1.81	16.6	2.03	17.4	2.22	18.2	2.43	19.0	2.63	19.8	2.84
2050	13.3	1.36	14.3	1.56	15.1	1.73	16.0	1.91	16.8	2.14	17.6	2.33	18.4	2.54	19.2	2.76	19.9	2.97
2100	13.6	1.46	14.5	1.67	15.4	1.84	16.2	2.02	17.0	2.25	17.8	2.46	18.6	2.66	19.3	2.89	20.1	3.10
2150	13.9	1.56	14.8	1.78	15.7	1.95	16.5	2.13	17.3	2.37	18.0	2.59	18.8	2.79	19.5	3.02	20.3	3.24
2250	14.2	1.67	15.1	1.89	15.9	2.07	16.7	2.24	17.5	2.48	18.2	2.72	19.0	2.92	19.7	3.15	20.4	3.38
2300	14.5	1.78	15.4	2.01	16.2	2.19	17.0	2.37	17.7	2.60	18.5	2.85	19.2	3.06	19.9	3.29	20.6	3.52
2350	14.8	1.90	15.7	2.13	16.4	2.32	17.2	2.51	18.0	2.72	18.7	2.99	19.4	3.21	20.1	3.44	20.8	3.67
2400	15.1	2.02	15.9	2.25	16.7	2.46	17.5	2.65	18.2	2.85	18.9	3.13	19.6	3.37	20.3	3.59	21.0	3.83
2450	15.4	2.15	16.2	2.38	17.0	2.60	17.7	2.80	18.5	2.99	19.2	3.26	19.8	3.52	20.5	3.75	21.2	3.99

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 11.8 to 14.8 r/s. All other r/s's require field-supplied drive.

Table 9 — Fan Performance, 48HJ014 — Vertical Discharge Units (SI)

AIRFLOW (L/s)	EXTERNAL STATIC PRESSURE (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1900	12.5	1.10	13.5	1.27	14.4	1.42	15.3	1.63	16.1	1.81	17.0	2.00	17.9	2.21	18.7	2.39	19.4	2.58	20.1	2.74
1950	12.7	1.18	13.7	1.36	14.6	1.52	15.5	1.73	16.4	1.92	17.2	2.11	18.0	2.31	18.8	2.51	19.6	2.71	20.3	2.88
2000	13.0	1.27	14.0	1.46	14.9	1.62	15.7	1.81	16.6	2.02	17.4	2.22	18.2	2.43	19.0	2.63	19.8	2.84	20.5	3.02
2050	13.3	1.36	14.3	1.56	15.1	1.72	16.0	1.91	16.8	2.14	17.6	2.33	18.4	2.54	19.2	2.76	19.9	2.97	20.7	3.17
2100	13.6	1.46	14.5	1.66	15.4	1.84	16.2	2.01	17.0	2.25	17.8	2.45	18.6	2.66	19.3	2.89	20.1	3.10	20.8	3.32
2200	13.9	1.56	14.8	1.78	15.7	1.95	16.5	2.13	17.3	2.37	18.0	2.59	18.8	2.79	19.5	3.01	20.3	3.24	21.0	3.46
2250	14.2	1.67	15.1	1.89	15.9	2.07	16.7	2.24	17.5	2.48	18.2	2.71	19.0	2.93	19.7	3.15	20.4	3.37	21.2	3.60
2300	14.5	1.78	15.4	2.00	16.2	2.19	17.0	2.37	17.7	2.60	18.5	2.85	19.2	3.05	19.9	3.29	20.6	3.52	21.3	3.76
2350	14.8	1.89	15.7	2.13	16.4	2.32	17.2	2.51	18.0	2.72	18.7	2.99	19.4	3.21	20.1	3.43	20.8	3.67	21.5	3.92
2400	15.0	2.01	15.9	2.25	16.7	2.46	17.5	2.64	18.2	2.85	18.9	3.12	19.6	3.36	20.3	3.59	21.0	3.82	21.7	4.08
2450	15.4	2.16	16.2	2.38	17.0	2.60	17.7	2.79	18.5	2.99	19.2	3.27	19.8	3.53	20.5	3.74	21.2	3.99	—	—
2500	15.7	2.28	16.5	2.52	17.3	2.75	18.0	2.95	18.7	3.13	19.4	3.38	20.1	3.67	20.7	3.93	21.4	4.15	—	—
2550	15.9	2.43	16.8	2.65	17.5	2.90	18.2	3.10	18.9	3.29	19.6	3.54	20.3	3.83	21.0	4.09	21.6	4.33	—	—
2600	16.2	2.58	17.1	2.81	17.8	3.05	18.5	3.26	19.2	3.47	19.9	3.69	20.5	4.01	21.2	4.27	—	—	—	—
2650	16.5	2.72	17.3	2.95	18.1	3.22	18.8	3.43	19.4	3.64	20.1	3.86	20.8	4.16	21.4	4.44	—	—	—	—
2700	16.8	2.89	17.6	3.12	18.4	3.39	19.0	3.60	19.7	3.83	20.4	4.03	21.0	4.32	—	—	—	—	—	—
2750	17.1	3.05	17.9	3.28	18.7	3.56	19.3	3.80	20.0	4.01	20.6	4.21	—	—	—	—	—	—	—	—
2800	17.4	3.21	18.2	3.45	18.9	3.74	19.6	3.98	20.2	4.19	20.9	4.40	—	—	—	—	—	—	—	—
2850	17.7	3.40	18.5	3.64	19.2	3.93	19.9	4.18	20.5	4.41	—	—	—	—	—	—	—	—	—	—
2900	18.0	3.57	18.8	3.81	19.5	4.11	20.2	4.37	—	—	—	—	—	—	—	—	—	—	—	—
2950	18.3	3.76	19.1	4.02	19.8	4.29	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3000	18.6	3.96	19.4	4.21	20.1	4.51	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3050	18.9	4.15	19.6	4.40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3100	19.2	4.38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency

R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).

2. indicates field-supplied motor and drive required.

3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.

5. Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

6. Motor drive range is 11.8 to 14.9 r/s. All other r/s's require field-supplied drive.

Table 10 — Fan Performance, 48HJ008 — Horizontal Discharge Units (SI)

AIRFLOW (L/s)	EXTERNAL STATIC PRESSURE (Pa)																	
	50		100		150		200		225		250		300		350		400	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1100	8.1	0.34	9.5	0.49	10.7	0.66	11.8	0.81	12.4	0.92	12.9	1.03	13.9	1.29	15.0	1.60	15.7	1.89
1150	8.4	0.39	9.7	0.53	10.9	0.71	12.0	0.89	12.5	0.98	13.0	1.08	14.0	1.34	15.1	1.68	15.9	1.92
1200	8.6	0.42	9.9	0.58	11.1	0.78	12.2	0.96	12.7	1.05	13.1	1.13	14.1	1.38	15.2	1.69	16.0	1.96
1250	8.9	0.46	10.2	0.64	11.3	0.81	12.4	1.02	12.8	1.11	13.3	1.21	14.3	1.42	15.2	1.74	16.1	2.01
1300	9.1	0.51	10.4	0.70	11.5	0.87	12.6	1.08	13.0	1.19	13.5	1.29	14.4	1.48	15.3	1.78	16.2	2.06
1350	9.4	0.56	10.7	0.75	11.7	0.93	12.7	1.14	13.2	1.25	13.7	1.37	14.5	1.56	15.4	1.81	16.3	2.09
1400	9.7	0.62	10.9	0.82	12.0	0.99	12.9	1.22	13.4	1.33	13.9	1.44	14.7	1.66	15.5	1.84	16.4	2.19
1450	10.0	0.67	11.2	0.88	12.2	1.07	13.2	1.27	13.6	1.40	14.1	1.52	14.9	1.77	15.7	1.97	16.4	2.18
1500	10.2	0.74	11.4	0.94	12.4	1.15	13.4	1.36	13.8	1.48	14.3	1.60	15.1	1.86	15.9	2.08	16.6	2.29
1550	10.5	0.80	11.7	1.02	12.7	1.23	13.6	1.44	14.0	1.56	14.2	1.68	15.3	1.94	16.1	2.21	16.8	2.43
1600	10.8	0.88	11.9	1.09	12.9	1.32	13.8	1.53	14.2	1.65	14.8	1.77	15.5	2.04	16.3	2.31	17.0	2.55
1650	11.1	0.97	12.2	1.17	13.2	1.41	14.0	1.63	14.4	1.75	14.9	1.86	15.7	2.13	16.5	2.42	17.4	2.70
1700	11.4	1.04	12.4	1.25	13.4	1.51	14.3	1.73	14.7	1.65	15.1	1.97	15.9	2.24	16.6	2.52	17.4	2.82
1750	11.7	1.12	12.7	1.35	13.7	1.61	14.5	1.85	14.9	1.97	15.3	2.08	16.1	2.35	16.8	2.64	17.6	2.94
1800	12.0	1.23	13.0	1.45	13.9	1.70	14.8	1.95	15.1	2.07	15.5	2.20	16.3	2.45	17.0	2.76	17.7	3.05
1850	12.2	1.33	13.2	1.54	14.2	1.81	15.0	2.08	15.4	2.20	15.8	2.32	16.5	2.58	17.2	2.87	17.9	3.19
1875	12.5	1.42	13.5	1.65	14.4	1.92	15.2	2.20	15.6	2.34	16.0	2.46	16.7	2.70	17.5	2.99	18.1	3.31

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

- 1. Boldface** indicates field-supplied drive required (see Note 6).
-  indicates field-supplied motor and drive required.
- Values include losses for filters, unit casing, and wet coils.

- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- Maximum usable output power (BkW) is 2.16. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 11.7 to 15.0 r/s. All other r/s's require field-supplied drive.

Table 11 — Fan Performance, 48HJ012 — Horizontal Discharge Units (SI)

AIRFLOW (L/s)	EXTERNAL STATIC PRESSURE (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1500	7.8	0.41	10.9	0.67	12.0	0.79	13.2	0.90	14.1	1.10	14.9	1.31	15.6	1.48	16.3	1.60	17.0	1.82	17.7	1.91
1550	8.2	0.45	11.1	0.71	12.1	0.85	13.4	0.95	14.3	1.15	15.1	1.37	15.8	1.54	16.5	1.65	17.1	1.86	17.8	2.02
1600	8.6	0.50	11.3	0.76	12.3	0.91	13.6	1.01	14.5	1.22	15.2	1.44	16.0	1.61	16.6	1.72	17.3	1.91	17.9	2.14
1650	8.9	0.56	11.5	0.81	12.5	0.96	13.8	1.08	14.7	1.27	15.4	1.50	16.1	1.68	16.8	1.79	17.4	1.97	18.1	2.19
1700	9.3	0.63	11.7	0.87	12.7	1.02	13.9	1.16	14.9	1.35	15.5	1.57	16.3	1.75	17.0	1.87	17.6	2.04	18.2	2.25
1750	9.8	0.73	11.9	0.92	12.9	1.08	14.1	1.24	15.1	1.43	15.7	1.65	16.4	1.83	17.1	1.94	17.8	2.12	18.4	2.32
1800	10.5	0.84	12.1	0.99	13.1	1.15	14.3	1.31	15.3	1.52	16.0	1.73	16.6	1.90	17.3	2.02	17.9	2.21	18.5	2.40
1850	11.3	0.90	12.5	1.07	13.5	1.24	14.5	1.42	15.5	1.63	16.4	1.82	17.3	2.01	18.0	2.17	18.6	2.30	18.9	2.38
1900	11.5	0.96	12.7	1.14	13.7	1.32	14.7	1.49	15.6	1.71	16.6	1.91	17.5	2.11	18.2	2.29	18.8	2.44	19.3	2.55
1950	11.8	1.04	12.9	1.22	13.9	1.40	14.9	1.57	15.8	1.80	16.7	2.00	17.6	2.21	18.4	2.41	19.1	2.58	19.6	2.71
2000	12.1	1.11	13.2	1.30	14.2	1.49	15.1	1.66	16.0	1.88	16.9	2.10	17.8	2.31	18.6	2.52	19.3	2.71	—	—
2050	12.3	1.19	13.4	1.38	14.4	1.59	15.3	1.75	16.2	1.97	17.1	2.20	17.9	2.42	18.7	2.64	—	—	—	—
2100	12.6	1.27	13.6	1.47	14.6	1.68	15.5	1.86	16.4	2.06	17.2	2.31	18.1	2.53	18.9	2.76	—	—	—	—
2150	12.8	1.36	13.9	1.56	14.9	1.78	15.7	1.96	16.6	2.15	17.4	2.41	18.2	2.64	—	—	—	—	—	—
2200	13.1	1.44	14.1	1.66	15.1	1.88	15.9	2.08	16.8	2.26	17.6	2.51	18.4	2.76	—	—	—	—	—	—
2250	13.4	1.53	14.4	1.76	15.3	1.99	16.2	2.19	17.0	2.37	17.8	2.61	—	—	—	—	—	—	—	—
2300	13.6	1.63	14.6	1.87	15.5	2.10	16.4	2.31	17.2	2.50	18.0	2.72	—	—	—	—	—	—	—	—
2400	13.9	1.74	14.9	1.98	15.8	2.20	16.6	2.44	17.4	2.64	—	—	—	—	—	—	—	—	—	—
2450	14.1	1.84	15.1	2.10	16.0	2.32	16.8	2.56	17.6	2.77	—	—	—	—	—	—	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

- 1. Boldface** indicates field-supplied drive required (see Note 5).
- Values include losses for filters, unit casing, and wet coils.
- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.

- Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 11.8 to 14.8 r/s. All other r/s's require field-supplied drive.

Table 12 — Fan Performance, 48HJ014 — Horizontal Discharge Units (SI)

AIRFLOW (L/s)	EXTERNAL STATIC PRESSURE (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1900	11.5	0.96	12.7	1.14	13.7	1.32	14.7	1.49	15.6	1.71	16.6	1.91	17.5	2.11	18.2	2.29	18.9	2.44	19.3	2.55
1950	11.8	1.04	12.9	1.22	13.9	1.40	14.9	1.57	15.8	1.80	16.7	2.00	17.6	2.21	18.4	2.41	19.1	2.58	19.6	2.71
2000	12.1	1.12	13.2	1.29	14.2	1.49	15.1	1.65	16.0	1.89	16.9	2.11	17.8	2.31	18.6	2.52	19.3	2.71	19.9	2.87
2050	12.3	1.18	13.4	1.38	14.4	1.59	15.3	1.75	16.2	1.96	17.1	2.20	17.9	2.42	18.7	2.64	19.5	2.84	20.1	3.02
2100	12.6	1.27	13.6	1.46	14.6	1.68	15.5	1.86	16.4	2.05	17.2	2.30	18.1	2.53	18.9	2.76	19.6	2.97	20.3	3.17
2150	12.8	1.36	13.9	1.56	14.9	1.78	15.7	1.96	16.6	2.15	17.4	2.42	18.2	2.64	19.0	2.88	19.8	3.10	20.5	3.31
2200	13.1	1.44	14.1	1.66	15.1	1.88	16.0	2.07	16.8	2.26	17.6	2.52	18.4	2.76	19.2	2.99	20.0	3.23	20.7	3.45
2250	13.3	1.53	14.4	1.75	15.3	1.99	16.2	2.20	17.0	2.36	17.8	2.61	18.6	2.88	19.4	3.11	20.1	3.37	20.9	3.60
2300	13.6	1.63	14.6	1.87	15.5	2.10	16.4	2.30	17.2	2.50	18.0	2.71	18.8	3.00	19.5	3.26	20.3	3.49	21.0	3.75
2400	13.9	1.74	14.9	1.98	15.8	2.20	16.6	2.44	17.4	2.64	18.2	2.83	18.9	3.13	19.7	3.39	20.5	3.64	21.2	3.89
2450	14.1	1.84	15.1	2.10	16.0	2.31	16.8	2.56	17.6	2.77	18.4	2.97	19.1	3.24	19.9	3.52	20.6	3.77	—	—
2500	14.4	1.95	15.4	2.22	16.2	2.44	17.1	2.69	17.8	2.90	18.6	3.09	19.3	3.35	20.0	3.66	20.8	3.93	—	—
2550	14.7	2.07	15.6	2.34	16.5	2.56	17.3	2.83	18.1	3.05	18.8	3.25	19.5	3.49	20.2	3.81	—	—	—	—
2600	14.9	2.18	15.8	2.47	16.7	2.69	17.5	2.96	18.3	3.20	19.0	3.42	19.7	3.63	20.4	3.95	—	—	—	—
2650	15.2	2.32	16.1	2.60	16.9	2.83	17.8	3.11	18.5	3.34	19.2	3.58	19.9	3.81	—	—	—	—	—	—
2700	15.4	2.44	16.4	2.74	17.2	2.96	18.0	3.26	18.7	3.51	19.4	3.73	20.1	3.92	—	—	—	—	—	—
2750	15.7	2.57	16.6	2.89	17.4	3.11	18.5	3.38	19.0	3.67	19.7	3.91	—	—	—	—	—	—	—	—
2800	15.9	2.71	16.9	3.03	17.7	3.27	18.4	3.55	19.2	3.84	—	—	—	—	—	—	—	—	—	—
2850	16.2	2.86	17.1	3.18	17.9	3.46	18.7	3.70	—	—	—	—	—	—	—	—	—	—	—	—
2900	16.5	2.98	17.3	3.32	18.2	3.57	18.9	3.85	—	—	—	—	—	—	—	—	—	—	—	—
2950	16.7	3.11	17.6	3.46	18.4	3.72	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3000	17.0	3.25	17.8	3.60	18.7	3.87	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3050	17.3	3.38	18.1	3.74	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3100	17.5	3.52	18.3	3.89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 11.8 to 14.9 r/s. All other r/s's require field-supplied drive.

Table 13 — Fan Performance, 48HJ008 — Vertical Discharge Units (English)

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
2200	506	0.52	586	0.72	656	0.95	718	1.18	776	1.43	838	1.78	898	2.21	935	2.58
2250	514	0.55	593	0.76	662	0.99	724	1.22	781	1.78	841	1.81	902	2.25	939	2.60
2300	521	0.57	600	0.79	668	1.02	730	1.26	786	1.50	843	1.83	905	2.28	943	2.62
2400	536	0.63	613	0.85	680	1.09	741	1.34	796	1.59	849	1.88	910	2.31	952	2.74
2500	551	0.69	626	0.93	693	1.17	753	1.43	808	1.69	859	1.96	912	2.31	963	2.81
2550	559	0.72	634	0.97	700	1.21	759	1.48	814	1.74	864	2.01	915	2.34	968	2.81
2600	567	0.75	641	1.00	706	1.25	764	1.52	819	1.79	869	2.06	918	2.37	973	2.81
2700	582	0.83	655	1.08	719	1.34	776	1.61	831	1.89	880	2.17	927	2.47	976	2.84
2800	598	0.90	670	1.17	732	1.43	789	1.71	842	2.00	892	2.29	938	2.58	983	2.92
2900	614	0.98	684	1.25	745	1.53	802	1.81	854	2.11	903	2.42	949	2.71	993	3.03
3000	630	1.07	699	1.35	759	1.63	815	1.92	866	2.23	915	2.54	961	2.85	1003	3.17
3100	646	1.16	714	1.45	773	1.74	828	2.04	878	2.35	926	2.67	972	3.00	1015	3.32
3200	662	1.26	729	1.55	787	1.86	841	2.16	891	2.48	938	2.81	983	3.14	1026	3.47
3300	679	1.36	744	1.66	801	1.98	854	2.29	904	2.61	950	2.95	995	3.30	—	—
3400	695	1.47	759	1.78	816	2.10	867	2.42	917	2.75	963	3.10	1007	3.45	—	—
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	988	3.41	—	—	—	—
3700	745	1.84	805	2.17	860	2.52	909	2.87	956	3.22	—	—	—	—	—	—
3750	754	1.91	813	2.24	868	2.59	917	2.95	963	3.30	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 2.9. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 697 to 900 rpm. All other rpm's require field-supplied drive.

Table 14 — Fan Performance, 48HJ012 — Vertical Discharge Units (English)

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
3000	556	0.65	624	0.81	682	0.95	737	0.99	745	1.04	750	1.12	809	1.24	815	1.40	899	1.56	950	1.92
3100	569	0.70	636	0.87	693	1.01	748	1.08	755	1.12	757	1.20	862	1.38	903	1.53	943	1.88	971	2.21
3200	583	0.76	649	0.94	705	1.08	758	1.17	787	1.30	819	1.36	905	1.52	971	1.86	982	2.19	992	2.41
3300	597	0.83	662	1.00	717	1.16	770	1.29	815	1.37	830	1.43	965	1.82	991	2.10	1000	2.40	1025	2.59
3400	611	0.90	675	1.08	730	1.23	781	1.41	830	1.50	840	1.63	992	2.11	1015	2.43	1030	2.62	1050	2.72
3500	625	0.97	688	1.15	742	1.32	792	1.49	840	1.64	860	1.85	1011	2.45	1028	2.62	1072	2.74	1099	2.90
3600	639	1.04	701	1.23	755	1.41	803	1.57	850	1.87	890	2.21	1026	2.55	1063	2.75	1095	2.89	1119	3.08
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	1152	3.27	1190	3.46
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	1163	3.44	1203	3.65
3900	761	1.56	820	1.80	875	2.01	928	2.29	979	2.56	1029	2.80	1079	3.07	1128	3.34	1173	3.60	1214	3.83
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	1183	3.76	1225	4.00
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	1193	3.93	1236	4.19
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	1202	4.09	1245	4.38
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	1212	4.27	1255	4.56
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	1222	4.44	1265	4.74
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	1232	4.62	1274	4.93
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	1242	4.81	1284	5.13
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	1262	5.00	1294	5.33
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	1263	5.20	—	—
4900	926	2.93	977	3.24	1024	3.54	1068	3.80	1111	4.06	1153	4.41	1194	4.77	1234	5.09	1274	5.40	—	—
5000	942	3.11	993	3.41	1039	3.73	1080	3.99	1125	4.26	1166	4.59	1207	4.97	1247	5.30	1286	5.62	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.

Table 15 — Fan Performance, 48HJ014 — Vertical Discharge Units (English)

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
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	1152	3.27	1190	3.46
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	1163	3.44	1203	3.65
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	1173	3.60	1214	3.83
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	1183	3.76	1225	4.00
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	1193	3.93	1236	4.19
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	1202	4.09	1245	4.38
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	1212	4.27	1255	4.56
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	1222	4.44	1265	4.74
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	1232	4.62	1274	4.93
4600	876	2.45	930	2.76	977	3.01	1024	3.26	1070	3.56	1114	3.90	1157	4.19	1199	4.49	1242	4.81	1284	5.13
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	1252	5.00	1294	5.33
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	1263	5.20	—	—
4900	926	2.93	977	3.24	1024	3.54	1068	3.80	1111	4.06	1153	4.41	1194	4.77	1234	5.09	1274	5.40	—	—
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	1286	5.62	—	—
5100	959	3.29	1009	3.60	1056	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	5.38	1272	5.74	—	—	—	—
5300	993	3.67	1041	3.98	1086	4.33	1127	4.61	1168	4.90	1208	5.19	1246	5.58	—	—	—	—	—	—
5400	1010	3.87	1057	4.18	1102	4.54	1142	4.84	1182	5.13	1221	5.41	—	—	—	—	—	—	—	—
5500	1027	4.07	1073	4.39	1118	4.76	1157	5.07	1197	5.36	1235	5.64	—	—	—	—	—	—	—	—
5600	1043	4.29	1090	4.61	1133	4.99	1173	5.31	1211	5.61	—	—	—	—	—	—	—	—	—	—
5700	1060	4.51	1106	4.83	1149	5.22	1189	5.55	—	—	—	—	—	—	—	—	—	—	—	—
5800	1077	4.74	1122	5.07	1165	5.46	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5900	1094	4.98	1139	5.31	1181	5.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	1111	5.22	1155	5.55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6100	1128	5.48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	1145	5.74	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.

Table 16 — Fan Performance, 48HJ008 — Horizontal Discharge Units (English)

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	1.38	786	1.49	846	1.84	910	2.25	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	967	2.68
2500	542	0.66	619	0.90	686	1.13	748	1.41	777	1.55	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	1.60	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	2.41	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	986	2.91
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	993	3.01
3000	620	1.02	690	1.30	750	1.58	806	1.86	832	2.02	849	2.18	910	2.52	958	2.85	1002	3.15
3100	636	1.11	704	1.39	764	1.69	818	1.97	844	2.13	870	2.29	920	2.64	968	2.99	1012	3.30
3200	652	1.21	718	1.49	778	1.80	831	2.09	856	2.25	882	2.40	931	2.76	979	3.13	1023	3.47
3300	668	1.31	732	1.59	793	1.92	844	2.21	869	2.37	894	2.53	942	2.89	989	3.26	1034	3.63
3400	684	1.41	747	1.70	807	2.04	857	2.35	882	2.51	907	2.66	954	3.02	1000	3.40	1044	3.79
3500	701	1.53	762	1.82	821	2.16	871	2.48	895	2.64	919	2.80	966	3.15	1011	3.55	1054	3.94
3600	717	1.65	777	1.94	835	2.29	885	2.63	908	2.79	932	2.95	978	3.30	1022	3.69	1065	4.10
3700	733	1.77	792	2.07	849	2.42	899	2.78	922	2.95	945	3.11	990	3.45	1034	3.84	1076	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	5.27

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 2.9. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 697 to 900 rpm. All other rpm's require field-supplied drive.

Table 17 — Fan Performance, 48HJ012 — Horizontal Discharge Units (English)

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
3000	478	0.57	658	0.92	721	1.08	796	1.23	851	1.50	898	1.78	942	2.01	983	2.17	1023	2.46	1063	2.61
3100	500	0.62	669	0.97	731	1.16	808	1.30	861	1.57	907	1.86	951	2.09	992	2.24	1031	2.51	1070	2.75
3200	519	0.69	680	1.03	741	1.23	818	1.38	873	1.65	916	1.95	960	2.18	1000	2.32	1039	2.58	1077	2.88
3300	537	0.77	692	1.10	751	1.30	828	1.47	884	1.72	925	2.03	969	2.27	1009	2.41	1048	2.66	1086	2.95
3400	561	0.86	704	1.17	761	1.37	837	1.57	896	1.82	934	2.12	978	2.36	1018	2.51	1057	2.75	1094	3.02
3500	592	0.98	715	1.24	773	1.45	847	1.66	907	1.92	945	2.22	987	2.46	1027	2.60	1066	2.85	1102	3.12
3600	632	1.12	727	1.32	784	1.54	857	1.76	917	2.03	957	2.32	996	2.55	1036	2.71	1075	2.96	1111	3.22
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	1156	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	779	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	5.47
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

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.

Table 18 — Fan Performance, 48HJ014 — Horizontal Discharge Units (English)

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
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	779	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	5.47
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	5.61	—	—
5200	896	2.95	952	3.33	1003	3.63	1053	4.00	1098	4.30	1141	4.60	1183	4.91	1225	5.29	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	5.29	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	5.44	1230	5.75	—	—	—	—	—	—
5700	970	3.80	1024	4.23	1072	4.59	1118	4.93	1163	5.34	1203	5.67	—	—	—	—	—	—	—	—
5800	985	3.99	1039	4.42	1086	4.80	1131	5.14	1176	5.56	—	—	—	—	—	—	—	—	—	—
5900	1000	4.18	1053	4.62	1100	5.02	1144	5.36	—	—	—	—	—	—	—	—	—	—	—	—
6000	1015	4.39	1068	4.83	1114	5.25	1158	5.58	—	—	—	—	—	—	—	—	—	—	—	—
6100	1030	4.59	1083	5.04	1128	5.48	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	1046	4.81	1097	5.26	1142	5.71	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.

Table 19 — Accessory/FIOP Static Pressure Drop (Pa), 48HJ008-014

COMPONENT	L/s								
	1040	1180	1415	1650	1890	2125	2360	2595	2830
Durablade Economizer	5.0	5.0	7.5	10.0	12.5	15.0	17.4	19.9	22.4

Table 20 — Accessory/FIOP Static Pressure Drop (in. wg), 48HJ008-014

COMPONENT	CFM								
	2200	2500	3000	3500	4000	4500	5000	5500	6000
Durablade Economizer	.02	.02	.03	.04	.05	.06	.07	.08	.09

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 26 for more details.
 - b. Make sure that air filters are 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 Tables 1A and 1B). 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.

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

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

Compressor Rotation — It is important to be certain the compressors are rotating in the proper direction. 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 fan is 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 and 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 26.

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 21 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 21 — Altitude Compensation*

ELEVATION m or km (ft)	31.4, 50.4 AND 59.8 kW (107,000, 172,000 AND 240,000 BTUH) NOMINAL INPUT		65.6 kW (224,000 BTUH) NOMINAL INPUT	
	Natural Gas Orifice Size†	Liquid Propane Orifice Size†	Natural Gas Orifice Size†	Liquid Propane Orifice Size†
0-610 m (0-2,000)	3.0 (31)	2.4 (41)	3.2 (30)	2.5 (38)
610 m (2,000)	2.9 (32)	2.3 (42)	3.2 (30)	2.5 (39)
914 m (3,000)	2.9 (32)	2.3 (42)	3.0 (31)	2.4 (40)
1.22 km (4,000)	2.9 (32)	2.3 (42)	2.9 (32)	2.4 (41)
1.52 km (5,000)	2.8 (33)	2.2 (43)	2.8 (33)	2.3 (42)
1.83 km (6,000)	2.8 (34)	2.2 (43)	2.8 (34)	2.2 (43)
2.13 km (7,000)	2.8 (35)	2.1 (44)	2.8 (35)	2.2 (43)
2.44 km (8,000)	2.7 (36)	2.1 (44)	2.7 (36)	2.1 (44)
2.74 km (9,000)	2.6 (37)	2.0 (45)	2.6 (37)	2.1 (44)
3.05 km (10,000)	2.5 (38)	2.0 (46)	2.5 (38)	2.0 (45)
3.35 km (11,000)	2.5 (39)	1.9 (47)	2.5 (39)	2.0 (45)
3.66 km (12,000)	2.4 (40)	1.9 (47)	2.4 (40)	2.0 (46)
3.96 km (13,000)	2.4 (41)	1.9 (48)	2.4 (41)	1.9 (47)
4.27 km (14,000)	2.3 (42)	1.9 (48)	2.3 (42)	1.9 (47)

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

†Orifice available through your local 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 Tables 1A and 1B.

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 (light-emitting diode) 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 fans start. The condenser-fan motors run 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 DURABLADE ECONOMIZER

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

When the outdoor-air temperature is below the OAT setting and the thermostat calls for Y1 and G, the economizer damper moves to the minimum position when the evaporator fan starts. The first stage of cooling is provided by the economizer. If the supply-air temperature is above 14 C (57 F), a switch on the supply-air thermostat is closed between the T2 terminal and the 24 vac terminal. This causes the damper to continue to modulate open until the supply-air temperature falls below 13 C (55 F) or the damper reaches the fully open position.

When the supply-air temperature is between 13 C (55 F) and 11 C (52 F), the supply-air thermostat has open switches between the T2 and 24 vac terminals and between the T1 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the supply-air temperature falls below 11 C (52 F), a switch on the supply-air thermostat is closed between the T1 terminal and the 24 vac terminal. This causes the damper to modulate closed until the supply-air temperature rises above 13 C (55 F) or the damper reaches the minimum position.

When the supply-air temperature is between 13 C (55 F) and 14 C (57 F), the supply-air thermostat has open switches between the T2 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

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

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

HEATING, UNITS WITH DURABLADE 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 or Two-Position Damper Installation Instructions or Optional Durablade Economizer 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 results, backflush toward return-air section to remove foreign material.
5. Flush condensate pan after completion.
6. Reinstall economizer or two-position damper and filters.
7. Reconnect wiring.
8. Replace access panels.

CONDENSER COIL

1. Turn off unit power.
2. Remove top panel screws on condenser end of unit.
3. Remove condenser coil corner post. See Fig. 26. To hold top panel open, place coil corner post between top panel and center post. See Fig. 27.
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 76 to 102 mm (3 to 4 in.) from the inner coil section. See Fig. 28.
6. Use a water hose or other suitable equipment to flush down between the 2 coil sections to remove dirt and debris. Clean the outer surfaces with a stiff brush in the normal manner.
7. Secure inner and outer coil rows together with a field-supplied fastener.
8. Reposition the outer coil section and remove the coil corner post from between the top panel and center post.
9. Reinstall the coil corner post and replace all screws.

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

FILTERS — Clean or replace at start of each heating and cooling season, or more often if operating conditions require it. Replacement filters must be same dimensions as original filters.

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

Lubrication

COMPRESSORS — Each compressor is charged with correct amount of oil at the factory.

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

Condenser-Fan Adjustment (Fig. 29)

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. 29.
4. Tighten setscrews and replace condenser-fan assembly.

Economizer Adjustment — Refer to Optional Dura-blade Economizer section on page 10.

Refrigerant Charge — Amount of refrigerant charge is listed on unit nameplate (also refer to Tables 1A and 1B). 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 Tables 1A and 1B).

LOW CHARGE COOLING — Using Cooling Charging Charts, Fig. 30-32, 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 L/s (cfm) must be within the normal operating range of the unit.

TO USE COOLING CHARGING CHART, STANDARD UNIT — 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..... 29 C (85 F)
Suction Pressure.....483 kPa (70 psig)
Suction Temperature should be.....9 C (48 F)
(Suction Temperature may vary ± 3 C [5 F].)

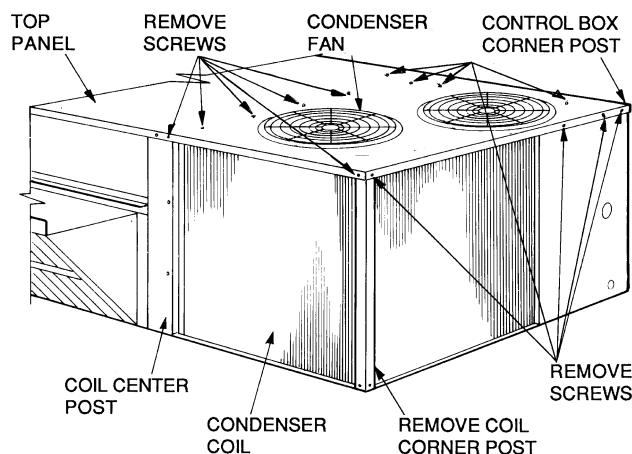


Fig. 26 — Cleaning Condenser Coil

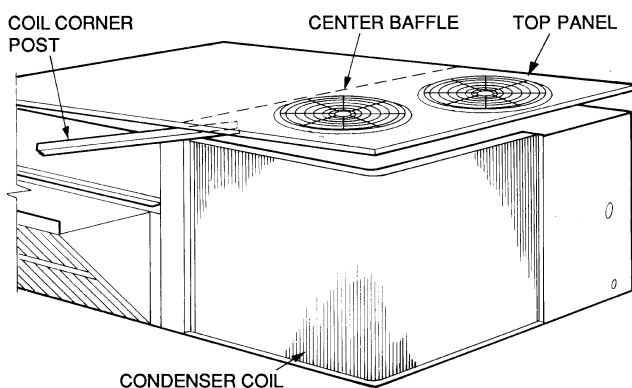


Fig. 27 — Propping Up Top Panel

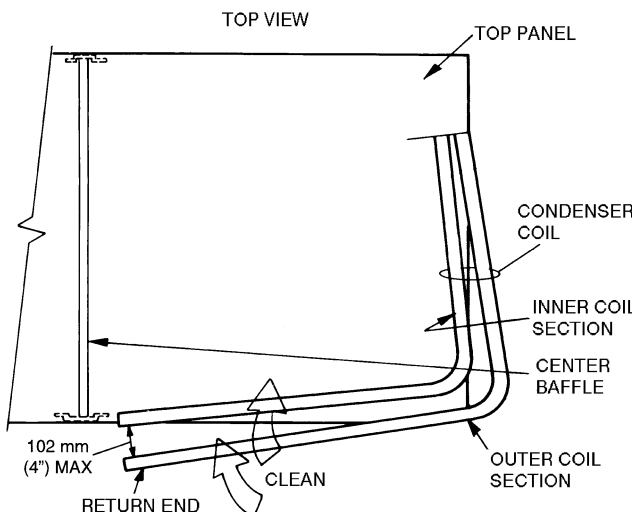


Fig. 28 — Separating Coil Sections

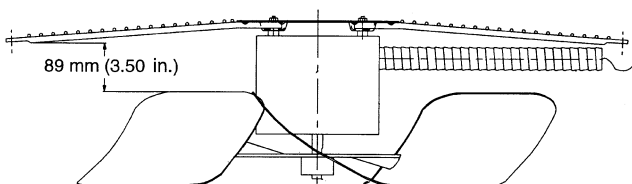


Fig. 29 — Condenser-Fan Adjustment

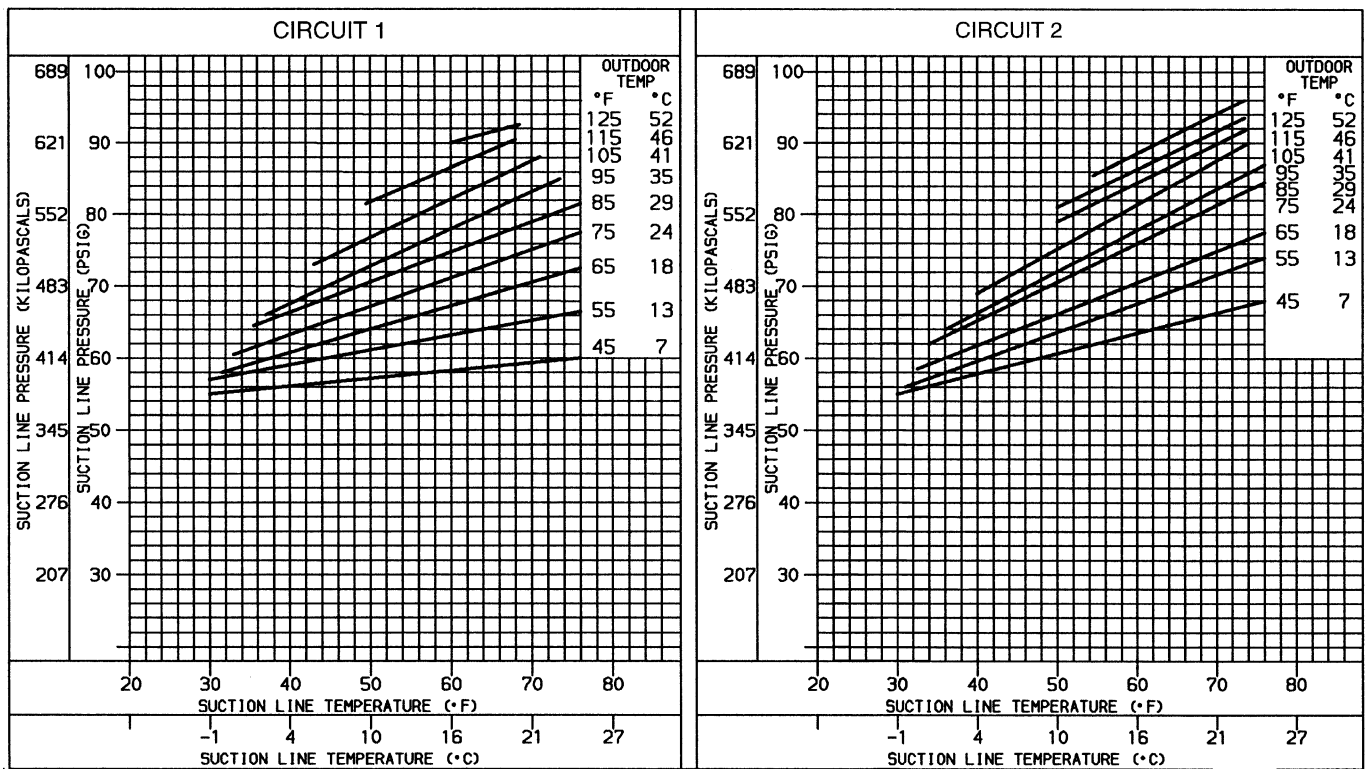


Fig. 30 — Cooling Charging Charts, Standard 48HJ008 Units

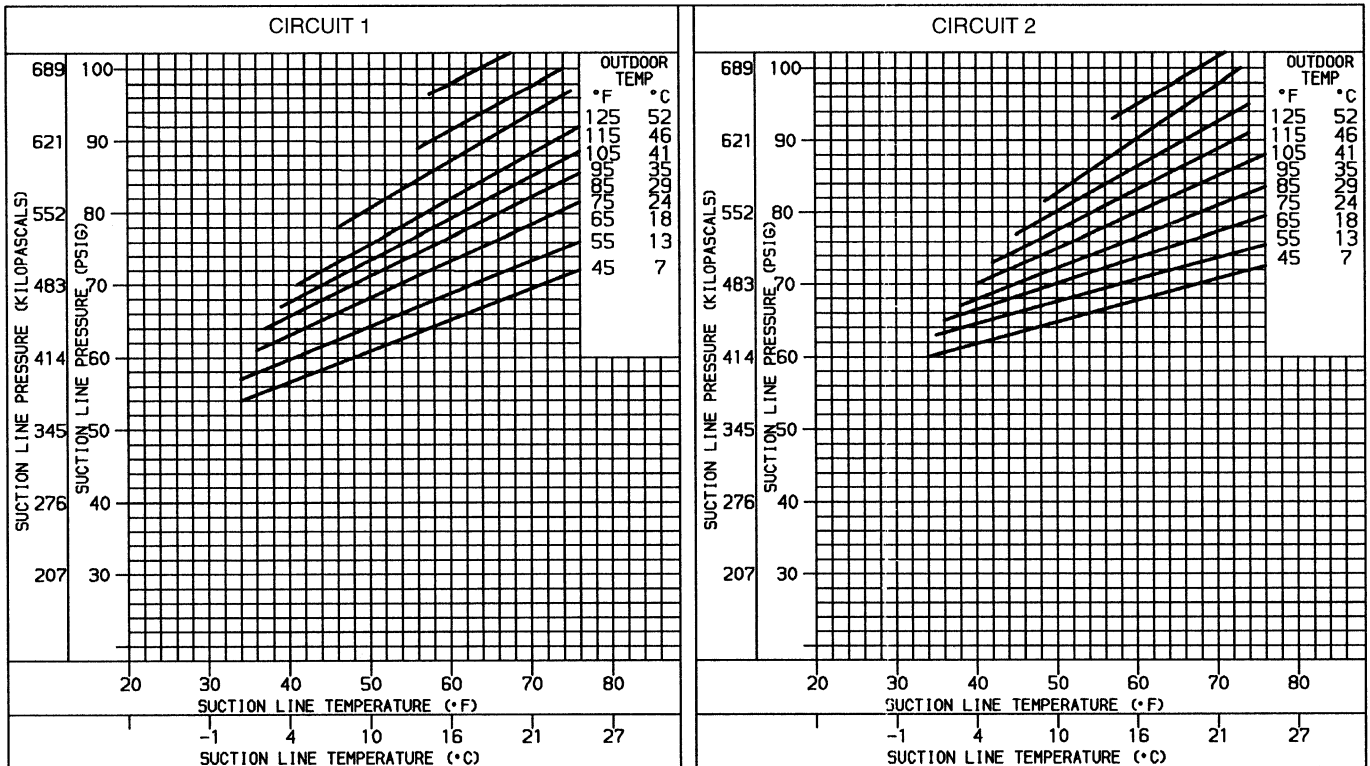


Fig. 31 — Cooling Charging Charts, Standard 48HJ012 Units

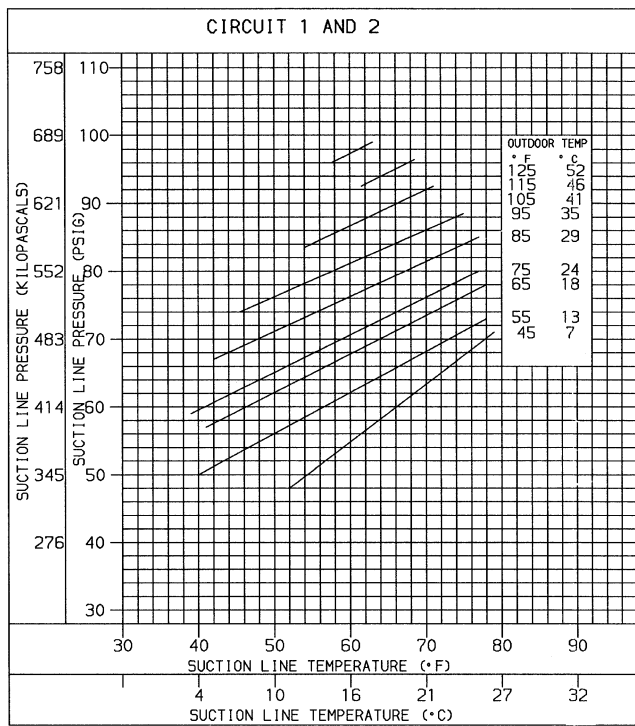


**Fig. 32 — Cooling Charging Chart,
Standard 48HJ014 Units**

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 5 screws holding the blower housing to the vestibule cover.
3. Remove the vestibule 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 5 screws that attach induced-draft motor assembly to the vestibule cover.

3. The blower wheel can be cleaned at this point. If additional cleaning is required, continue with Steps 4 and 5.
4. Remove blower by removing 2 setscrews.
5. 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.
6. To reinstall, reverse the procedure.

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

Burner Ignition — Unit is equipped with a direct-spark ignition, 100% lockout system. Integrated Gas Unit Controller (IGC) located in the control box (Fig. 11). The IGC contains a self-diagnostic LED that can be observed through the viewport. During service, refer to the label on the control box cover or Table 22 for an explanation of LED error code descriptions.

A single LED on the 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 evaporator fan on/off time delay will also be reset. Refer to Start-Up, Heating section on page 24 for additional information.

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

Table 22 — LED Error Code Description*

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

LEGEND

LED — Light-Emitting Diode

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

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

IMPORTANT: Refer to Troubleshooting Tables 23-26 for additional information.

REMOVAL AND REPLACEMENT OF GAS TRAIN (See Fig. 33 and 34)

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. Disconnect gas piping at unit gas valve.
6. Remove wires connected to gas valve. Mark each wire.
7. Remove induced-draft motor, ignitor, and sensor wires at the Integrated Gas Unit Controller (IGC).
8. Remove the 2 screws that attach the burner rack to the vestibule plate.
9. Remove the gas valve bracket.
10. Slide the burner tray out of the unit (see Fig. 34).
11. To reinstall, reverse the procedure outlined above.

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. 35.
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.

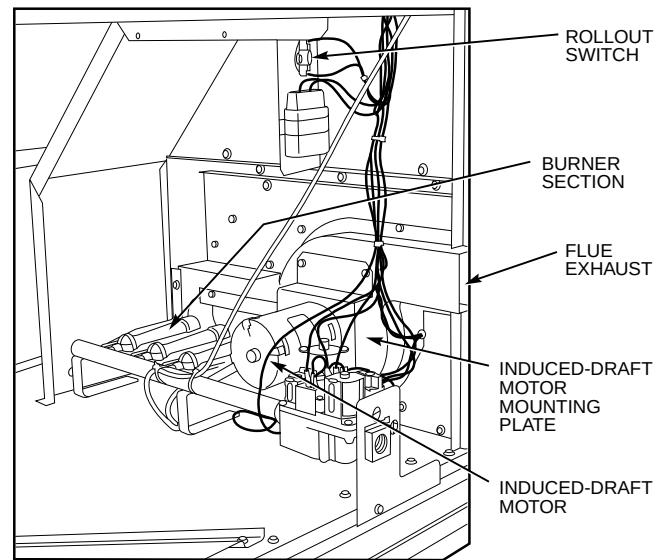


Fig. 33 — Burner Section Details

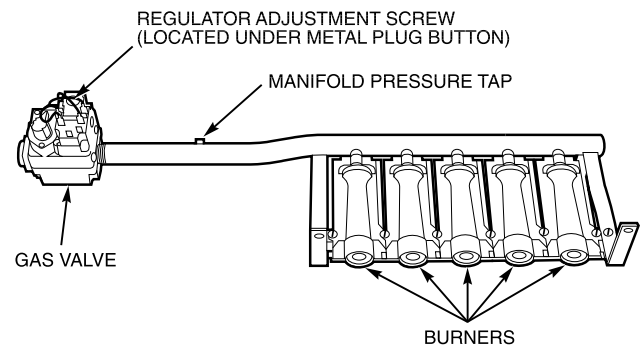


Fig. 34 — Burner Tray Details

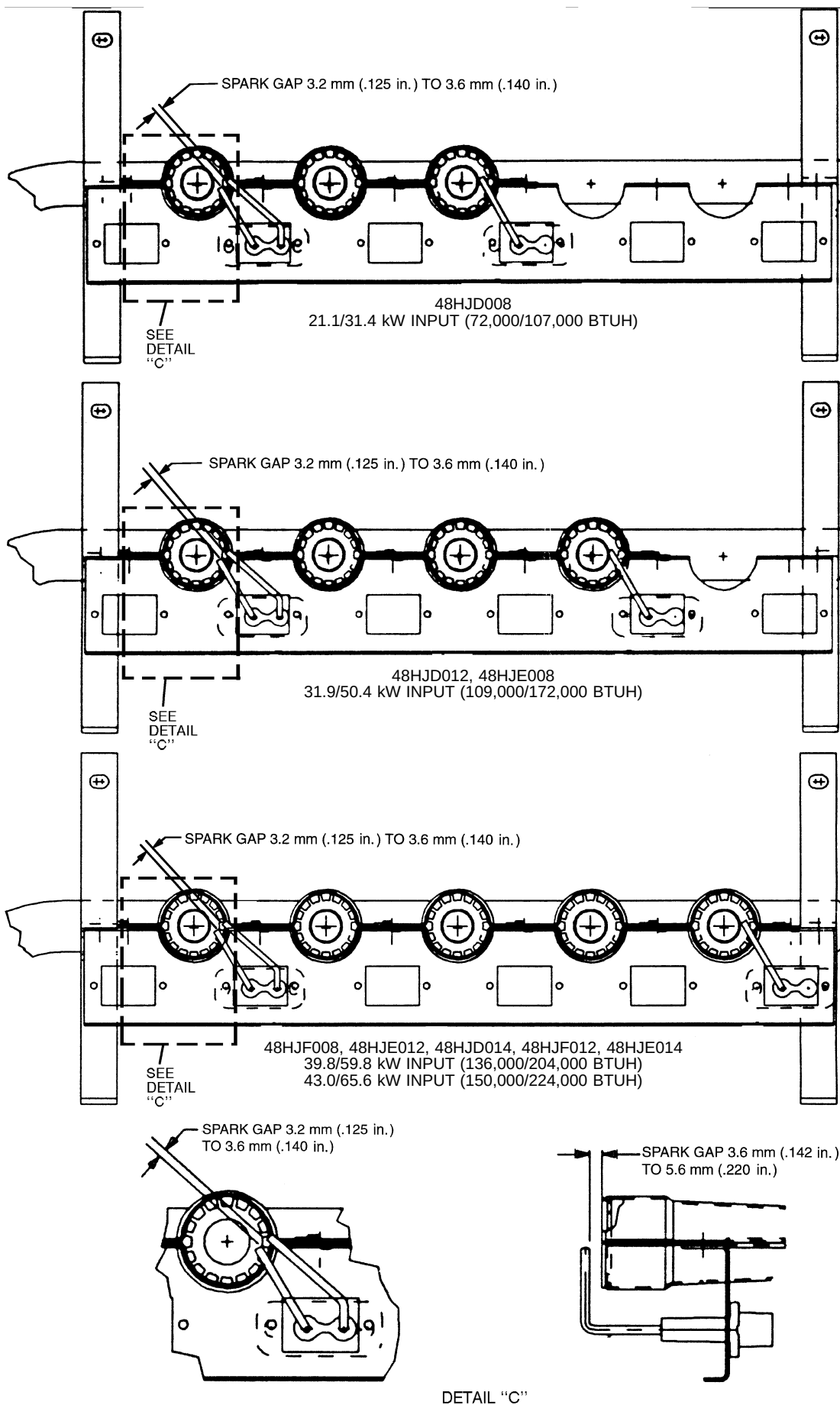


Fig. 35 — Spark Gap Adjustment

TROUBLESHOOTING

Refer to Tables 23-26 for troubleshooting details.

Table 23 — 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 overload.	Determine cause and replace.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor.	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective overload.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor operates continuously.	Dirty air filter.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Leaking valves in compressor.	Replace compressor.
	Air in system.	Recover 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.	Recover excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
Head pressure too low.	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive suction pressure.	High heat load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Insufficient evaporator airflow.	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.
Compressor no. 2 will not run.	Unit in economizer mode.	Proper operation; no remedy necessary.

Table 24 — 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. Check orifice to burner alignment.
Burners will not turn off.	Unit is locked into Heating mode for a one minute minimum.	Wait until mandatory one minute time period has elapsed or power to unit.

LEGEND

GR — Ground

Table 25 — 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 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 evaporator-fan motor and that supply-air temperature rise agrees with range on unit nameplate information.
Ignition lockout. (LED 5 flashes)	Unit unsuccessfully attempted ignition for 15 minutes.	Check ignitor and flame sensor electrode spacing, gaps, etc. Ensure that flame sense and ignition wires are properly terminated. Verify that unit is obtaining proper amount of gas.
Induced-draft motor fault. (LED 6 flashes)	IGC does not sense that induced-draft motor is operating.	Check for proper voltage. If motor is operating, check the speed sensor plug/IGC Terminal J2 connection. Proper connection: PIN 1 — White, PIN 2 — Red, PIN 3 — Black.
Rollout switch fault. (LED 7 flashes)	Rollout switch has opened.	Rollout switch will automatically reset, but IGC will continue to lock out unit. Check gas valve operation. Ensure that induced-draft blower wheel is properly secured to motor shaft. Reset unit at unit disconnect.
Internal control fault. (LED 8 flashes)	Microprocessor has sensed an error in the software or hardware.	If error code is not cleared by resetting unit power, replace the IGC.

LEGEND

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

IMPORTANT: Refer to Table 24 — Heating Service Analysis for additional heating section troubleshooting information.

⚠ WARNING

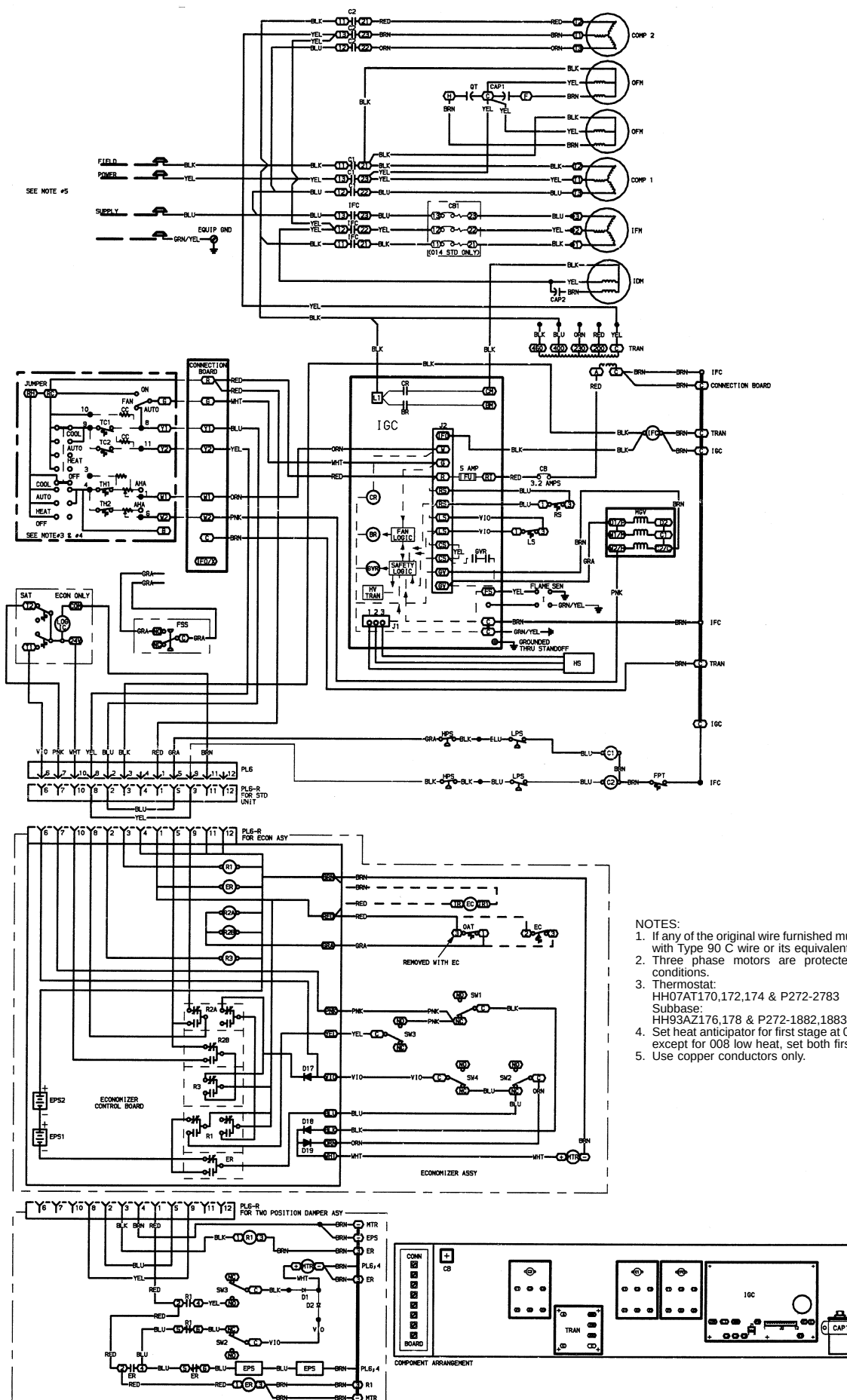
If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that may be present before handling new control board. The IGC is sensitive to static electricity and may be damaged if the necessary precautions are not taken.

Table 26 — Durablade Economizer Service Analysis

PROBLEM	CAUSE	REMEDY
Damper does not open.	Evaporator fan is off.	1. Check to ensure that 24 vac is present at terminal C1 on the IFC or that 24 vac is present at the IFO terminal. Check whether 24 vac is present at PL6-1 (red wire) and/or PL6-3 (black wire). If 24 vac is not present, check wiring (see unit label diagram). 2. Check proper thermostat connection to G on the connection board.
	No power to economizer motor.	1. Check that SW3 is properly making contact with the damper blade. Check that SW1 is in the NC (normally closed) position. 2. Check diode D18. If diode is not functioning properly, replace economizer control board. 3. Confirm that the economizer control board is grounded properly at PL6-4 (brown wire) and at brown terminal of the economizer control board (brown wire). The economizer motor must also be grounded properly at the negative motor terminal (brown wire). 4. Verify SW1 and SW3 are working and wired properly (see unit label diagram). 5. Check for 24 vac input at both PL6-1 (red wire) and PL6-3 (black wire). If 24 vac not present, check unit wiring (see unit label diagram). If 24 vac is found in both places, check for 24 vac at the yellow terminal of the economizer control board (yellow wire). If 24 vac power is not present, replace the economizer control board.
	Economizer motor failure.	If the indoor (evaporator) fan and economizer motor are energized, verify that there is a minimum of 18 vdc at the positive motor terminal. If the motor is not operating, replace the motor.
Economizer operation limited to minimum position.	OAT or EC set too high.	1. Set at correct temperature (1.7 C [3 F] below indoor space temperature). 2. Check OAT or EC by setting above outdoor temperature or humidity level. If the OAT or EC switches do not close, replace OAT or EC.
	Economizer control board incorrectly wired or not functioning.	1. Perform the following tests when OAT or EC is closed, Y1 is called for, and damper is at minimum position. Confirm 24 vac on gray terminal of the economizer control board (gray wire). If 24 vac is not present, check wiring (see unit label diagram). 2. Verify that SW1 and SW3 are wired correctly and working properly (see unit label diagram). 3. Check to ensure that 24 vac exists at PL6-2 (blue wire). If 24 vac is not present, check wiring (see unit wiring label diagram). 4. Check 24 vac output at PL6-10 (white wire). If 24 vac is not present, replace economizer control board.
	Incorrect SAT wiring or inoperative SAT.	1. After verifying that the OAT and EC settings and the economizer control board wiring are correct, check to ensure that the 24 vac terminal of the SAT has 24 vac (white wire). If OAT, EC, and control board are functioning and wired properly and no 24 vac exists, check wiring (see unit label diagram). 2. If supply-air temperature is greater than 14 C (57 F), 24 vac should be found at terminal T2 on the SAT (pink wire). If 24 vac is not present, replace SAT.
Damper does not close.	Incorrect economizer wiring.	1. Verify that SW2 and SW4 are wired and working properly (see unit label diagram). 2. Check diode D19. If diode is not functioning properly, replace economizer control board.
	Incorrect damper actuator wiring or inoperative economizer circuit board.	1. After verifying that the wiring is correct, modulate the damper to the minimum position. Remove the calls for G. 2. If the damper does not move, check for 24 vac at PL6-1 (red wire). If 24 vac is not present, check wiring (see unit label diagram). 3. If damper still does not move, check for 24 vac at blue terminal of economizer control board (blue wire). If 24 vac is not present, replace the economizer control board.
	Incorrect SAT wiring or inoperative SAT.	1. After verifying that the wiring is correct and the economizer control board is functioning properly, place the OAT or EC switch in the closed position. Place a call for Y1 and open the damper to the fully open position. Confirm that the 24 vac terminal of the SAT has 24 vac (white wire). If 24 vac is not present, check wiring (see unit label diagram). 2. If supply-air temperature is less than 11 C (52 F), 24 vac should be found at terminal T1 on the SAT (violet wire). If 24 vac not found, replace SAT.
	Economizer motor failure.	If economizer control board and SAT are functioning properly, verify that there is a minimum of 18 vdc at the positive motor terminal. If a minimum of 18 vdc is present and the motor is still not operating, replace the motor.
Economizer damper does not close on power loss.	Insufficient battery power, inoperative economizer control board.	1. Check voltage potential across batteries. If lower than 14 vdc, replace close-on-power-loss power supply (9-v alkaline batteries). Check this emergency power supply on a regular basis or whenever the filters are changed. 2. If the close-on-power-loss and economizer control board are functioning properly, check for 14 vdc or higher at the blue terminal of the economizer control board (blue wire) when power is disconnected from unit. If 14 vdc is not present, replace the control board.

LEGEND

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



- 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. Three phase motors are protected under primary single phasing conditions.
 3. Thermostat:
HH07AT170,172,174 & P272-2783
Subbase:
HH93AZ176,178 & P272-1882,1883
 4. Set heat anticipator for first stage at 0.14 amp, second stage at 0.2 amp, except for 008 low heat, set both first and second stage at 0.14 amp.
 5. Use copper conductors only.

Fig. 36 — Typical Wiring Schematic

LEGEND FOR TYPICAL WIRING SCHEMATIC (Fig. 36)

AHA	— Adjustable Heat Anticipator	QT	— Quadruple Terminal
BR	— Blower Relay	R	— Relay
C	— Contactor, Compressor	RS	— Rollout Switch
CAP	— Capacitor	SAT	— Supply Air Thermostat
CB	— Circuit Breaker	SW1	— Switch, Fully Open
CC	— Cooling Compensator	SW2	— Switch, Fully Closed
COMP	— Compressor Motor	SW3	— Switch, Minimum Vent Position
CR	— Combustion Relay	SW4	— Switch, Maximum Vent Position
D	— Diode	TC	— Thermostat-Cooling
EC	— Enthalpy Control	TH	— Thermostat, Heating
ECON	— Economizer	TRAN	— Transformer
EPS	— Emergency Power Supply (9-volt battery)		Field Splice
EQUIP	— Equipment		Marked Wire
ER	— Economizer Relay		Terminal (Marked)
FPT	— Freeze Protection Thermostat		Terminal (Unmarked)
FSS	— Filter Status Switch		Terminal Block
FU	— Fuse		Splice
GND	— Ground		Splice (Marked)
GVR	— Gas Valve Relay		Factory Wiring
HPS	— High-Pressure Switch		Field Control Wiring
HS	— Hall Effect Sensor		Field Power Wiring
IDM	— Induced Draft Motor		Accessory or Optional Wiring
IFC	— Indoor (Evaporator) Fan Contactor		To indicate common potential only. Not to represent wiring.
IFM	— Indoor Fan Motor		
IFR	— Indoor (Evaporator) Fan Relay		
IGC	— Integrated Gas Unit Controller		
LPS	— Low-Pressure Switch		
LS	— Limit Switch		
MGV	— Main Gas Valve		
MTR	— Motor		
MV	— Main Valve		
NC	— Normally Closed		
NO	— Normally Open		
OAT	— Outdoor-Air Thermostat		
OFM	— Outdoor Fan Motor		
PL	— Plug Assembly		

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

I. PRELIMINARY INFORMATION

MODEL NO.: _____

SERIAL NO.: _____

DATE: _____

TECHNICIAN: _____

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

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

III. START-UP

ELECTRICAL

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

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ DB

RETURN-AIR TEMPERATURE _____ DB _____ WB

COOLING SUPPLY AIR _____

GAS HEAT SUPPLY AIR _____

PRESSURES

GAS INLET PRESSURE _____ kPa (IN. WG)

GAS MANIFOLD PRESSURE _____ kPa (IN. WG)

REFRIGERANT SUCTION _____ Pa (PSIG) CIRCUIT NO. 1 _____ Pa (PSIG) CIRCUIT NO. 2 _____ Pa (PSIG)

REFRIGERANT DISCHARGE _____ Pa (PSIG) CIRCUIT NO. 1 _____ Pa (PSIG) CIRCUIT NO. 2 _____ Pa (PSIG)

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