



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.

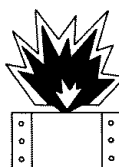
Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit,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

⚠ CAUTION

Ensure voltage listed on unit data plate agrees with electrical supply provided for the unit.

⚠ WARNING



Disconnect gas piping from unit when leak testing at pressure greater than 1/2 psig. Pressures greater than 1/2 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 1/2 psig, it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of 1/2 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. See Fig. 1.

Step 1 — Provide Unit Support

ROOF CURB — Assemble and install accessory roof curb in accordance with instructions shipped with curb. See Fig. 2. 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. 2. 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. 3. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

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

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

ALTERNATE UNIT SUPPORT — When the curb or adapter cannot be used, support unit with sleepers using unit curb or adapter support area. If sleepers cannot be used, support the long sides of the unit with a minimum of 3 equally spaced 4-in. x 4-in. pads on each side.

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 weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

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

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 pressure (a negative condition) shall not exceed 0.35 in. wg with economizer or 0.45 in. wg without economizer.

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

To operate at lower return-air temperatures, a field-supplied outdoor-air temperature control must be used to initiate both stages of heat when the temperature is below 45 F. Indoor comfort may be compromised when these lower air temperatures are used with insufficient heating temperature rise.

Step 3 — Determine Location of Drain Line and External Trap — The unit's $\frac{3}{4}$ -in. condensate drain connections are located on 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. The center drain plug looks like a star connection, however it can be removed with a $\frac{1}{2}$ -in. socket drive extension. See Fig. 4. The piping for the condensate drain and external trap can be completed after the unit is in place.

All units must have an external trap for condensate drainage. Install a trap at least 4 in. deep and protect against freeze-up. See Fig. 5. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1 in. per 10 ft of run. Do not use a pipe size smaller than the unit connection.

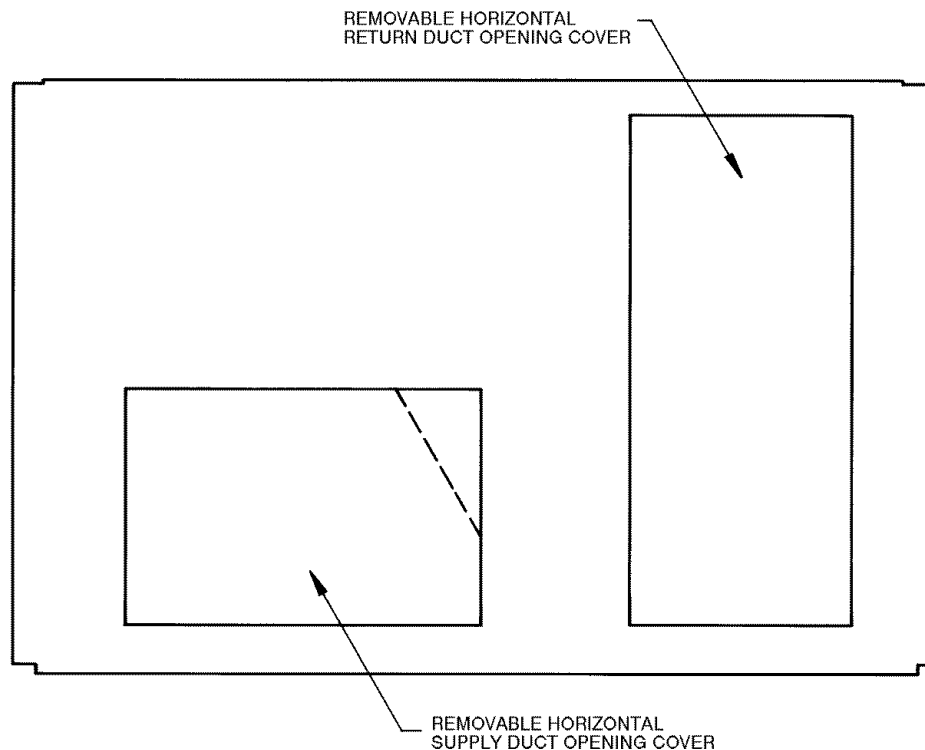


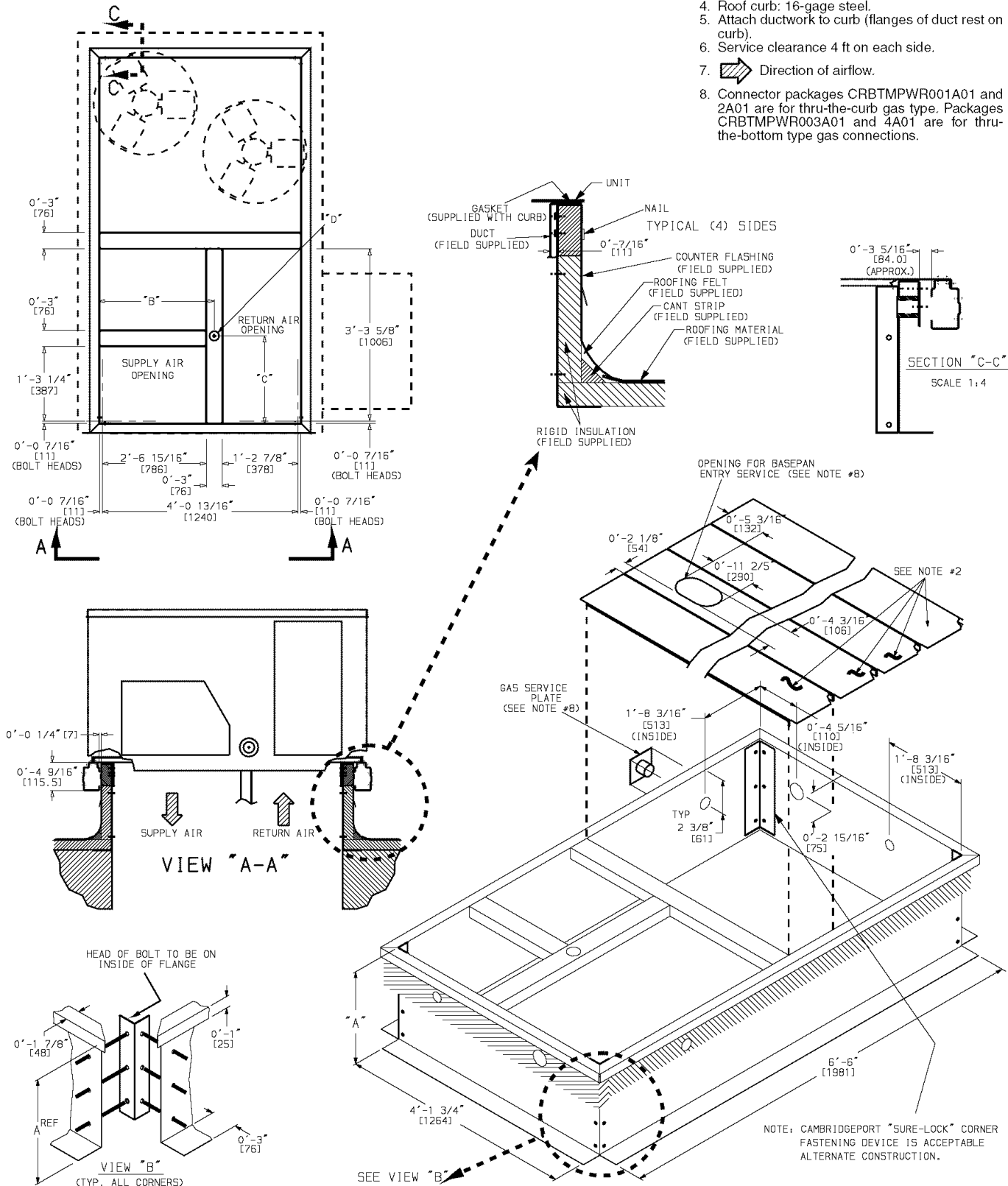
Fig. 1 — Horizontal Conversion Panels

CONNECTOR PKG. ACCY.	B	C	D ALT DRAIN HOLE	GAS	POWER	CONTROL
CRBTMPWR001A01	2'-87 $\frac{1}{16}$ " [827]	1'-10 $\frac{5}{16}$ " [583]	1 $\frac{3}{4}$ " [44.5]	3/4" [19] NPT	3/4" [19] NPT	1/2" [12.7] NPT
CRBTMPWR002A01				1/2" [12.7] NPT	1 1/4" [31.7]	1/2" [12.7] NPT
CRBTMPWR003A01				3/4" [19] NPT	3/4" [19] NPT	1/2" [12.7] NPT
CRBTMPWR004A01				1 1/4" [31.7]	1 1/4" [31.7]	1/2" [12.7] NPT

ROOF CURB ACCESSORY	"A"	UNIT SIZE
CRRFCURB003A01	1'-2" [356]	48HJ008-014
CRRFCURB004A01	2'-0" [610]	

NOTES:

1. Roof curb accessory is shipped disassembled.
2. Insulated panels: 1-in. thick polyurethane foam, 1 $\frac{3}{4}$ lb density.
3. Dimensions in [] are in millimeters.
4. Roof curb: 16-gage steel.
5. Attach ductwork to curb (flanges of duct rest on curb).
6. Service clearance 4 ft on each side.
7.  Direction of airflow.
8. Connector packages CRBTMPWR001A01 and 2A01 are for thru-the-curb gas type. Packages CRBTMPWR003A01 and 4A01 are for thru-the-bottom type gas connections.



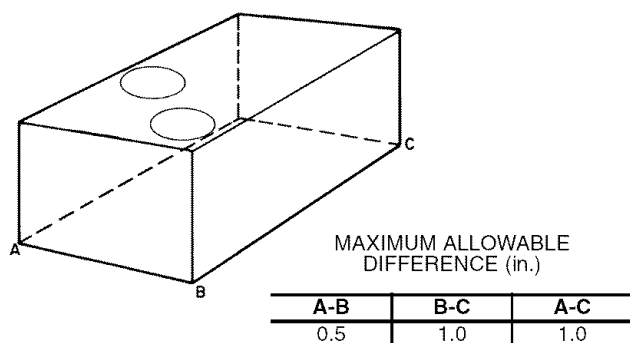


Fig. 3 — Unit Leveling Tolerances

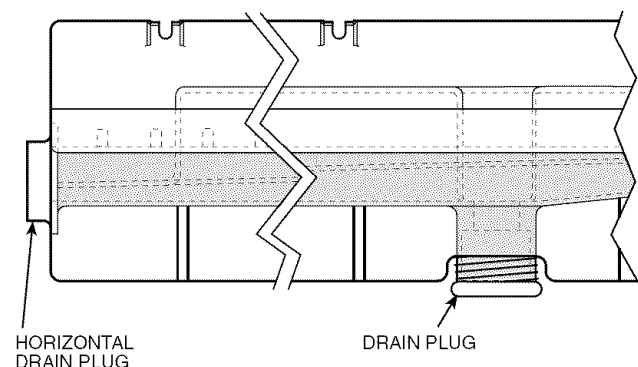
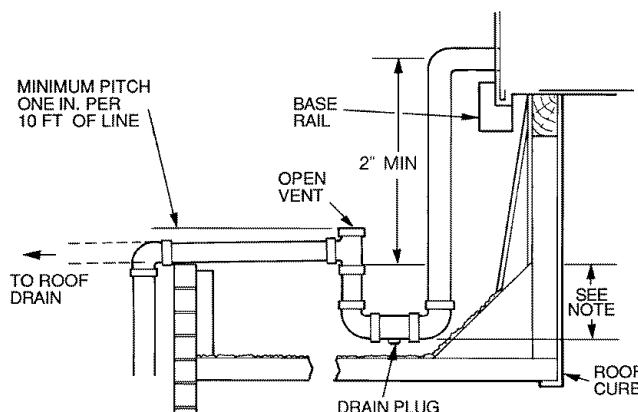


Fig. 4 — Condensate Drain Pan



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

Fig. 5 — Condensate Drain Piping Details

Step 4 — Rig and Place Unit — Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 6 for additional information. Operating weight is shown in Table 1 and Fig. 6.

Lifting holes are provided in base rails as shown in Fig. 6 and 7. 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. 7.

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

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

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

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

Position unit on roof curb so that the following clearances are maintained: $\frac{1}{4}$ -in. clearance between the roof curb and the base rail inside the front and rear, 0.0 in. clearance between the roof curb and the base rail inside on the duct end of the unit. This will result in the distance between the roof curb and the base rail inside on the condenser end of the unit being approximately equal to Fig. 2, section C-C.

Locate mechanical draft system flue assembly at least 48 in. from an adjacent building or combustible material. Units having accessory flue discharge deflector require only 18 in. clearance. When unit is located adjacent to public walkways, flue assembly must be at least 7 ft above grade.

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

Adequate combustion and ventilation 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 Fire Protection Association), ANSI (American National Standards Institute) Z223.1-latest year and addendum Z223.1A-latest year. In Canada, installation must be in accordance with the CAN1.B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

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

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

Step 5 — Install Flue Hood — Flue hood is shipped screwed to the burner compartment access panel. Remove from shipping location and, using screws provided, install flue hood and screen in location shown in Fig. 7 and 8.

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-latest year and addendum Z223.1A-latest year entitled NFPA. In Canada, installation must be in accordance with the CAN1.B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

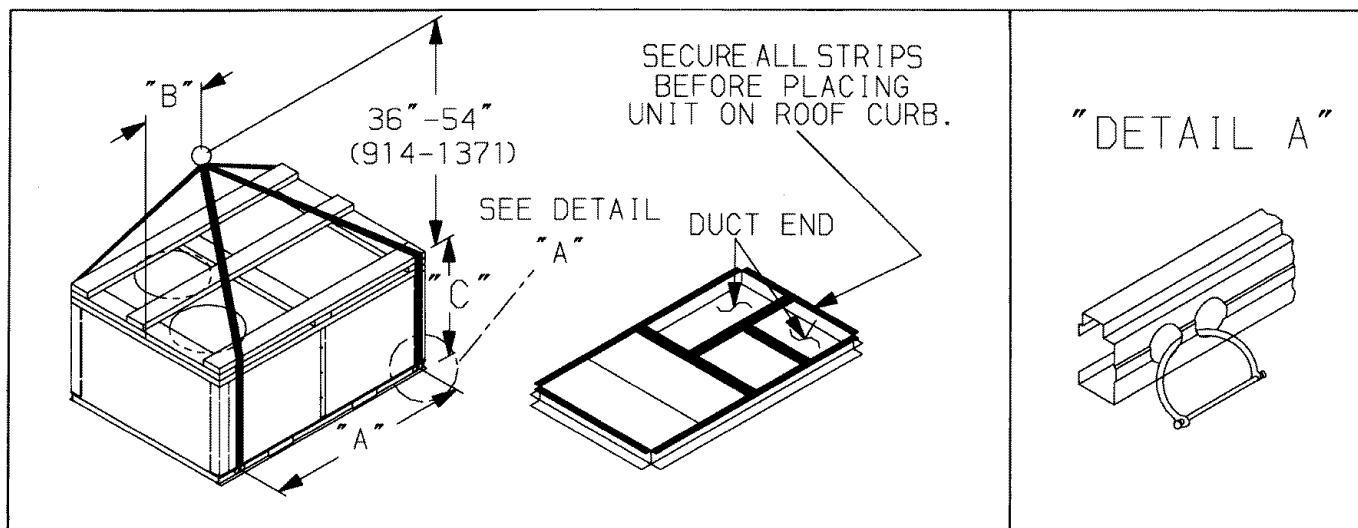
For natural gas applications, gas pressure at unit gas connection must not be less than 4.0 in. wg or greater than 13.0 in. wg while unit is operating. For liquid propane and high heat applications, the gas pressure must not be less than 5.0 in. wg or greater than 13.0 in. wg at the unit connection.

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

Support gas piping as shown in the table in Fig. 9. For example, a $\frac{3}{4}$ -in. gas pipe must have one field-fabricated support beam every 8 ft. Therefore, an 18-ft long gas pipe would have a minimum of 3 support beams. See Fig. 9 for typical pipe guide and locations of external manual gas shutoff valve.

⚠ WARNING

When connecting the gas line to the unit gas valve, the installer **MUST** use a backup wrench to prevent valve damage.



NOTES:

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

48HJ	OPERATING WEIGHT		"A"		"B"		"C"	
	lb	kg	in.	mm	in.	mm	in.	mm
008	870	395	77.42	1967	41.5	1054	42.12	1070
009	1015	460	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.

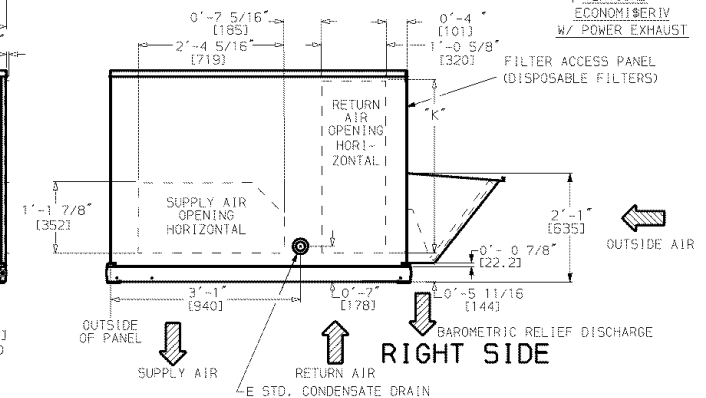
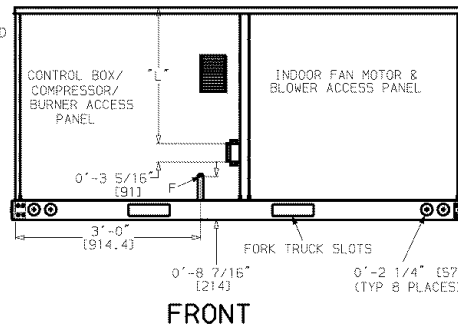
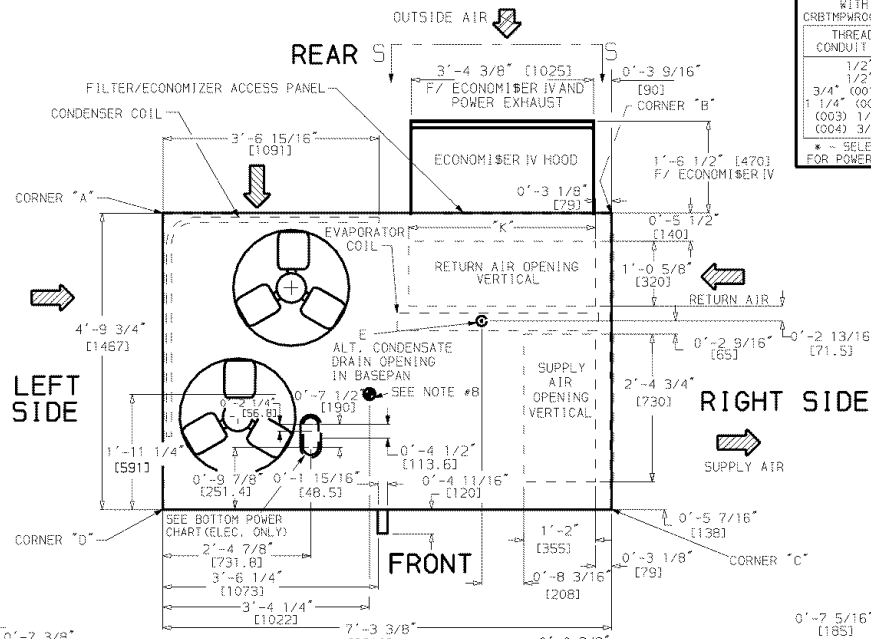
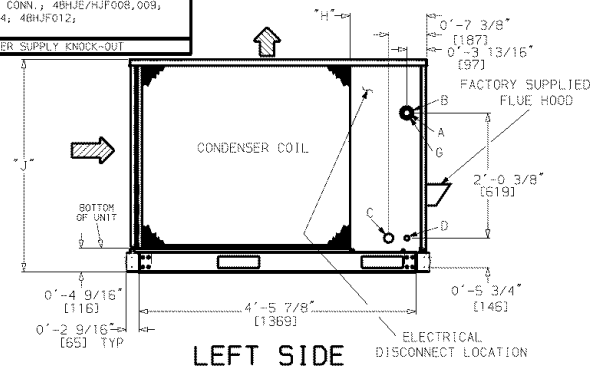
Fig. 6 — Rigging Details

UNIT	STD. UNIT WEIGHT		ECONOMIZER UNIT WEIGHT		VERT. ECONOMIZER W/ P.E. WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		"H"		"J"		"K"		"L"	
	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG	FT - IN.	MM	FT - IN.	MM	FT - IN.	MM	FT - IN.	MM
48HJ008	870	395	75	34.1	145	65.9	189	86	161	73	239	109	280	127	2'-0 7/8"	632	3'-5 5/16"	1050	2'-9 11/16"	856	2'-2 7/16"	672
48HJ009	1015	460					223	101	188	85	279	126	327	148	1'-2 7/8"	378	4'-1 5/16"	1253	3'-0 3/8"	924	2'-10 7/16"	875
48HJ012	1035	469					225	102	192	87	285	129	333	151	1'-2 7/8"	378	4'-1 5/16"	1253	3'-0 3/8"	924	2'-10 7/16"	875
48HJ014	1050	476					228	103	195	88	289	131	338	153	1'-2 7/8"	378	4'-1 5/16"	1253	3'-0 3/8"	924	2'-10 7/16"	875

NOTES:

- DIMENSIONS IN () ARE IN MILLIMETERS.
- CENTER OF GRAVITY.
- DIRECTION OF AIR FLOW.
- ON VERTICAL DISCHARGE UNITS, DUCTWORK TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY; FOR HORIZONTAL DISCHARGE UNITS FIELD SUPPLIED FLANGES SHOULD BE ATTACHED TO HORIZONTAL DISCHARGE OPENINGS, AND ALL DUCTWORK SHOULD BE ATTACHED TO THE FLANGES.
- MINIMUM CLEARANCE (LOCAL CODES OR JURISDICTION MAY PREVAIL):
 - BETWEEN UNIT, FLUE SIDE AND COMBUSTIBLE SURFACES, 48 INCHES, 18 INCHES WHEN USING ACCESSORY FLUE DISCHARGE DEFLECTOR.
 - BOTTOM OF UNIT TO COMBUSTIBLE SURFACES (WHEN NOT USING CURB) 0 INCHES.
 - CONDENSER COIL, FOR PROPER AIR FLOW, 36 INCHES ONE SIDE, 12 INCHES THE OTHER, THE SIDE GETTING THE GREATER CLEARANCE IS OPTIONAL.
 - OVERHEAD, 60 INCHES TO ASSURE PROPER CONDENSER FAN OPERATION.
 - BETWEEN UNITS, CONTROL BOX SIDE, 42 IN. PER NEC.
 - BETWEEN UNIT AND UNGROUNDED SURFACES, CONTROL BOX SIDE, 36 IN. PER NEC.
 - BETWEEN UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, CONTROL BOX SIDE, 42 IN. PER NEC.
 - HORIZONTAL SUPPLY AND RETURN END, 0 INCHES WHEN THE ALTERNATE CONDENSATE DRAIN IS USED.
- WITH THE EXCEPTION OF THE CLEARANCE FOR THE CONDENSER COIL AND COMBUSTION SIDE AS STATED IN NOTE #5o, b, AND c, A REMOVABLE FENCE OR BARRICADE REQUIRES NO CLEARANCE.
- UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM WOOD OR CLASS A, B, OR C ROOF COVERING MATERIAL IF SET ON BASE RAIL.
- THE VERTICAL CENTER OF GRAVITY IS 1'-7" [483] FOR 008, 1'-11" [584] FOR HJ009, 012 AND 014 UP FROM THE BOTTOM OF THE BASE RAIL.

CONNECTION SIZES	
A	1/2" DIA. (35) FIELD POWER SUPPLY HOLE
B	2 1/2" DIA. (64) POWER SUPPLY KNOCK-OUT
C	1 3/4" DIA. (44) CHARGING PORT HOLE
D	7/8" DIA. (22) FIELD CONTROL WIRING HOLE
E	3/4" -14 NPT CONDENSATE DRAIN
F	1/2" -14 NPT GAS CONN.; 48HJ008, 009;
G	3/4" -14 NPT GAS CONN.; 48HJ009, 012, 014;
H	48HJ012, 014, 48HJ012;
I	2" DIA. (51) POWER SUPPLY KNOCK-OUT



BOTTOM POWER CHART: THESE HOLES REQ'D FOR USE WITH ACCESSORY PACKAGES - CRBTMPWR001A01, 2A01, 3A01, OR 4A01		
THREADED CONDUIT SIZE	WIRE USE	REQ'D HOLE SIZES (MAX.)
1/2"	ACC. 24V	7/8" [22.2]
3/4"	POWER	1 1/8" [28.4]
1 1/4"	POWER	1 3/4" [44.4]
(003) 1/2" FPT	GAS	1 1/4" [31.8]
(004) 3/4" FPT	GAS	1 5/8" [41.3]

* - SELECT EITHER 3/4" OR 1 1/4" FOR POWER, DEPENDING ON WIRE SIZE.

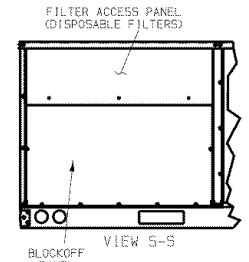


Fig. 7 — Base Unit Dimensions

Table 1 — Physical Data

UNIT SIZE 48HJ		D/E/F008	D/E/F009	D/E/F012	D/E014
NOMINAL CAPACITY (tons)		7 ¹ / ₂	8 ¹ / ₂	10	12 ¹ / ₂
OPERATING WEIGHT (lb)					
Unit		870	1015	1035	1050
Humidi-MiZer™ Adaptive Dehumidification System		44	51	51	51
EconoMiSer IV		75	75	75	75
Roof Curb		143	143	143	143
COMPRESSOR		Scroll			
Quantity		2	2	2	2
Oil (oz) (each compressor)		53	50	50	60
REFRIGERANT TYPE		R-22			
Expansion Device		Acutrol™ Metering Device			
Operating Charge (lb-oz)					
Standard Unit					
Circuit 1		7-10	9- 8	9-6	9-8
Circuit 2		8- 2	8-13	10-9	9-5
Unit with Humidi-MiZer Adaptive Dehumidification System					
Circuit 1		17-0	19- 2	19-14	19-6
Circuit 2		18-3	19-10	20- 3	19-0
CONDENSER FAN		Propeller			
Quantity...Diameter (in.)		2...22	2...22	2...22	2...22
Nominal Cfm		6500	6500	7000	7000
Motor Hp...Rpm		1/4...1100	1/4...1100	1/4...1100	1/4...1100
Watts Input (Total)		650	650	650	650
CONDENSER COIL		Enhanced Copper Tubes, Aluminum Lanced Fins			
Rows...Fins/in.		2...17	2...17	2...17	2...17
Total Face Area (sq ft)		20.5	25.0	25.0	25.0
EVAPORATOR FAN		Centrifugal			
Size (in.)		15 x 15	15 x 15	15 x 15	15 x 15
Type Drive		Belt	Belt	Belt	Belt
Nominal Cfm		3000	3400	4000	5000
Maximum Continuous Bhp		Std 2.90	2.90	3.70	5.25
		Hi-Static 4.20	4.20	5.25	---
Motor Frame		56	56	56	56
Fan Rpm Range		Std 840-1085	840-1085	860-1080	830-1130
		Hi-Static 860-1080	860-1080	830-1130	---
Motor Bearing Type		Ball	Ball	Ball	Ball
Maximum Fan Rpm		2100	2100	2100	2100
Motor Pulley Pitch Diameter		Std 3.4/4.4	3.4/4.4	4.0/5.0	2.8/3.8
A/B (in.)		Hi-Static 4.0/5.0	4.0/5.0	2.8/3.8	---
Nominal Motor Shaft Diameter (in.)		7/8	7/8	7/8	7/8
Fan Pulley Pitch Diameter (in.)		Std 7.0	7.0	8.0	5.8
		Hi-Static 8.0	8.0	5.8	---
Belt — Type...Length (in.)		Std A...48	A...51	A...51	BX...46
		Hi-Static A...55	A...55	BX...46	---
Pulley Center Line Distance (in.)		16.75-19.25	16.75-19.25	15.85-17.50	15.85-17.50
Speed Change per Full Turn of		Std 50	50	45	60
Movable Pulley Flange (rpm)		Hi-Static 60	60	60	---
Movable Pulley Maximum Full		Std 5	5	5	6
Turns from Closed Position		Hi-Static 5	5	6	---
Factory Setting — Full Turns Open		Std 5	5	5	5
		Hi-Static 5	5	5	---
Factory Speed Setting (rpm)		Std 840	840	860	887
		Hi-Static 860	860	890	---
Fan Shaft Diameter at Pulley (in.)		1	1	1	1
EVAPORATOR COIL		Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Face-Split			
Standard Unit					
Rows...Fins/in.		3...15	4...15	4...15	4...15
Total Face Area (sq ft)		8.9	11.1	11.1	11.1
Unit with Humidi-MiZer Adaptive Dehumidification System					
Rows...Fins/in.		2...17	2...17	2...17	2...17
Total Face Area (sq ft)		6.3	8.4	8.4	8.4

LEGEND

Bhp — Brake Horsepower

*Indicates automatic reset.

†An LP kit is available as an accessory. Kit may be used at elevations as high as 2000 ft.

Table 1 — Physical Data (cont)

UNIT SIZE 48HJ	D/E/F008	D/E/F009	D/E/F012	D/E014
FURNACE SECTION				
Rollout Switch Cutout Temp (F)*	195	195	195	195
Burner Orifice Diameter (in. ...drill size)				
Natural Gas — Std	HJD .120...31 HJE .120...31 HJF .120...31	HJD .120...31 HJE .120...31 HJF .120...31	HJD .120...31 HJE .120...31 HJF .129...30	HJD .120...31 HJE .129...30
Liquid Propane — Alt†	HJD .096...41 HJE .096...41 HJF .096...41	HJD .096...41 HJE .096...41 HJF .096...41	HJD .096...41 HJE .096...41 HJF .102...38	HJD .096...41 HJE .102...38
Thermostat Heat Anticipator Setting (amps)				
Stage 1	HJD .14 HJE .14 HJF .14	HJD .14 HJE .14 HJF .14	HJD .14 HJE .14 HJF .14	HJD .14 HJE .14
Stage 2	HJD .14 HJE .20 HJF .20	HJD .14 HJE .20 HJF .20	HJD .20 HJE .20 HJF .20	HJD .20 HJE .20
Gas Input (Btuh)				
Stage 1	HJD 90,000 HJE 120,000 HJF 180,000	HJD 90,000 HJE 120,000 HJF 180,000	HJD 120,000 HJE 180,000 HJF 200,000	HJD 180,000 HJE 200,000
Stage 2	HJD 125,000 HJE 180,000 HJF 224,000	HJD 125,000 HJE 180,000 HJF 224,000	HJD 180,000 HJE 224,000 HJF 250,000	HJD 224,000 HJE 250,000
Efficiency (Steady State) (%)	HJD 82 HJE 82 HJF 82	HJD 82 HJE 82 HJF 82	HJD 82 HJE 82 HJF 80	HJD 82 HJE 80
Temperature Rise Range	HJD 20-50 HJE 35-65 HJF 45-75	HJD 20-50 HJE 35-65 HJF 45-75	HJD 35-65 HJE 35-65 HJF 40-70	HJD 35-65 HJE 40-70
Manifold Pressure (in. wg)				
Natural Gas — Std	3.5	3.5	3.5	3.5
Liquid Propane — Alt†	3.5	3.5	3.5	3.5
Field Gas Connection Size (in.)	HJD .50 HJE .75 HJF .75	HJD .50 HJE .75 HJF .75	HJD .75 HJE .75 HJF .75	HJD .75 HJE .75
HIGH-PRESSURE SWITCH (psig)	450 ± 50			
Standard Compressor Internal Relief	428			
Cutout	320			
Reset (Auto.)				
LOSS-OF-CHARGE SWITCH/LOW-PRESSURE SWITCH (Liquid Line) (psig)				
Cutout	7 ± 3			
Reset (Auto.)	22 ± 7			
FREEZE PROTECTION THERMOSTAT				
Opens (F)	30 ± 5			
Closes (F)	45 ± 5			
OUTDOOR-AIR INLET SCREENS	Cleanable. Screen quantity and size varies with option selected.			
RETURN-AIR FILTERS	Throwaway			
Quantity...Size (in.)	4...16 x 20 x 2	4...20 x 20 x 2	4...20 x 20 x 2	4...20 x 20 x 2

LEGEND

Bhp — Brake Horsepower
LP — Liquid Propane

*Indicates automatic reset.

†An LP kit is available as an accessory. Kit may be used at elevations as high as 2000 ft.

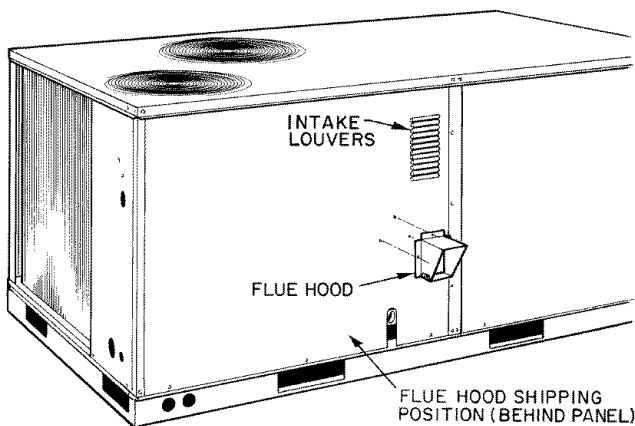
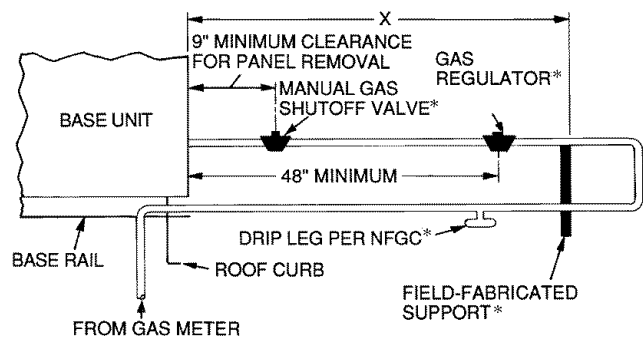


Fig. 8 — Flue Hood Details



LEGEND

NFGC — National Fuel Gas Code

*Field supplied.

NOTE: Follow all local codes.

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

Fig. 9 — Gas Piping Guide (With Accessory Thru-the-Curb Service Connections)

⚠ WARNING

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

Install conduit through side panel openings indicated in Fig. 7. Route power lines through connector to terminal connections as shown in Fig. 10.

Route thermostat cable or equivalent single leads of colored wire from thermostat subbase terminals to low-voltage connections on unit (shown in Fig. 11A and 11B) as described in Steps 1-4 below.

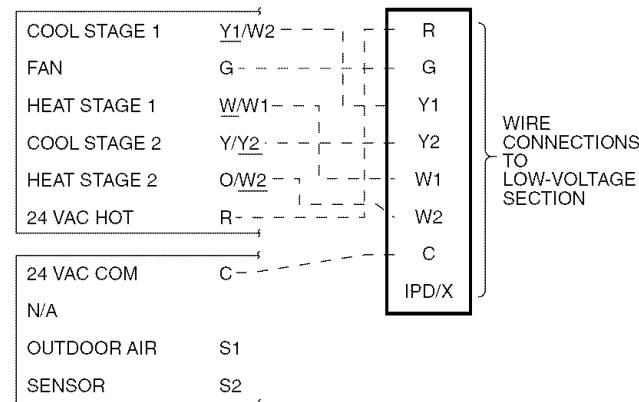
1. If unit is mounted on roof curb and accessory thru-the-bottom connections are used, route wire through connection plate.
2. Pass control wires through the hole provided on unit (see connection D, Connection Sizes table, Fig. 7).
3. Feed wires through the raceway built into the corner post to the 24-v barrier located on the left side of the control box. See Fig. 12. The raceway provides the UL-required clearance between high-voltage and low-voltage wiring.
4. Connect thermostat wires to screw terminals of low-voltage connection board (see Fig. 11A and 11B).



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

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

HEAT ANTICIPATOR SETTINGS — On 48HJ008 and 009 units, set heat anticipator settings at 0.14 amp for both first and second stage heating for low heat. For all other stages and unit sizes, set heat anticipator settings at 0.14 amp for first stage and 0.20 amp for second-stage heating.



THERMOSTAT DIPSWITCH SETTINGS



LEGEND

----- Field Wiring

NOTE: Underlined letter indicates active thermostat output when configured for A/C operation.

Fig. 11A — Standard Low-Voltage Connections

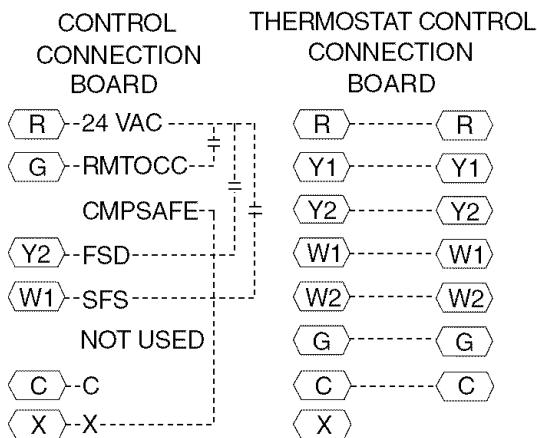


Fig. 11B — Low Voltage Connections (Units with PremierLink™ Controls)

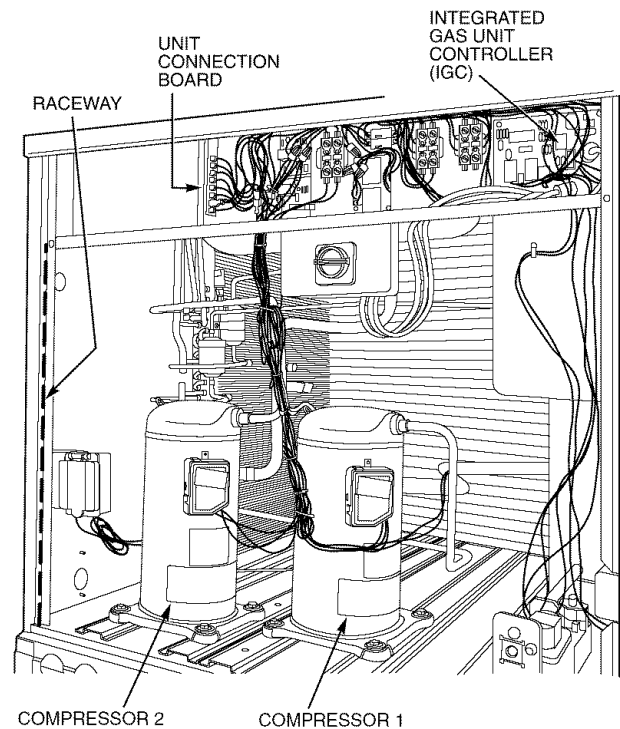


Fig. 12 — Field Control Wiring Raceway

Step 8 — Adjust Factory-Installed Options

HUMIDI-MIZER™ ADAPTIVE DEHUMIDIFICATION SYSTEM — Humidi-MiZer adaptive dehumidification system operation can be controlled by field installation of a Carrier-approved humidistat (Fig. 13).

NOTE: A light commercial Thermidstat™ device (Fig. 14) can be used instead of the humidistat if desired. The Thermidstat device includes a thermostat and a humidistat. The humidistat is normally used in applications where a temperature sensor is already provided (units with PremierLink™ control).

To install the humidistat:

1. Route humidistat cable through hole provided in unit corner post.
2. 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. 12. The raceway provides the UL-required clearance between high-voltage and low-voltage wiring.
3. Use a wire nut to connect humidistat cable into low-voltage wiring as shown in Fig. 15.

To install a Thermidstat device:

1. Route Thermidstat cable through the hole provided in unit corner post.
2. Feed the 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. 12. The raceway provides the UL-required clearance between high and low voltage wiring.
3. A field-supplied relay must be installed between the thermidstat and the Humidi-MiZer circuit (recommended relay: HN612KK324). The relay coil is connected between the DEHUM output and C (common) of the unit. Refer to Fig. 16. The relay controls the Humidi-MiZer solenoid valve and must be wired between the Humidi-MiZer fuse and the low-pressure switch. Refer to the installation instructions included with the Carrier Light Commercial Thermidstat device for more information.

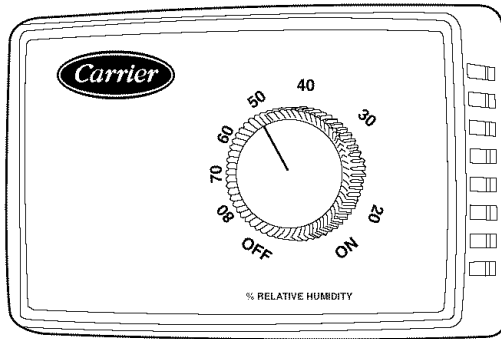


Fig. 13 — Accessory Field-Installed Humidistat

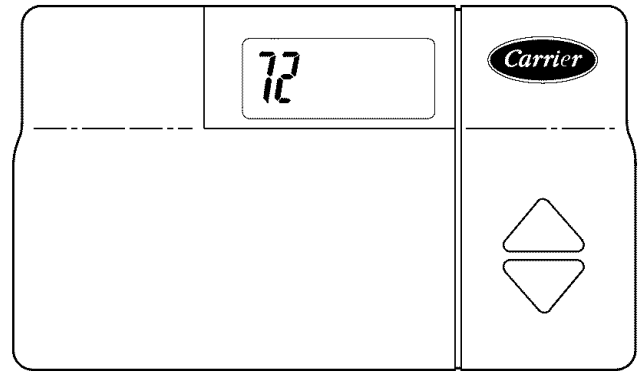
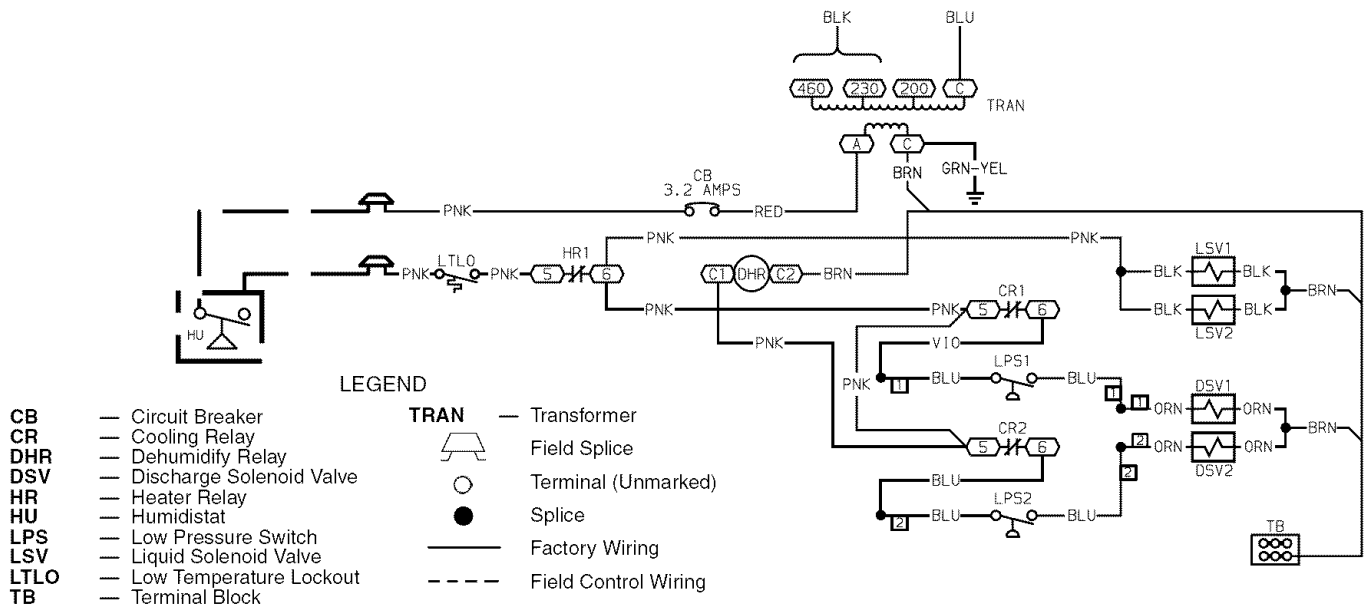


Fig. 14 — Light Commercial Thermidistat™ Device



NOTE: The Humidi-MiZer circuit is active when both LLSV1 and LLSV2 are energized.

Fig. 15 — Typical Humidi-MiZer™ Adaptive Dehumidification System Humidistat Wiring (208/230-v Unit Shown)

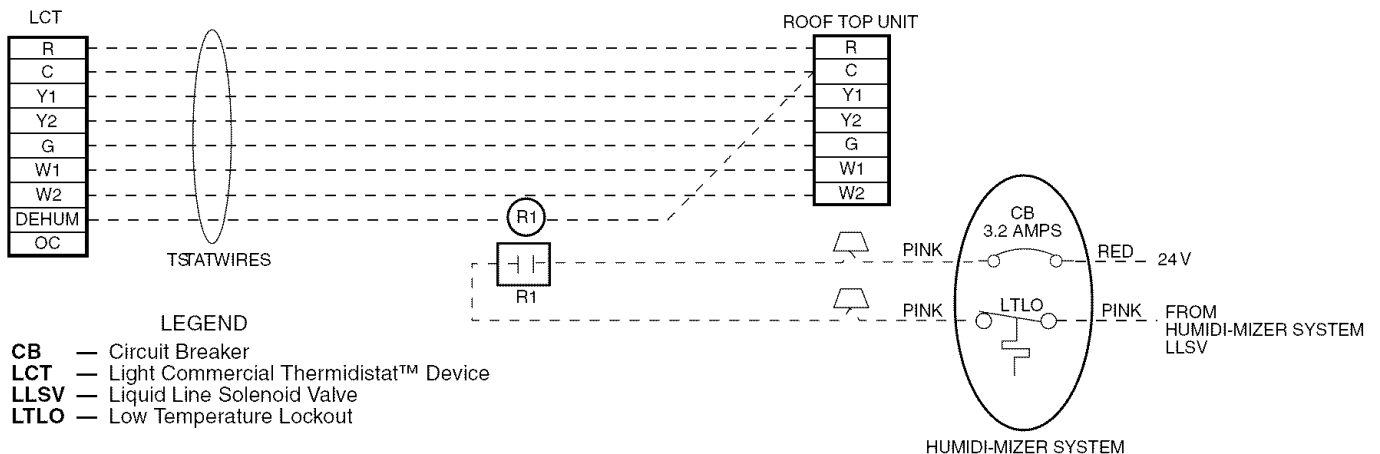


Fig. 16 — Typical Rooftop Unit with Humidi-MiZer Adaptive Dehumidification System Wiring with Thermidistat Device

Table 2A — Electrical Data (Standard Motor Units Without Electrical Convenience Outlet)

UNIT 48HJ	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR (each)			OFM (each)	IFM	COMBUSTION FAN MOTOR	POWER SUPPLY*		MINIMUM UNIT DISCONNECT SIZE†	
		Min	Max	Qty	RLA	LRA	FLA	FLA	FLA	MCA	MOCP**	FLA	LRA
008 (7½ Tons)	208/230-3-60	187	254	2	12.4	88.0	1.4	7.5	.60	38.2/38.2	45/45	40/40	242/242
	460-3-60	414	508		6.4	44.0	0.7	3.4	.30	19.2	25	20	121
	575-3-60	518	632		4.8	34.0	0.7	3.4	.30	14.6	20	15	95
009 (8½ Tons)	208/230-3-60	187	254	2	13.4	105.0	1.4	7.5	.60	40.2/40.2	45/45	42/42	276/276
	460-3-60	414	508		7.4	55.0	0.7	3.4	.30	21.5	25	23	143
	575-3-60	518	632		6.4	44.0	0.7	3.4	.30	18.2	20	19	115
012 (10 Tons)	208/230-3-60	187	254	2	17.6	125.0	1.4	10.6	.60	53/53	60/60	56/56	341/341
	460-3-60	414	508		8.3	62.5	0.7	4.8	.30	24.9	30	26	171
	575-3-60	518	632		6.3	50.0	0.7	4.8	.30	19.1	25	20	136
014 (12½ Tons)	208/230-3-60	187	254	2	19.0	156.0	1.4	15.0	.60	60.6/60.6	70/70††	64/64	426/426
	460-3-60	414	508		9.0	75.0	0.7	7.4	.30	29.1	35	31	207
	575-3-60	518	632		7.4	54.0	0.7	7.4	.30	23.7	30	25	154

Table 2B — Electrical Data (Standard Motor Units With Electrical Convenience Outlet)

UNIT 48HJ	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR (each)			OFM (each)	IFM	COMBUSTION FAN MOTOR	POWER SUPPLY WITH OUTLET*		MINIMUM UNIT DISCONNECT SIZE†	
		Min	Max	Qty	RLA	LRA	FLA	FLA	FLA	MCA	MOCP**	FLA	LRA
008 (7½ Tons)	208/230-3-60	187	254	2	12.4	88.0	1.4	7.5	.60	44.2/44.2	50/50	46/46	247/247
	460-3-60	414	508		6.4	44.0	0.7	3.4	.30	21.9	25	23	123
	575-3-60	518	632		4.8	34.0	0.7	3.4	.30	16.8	20	17	95
009 (8½ Tons)	208/230-3-60	187	254	2	13.4	105.0	1.4	7.5	.60	46.2/46.2	50/50	48/48	281/281
	460-3-60	414	508		7.4	55.0	0.7	3.4	.30	24.2	30	25	145
	575-3-60	518	632		6.4	44.0	0.7	3.4	.30	20.4	25	21	116
012 (10 Tons)	208/230-3-60	187	254	2	17.6	125.0	1.4	10.6	.60	59/59	70/70††	61/61	345/345
	460-3-60	414	508		8.3	62.5	0.7	4.8	.30	27.6	30	29	173
	575-3-60	518	632		6.3	50.0	0.7	4.8	.30	21.3	25	22	138
014 (12½ Tons)	208/230-3-60	187	254	2	19.0	156.0	1.4	15.0	.60	66.6/66.6	70/70††	70/70	431/431
	460-3-60	414	508		9.0	75.0	0.7	7.4	.30	31.8	35	33	209
	575-3-60	518	632		7.4	54.0	0.7	7.4	.30	25.9	30	27	156

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
NEC — National Electrical Code
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps
UL — Underwriters' Laboratories



Maximum deviation is 7 v.

Determine percent of voltage imbalance.

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

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

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

POWER EXHAUST ELECTRICAL DATA

POWER EXHAUST PART NO.	MCA (230 v)	MCA (460 v)	MCA (575 v)	MOCP (for separate power source)
CRPWREXH021A01	N/A	0.9	N/A	15
CRPWREXH022A01	3.3	N/A	1.32	15
CRPWREXH023A01	N/A	1.8	N/A	15
CRPWREXH028A01	1.7	N/A	0.68	15
CRPWREXH029A01	N/A	1.0	N/A	15
CRPWREXH030A01	1.6	N/A	0.64	15

N/A — Not available

NOTE: If a single power source is to be used, size wire to include power exhaust MCA and MOCP.

Check MCA and MOCP when power exhaust is powered through the unit. Determine the new MCA including the power exhaust using the following formula:

MCA New = MCA unit only + MCA of Power Exhaust

For example, using a 48HJD008 unit with MCA = 38.2 and MOCP = 45, with CRPWREXH030A01 power exhaust.

MCA New = 38.2 amps + 1.6 amps = 39.8 amps

If the new MCA does not exceed the published MOCP, then MOCP would not change. The MOCP in this example is 45 amps and the MCA New is below 45; therefore the MOCP is acceptable. If "MCA New" is larger than the published MOCP, raise the MOCP to the next larger size. For separate power, the MOCP for the power exhaust will be 15 amps per NEC.

*The values listed in this table do not include power exhaust. See table at right for power exhaust requirements.

†Used to determine minimum disconnect per NEC.

**Fuse or HACR circuit breaker.

††Fuse only.

NOTES:

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The UL, Canada units may be fuse or circuit breaker.

2. Electrical data based on 95 F ambient outdoor-air temperature ± 10% voltage.

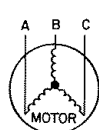
3. Unbalanced 3-Phase Supply Voltage

Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percent of voltage imbalance.

% Voltage Imbalance

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

Example: Supply voltage is 460-3-60.



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

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

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage.

(AB) 457 - 452 = 5 v

(BC) 464 - 457 = 7 v

(AC) 457 - 455 = 2 v

Table 2C — Electrical Data (High-Static Motor Units Without Electrical Convenience Outlet)

UNIT 48HJ	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR (each)			OFM (each)	IFM	COMBUSTION FAN MOTOR	POWER SUPPLY*		MINIMUM UNIT DISCONNECT SIZE†	
		Min	Max	Qty	RLA	LRA	FLA	FLA	RLA	MCA	MOCP**	FLA	LRA
008	208/230-3-60	187	254	2	12.4	88.0	1.4	10.6	0.6	41.3	45	44	267
	460-3-60	414	508		6.4	44.0	0.7	4.8	0.3	20.6	25	22	134
	575-3-60	632	518		4.8	34.0	0.7	4.8	0.3	15.8	20	17	104
009	208/230-3-60	187	254	2	13.4	105.0	1.4	10.6	0.6	43.3	50	46	301
	460-3-60	414	508		7.4	55.0	0.7	4.8	0.3	22.9	25	24	156
	575-3-60	518	632		6.4	44.0	0.7	4.8	0.3	18.2	20	19	115
012	208/230-3-60	187	254	2	17.6	125.0	1.4	15.0	0.6	57.4	70††	61	364
	460-3-60	414	508		8.3	62.5	0.7	7.4	0.3	27.5	30	29	182
	575-3-60	518	632		6.3	50.0	0.7	7.4	0.3	21.7	25	23	146

Table 2D — Electrical Data (High-Static Motor Units With Electrical Convenience Outlet)

UNIT 48HJ	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR (each)			OFM (each)	IFM	COMBUSTION FAN MOTOR	POWER SUPPLY*		MINIMUM UNIT DISCONNECT SIZE†	
		Min	Max	Qty	RLA	LRA	FLA	FLA	RLA	MCA	MOCP**	FLA	LRA
008	208/230-3-60	187	254	2	12.4	88.0	1.4	10.6	0.6	47.3	50	49	271
	460-3-60	414	508		6.4	44.0	0.7	4.8	0.3	23.3	25	24	136
	575-3-60	518	632		4.8	34.0	0.7	4.8	0.3	17.9	20	19	104
009	208/230-3-60	187	254	2	13.4	105.0	1.4	10.6	0.6	49.3	60	51	305
	460-3-60	414	508		7.4	55.0	0.7	4.8	0.3	25.6	30	27	158
	575-3-60	518	632		6.4	44.0	0.7	4.8	0.3	21.5	25	22	126
012	208/230-3-60	187	254	2	17.6	125.0	1.4	15.0	0.6	63.4	70††	66	369
	460-3-60	414	508		8.3	62.5	0.7	7.4	0.3	30.2	35	32	184
	575-3-60	518	632		6.3	50.0	0.7	7.4	0.3	23.4	25	25	148

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
NEC — National Electrical Code
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps
UL — Underwriters' Laboratories



*The values listed in this table do not include power exhaust. See table at right for power exhaust requirements.
 †Used to determine minimum disconnect per NEC.
 **Fuse or HACR circuit breaker.
 ††Fuse only.

NOTES:

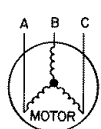
- In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The UL, Canada units may be fuse or circuit breaker.
- Electrical data based on 95 F ambient outdoor-air temperature $\pm$ 10% voltage.
- 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 percent of voltage imbalance.

% Voltage Imbalance

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

Example: Supply voltage is 460-3-60.



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

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

Determine maximum deviation from average voltage.

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

Maximum deviation is 7 v.

Determine percent of voltage imbalance.

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

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

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

POWER EXHAUST ELECTRICAL DATA

POWER EXHAUST PART NO.	MCA (230 v)	MCA (460 v)	MCA (575 v)	MOCP (for separate power source)
CRPWREXH021A01	N/A	0.9	N/A	15
CRPWREXH022A01	3.3	N/A	1.32	15
CRPWREXH023A01	N/A	1.8	N/A	15
CRPWREXH028A01	1.7	N/A	0.68	15
CRPWREXH029A01	N/A	1.0	N/A	15
CRPWREXH030A01	1.6	N/A	0.64	15

N/A — Not available

NOTE: If a single power source is to be used, size wire to include power exhaust MCA and MOCP.

Check MCA and MOCP when power exhaust is powered through the unit. Determine the new MCA including the power exhaust using the following formula:

MCA New = MCA unit only + MCA of Power Exhaust

For example, using a 48HJD008 unit with MCA = 38.2 and MOCP = 45, with CRPWREXH030A01 power exhaust.

MCA New = 38.2 amps + 1.6 amps = 39.7 amps

If the new MCA does not exceed the published MOCP, then MOCP would not change. The MOCP in this example is 45 amps and the MCA New is below 45; therefore the MOCP is acceptable. If "MCA New" is larger than the published MOCP, raise the MOCP to the next larger size. For separate power, the MOCP for the power exhaust will be 15 amps per NEC.

CONVENIENCE OUTLET — An optional convenience outlet provides power for rooftop use. For maintenance personnel safety, the convenience outlet power is off when the unit disconnect is off. Adjacent unit outlets may be used for service tools. An optional “Hot Outlet” is available from the factory as a special order item.

NOVAR CONTROLS — Optional Novar controls (ETM 3051) are available for replacement or new constructions jobs.

MANUAL OUTDOOR-AIR DAMPER — The outdoor-air hood and screen are attached to the basepan at the bottom of the unit for shipping.

Assembly:

1. Determine quantity of ventilation required for building. Record amount 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 the filter access panel. Remove outdoor-air opening panel. Save panels and screws. See Fig. 17.
3. Separate hood and screen from basepan by removing the screws and brackets securing them. Save all screws and discard brackets.
4. Replace outdoor air opening panel with screws saved from Step 2.
5. Place hood on front of outdoor-air opening panel. See Fig. 18 for hood details. Secure top of hood with the 6 screws removed in Step 3. See Fig. 19.
6. Remove and save 6 screws (3 on each side) from sides of the manual outdoor-air damper.
7. Align screw holes on hood with screw holes on side of manual outdoor-air damper. See Fig. 18 and 19. Secure hood with 6 screws from Step 6.
8. Adjust minimum position setting of the damper blade by adjusting the manual outdoor-air adjustment screws on the front of the damper blade. See Fig. 17. Slide blade vertically until it is in the appropriate position determined by Fig. 20. Tighten screws.
9. Remove and save screws currently on sides of hood. Insert screens. Secure screens to hood using the screws. See Fig. 19.
10. Replace filter access panel. Ensure filter access panel slides along the tracks and is securely engaged.

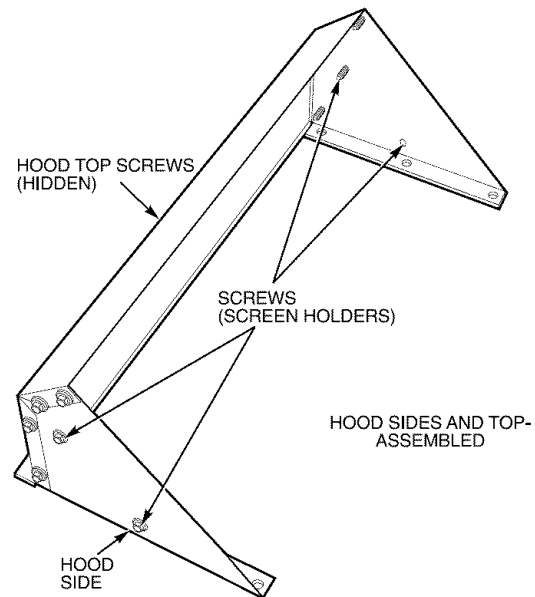


Fig. 18 — Outdoor-Air Hood Details

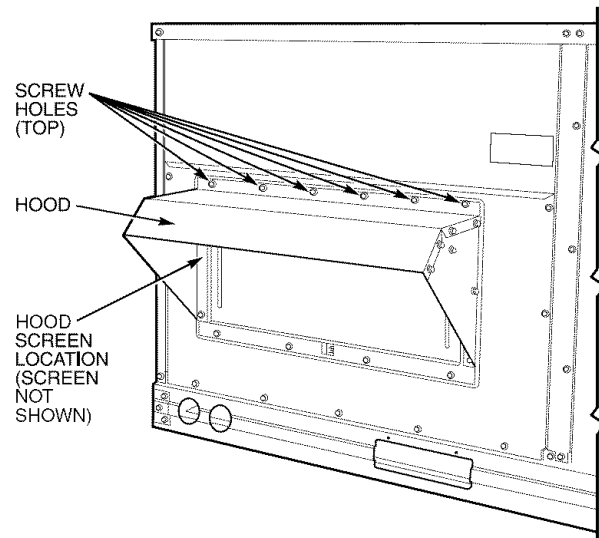


Fig. 19 — Optional Manual Outdoor-Air Damper with Hood Attached

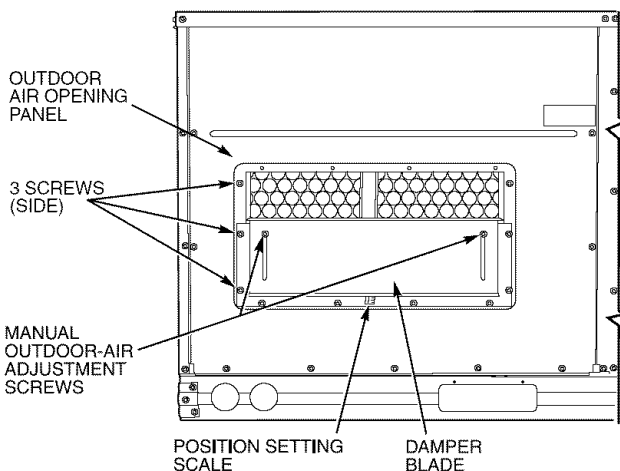


Fig. 17 — Damper Panel with Manual Outdoor-Air Damper Installed

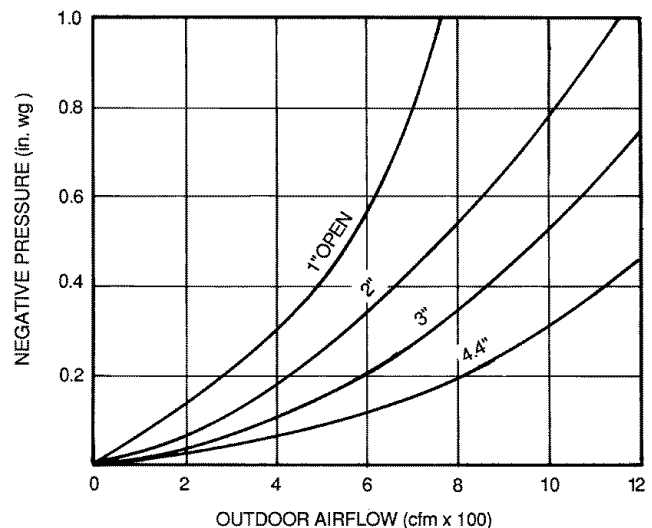


Fig. 20 — Outdoor-Air Damper Position Setting

PREMIERLINK™ CONTROL — The PremierLink controller is compatible with Carrier Comfort Network® (CCN) devices. This control is designed to allow users the access and ability to change factory-defined settings, thus expanding the function of the standard unit control board. Carrier's diagnostic standard tier display tools such as Navigator or Scrolling Marquee can be used with the PremierLink controller.

The PremierLink controller (see Fig. 21A and 21B) requires the use of a Carrier electronic thermostat or a CCN connection for time broadcast to initiate its internal timeclock. This is necessary for broadcast of time of day functions (occupied/unoccupied). No sensors are supplied with the field-mounted PremierLink control. The factory-installed PremierLink control includes only the supply-air sensor (SAT) and the outdoor air temperature sensor (OAT) as standard. An indoor air quality (CO₂) sensor can be added as an option. Refer to Table 3 for sensor usage. Refer to Fig. 22 for PremierLink controller wiring. The PremierLink control may be mounted in the control panel or an area below the control panel.

NOTE: PremierLink controller versions 1.3 and later are shipped in Sensor mode. If used with a thermostat, the PremierLink controller must be configured to Thermostat mode.

Install the Supply Air Temperature (SAT) Sensor — When the unit is supplied with a factory-mounted PremierLink control, the supply-air temperature (SAT) sensor (33ZCSENSAT) is factory-supplied and wired. The wiring is routed from the PremierLink control over the control box, through a grommet,

into the fan section, down along the back side of the fan, and along the fan deck over to the supply-air opening.

The SAT probe is wire-tied to the supply-air opening (on the horizontal opening end) in its shipping position. Remove the sensor for installation. Re-position the sensor in the flange of the supply-air opening or in the supply air duct (as required by local codes). Drill or punch a 1/2-in. hole in the flange or duct. Use two field-supplied, self-drilling screws to secure the sensor probe in a horizontal orientation.

NOTE: The sensor must be mounted in the discharge airstream downstream of the cooling coil and any heating devices. Be sure the probe tip does not come in contact with any of the unit or heat surfaces.

Outdoor Air Temperature (OAT) Sensor — When the unit is supplied with a factory-mounted PremierLink control, the outdoor-air temperature (OAT) sensor is factory-supplied and wired.

Install the Indoor Air Quality (CO₂) Sensor — Mount the optional indoor air quality (CO₂) sensor according to manufacturer specifications.

A separate field-supplied transformer must be used to power the CO₂ sensor.

Wire the CO₂ sensor to the COM and IAQI terminals of J5 on the PremierLink controller. Refer to the PremierLink control Installation, Start-Up, and Configuration Instructions for detailed wiring and configuration information.

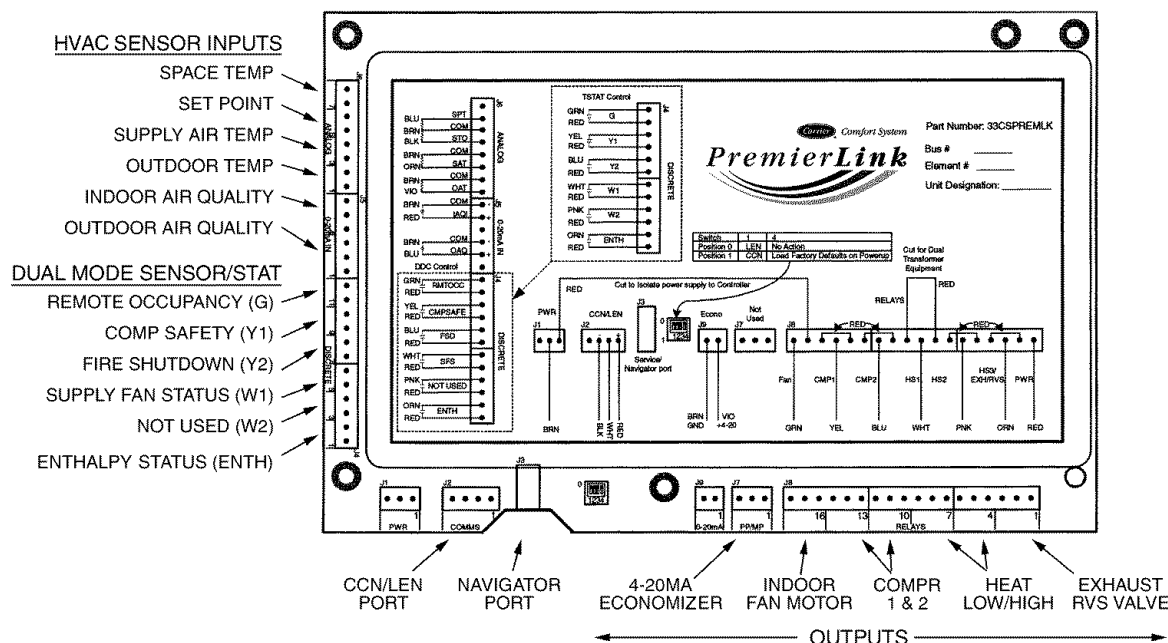


Fig. 21A — PremierLink Controller

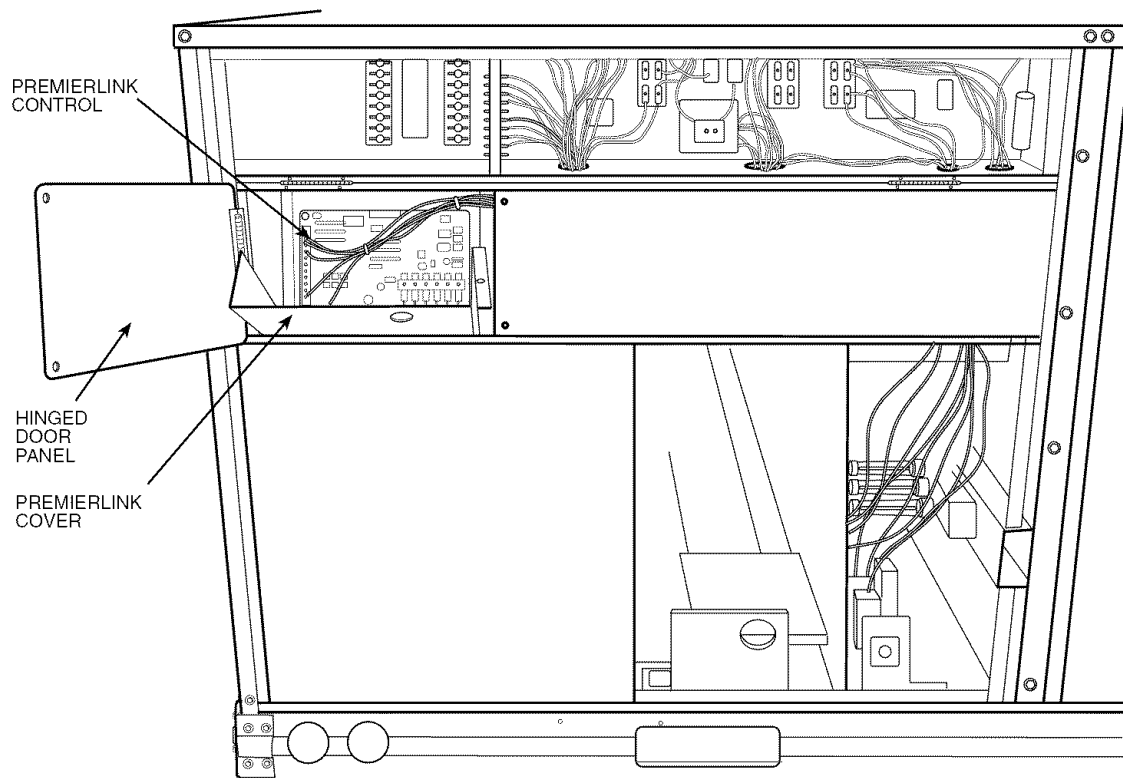


Fig. 21B — PremierLink™ Controller (Installed)

Table 3 — PremierLink Sensor Usage

APPLICATION	OUTDOOR AIR TEMPERATURE SENSOR	RETURN AIR TEMPERATURE SENSOR	OUTDOOR AIR ENTHALPY SENSOR	RETURN AIR ENTHALPY SENSOR
Differential Dry Bulb Temperature with PremierLink* (PremierLink requires 4-20 mA Actuator)	Included — CRTEMPSN001A00	Required — 33ZCT55SPT or Equivalent	—	—
Single Enthalpy with PremierLink* (PremierLink requires 4-20 mA Actuator)	Included — Not Used	—	Required — HH57AC077 or Equivalent	—
Differential Enthalpy with PremierLink* (PremierLink requires 4-20 mA Actuator)	Included — Not Used	—	Required — HH57AC077 or Equivalent	Required — HH57AC078 or Equivalent

*PremierLink control requires Supply Air Temperature sensor 33ZCSENSAT and Outdoor Air Temperature sensor HH79NZ017 — Included with factory-installed PremierLink control; field-supplied and field-installed with field-installed PremierLink control.

NOTES:

- CO₂ Sensors (Optional):
 - 33ZCSENSCO2 — Room sensor (adjustable). Aspirator box is required for duct mounting of the sensor.
 - 33ZCASPACO2 — Aspirator box used for duct-mounted CO₂ room sensor.
 - 33ZCT55CO2 — Space temperature and CO₂ room sensor with override.
 - 33ZCT56CO2 — Space temperature and CO₂ room sensor with override and set point.
- All units include the following Standard Sensors:
 - Outdoor-Air Sensor — 50HJ540569 — Opens at 67 F, closes at 52 F, not adjustable.
 - Mixed-Air Sensor — HH97AZ001 — (PremierLink control requires Supply Air Temperature sensor 33ZCSENSAT and Outdoor Air Temperature Sensor HH79NZ017)
 - Compressor Lockout Sensor — 50HJ540570 — Opens at 35 F, closes at 50 F.

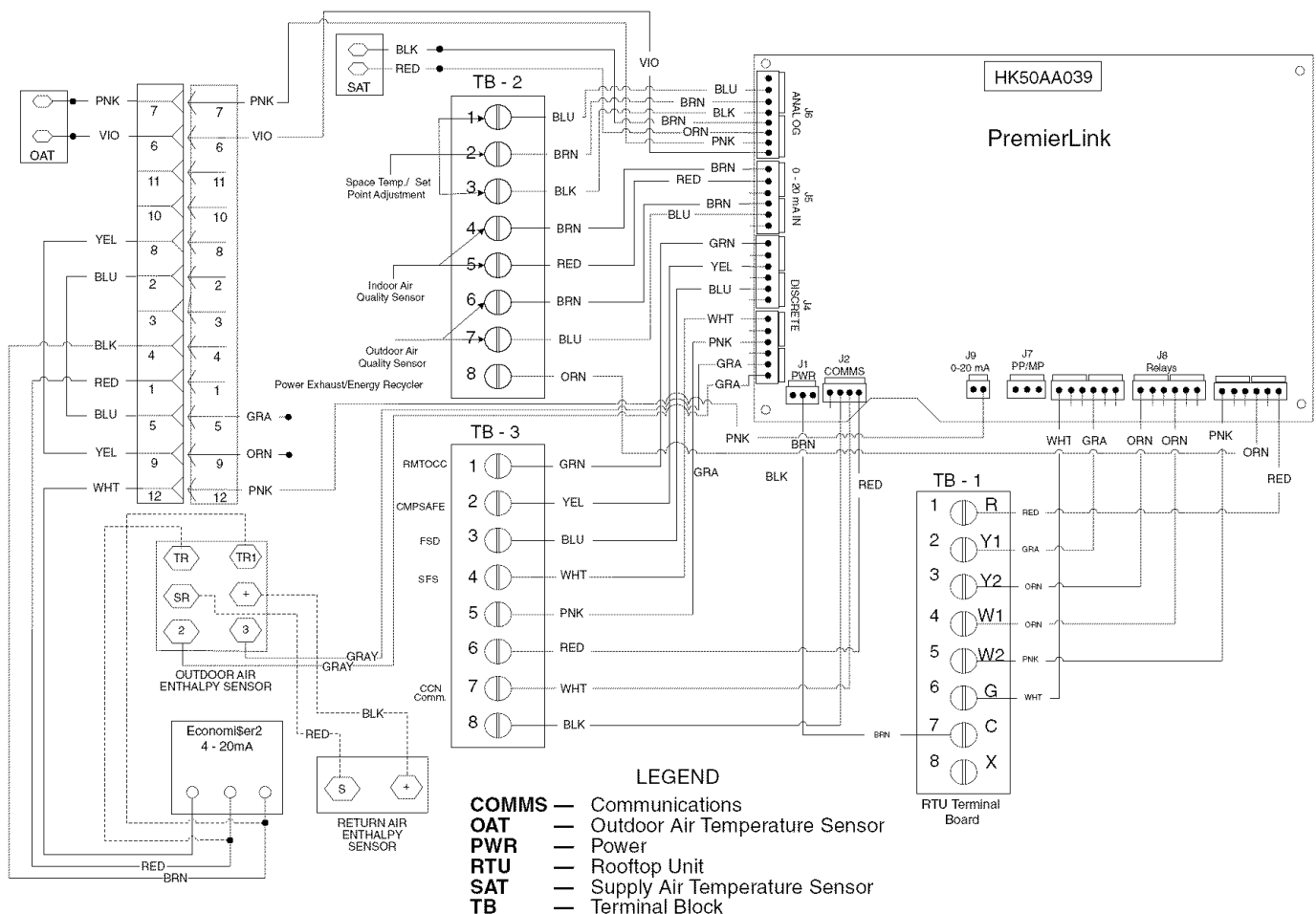


Fig. 22 — Typical PremierLink™ Controls Wiring

Enthalpy Sensors and Control — The enthalpy control (HH57AC077) is supplied as a field-installed accessory to be used with the EconoMiSer2 damper control option. The outdoor air enthalpy sensor is part of the enthalpy control. The separate field-installed accessory return air enthalpy sensor (HH57AC078) is required for differential enthalpy control.

NOTE: The enthalpy control must be set to the “D” setting for differential enthalpy control to work properly.

The enthalpy control receives the indoor and return air enthalpy from the outdoor and return air enthalpy sensors and provides a dry contact switch input to the PremierLink controller. Locate the controller in place of an existing economizer controller or near the actuator. The mounting plate may not be needed if existing bracket is used.

A closed contact indicates that outside air is preferred to the return air. An open contact indicates that the economizer should remain at minimum position.

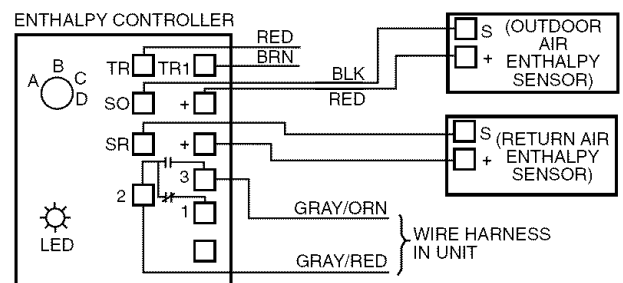
Outdoor Air Enthalpy Sensor/Enthalpy Controller (HH57AC077) — To wire the outdoor air enthalpy sensor, perform the following (see Fig. 23 and 24):

NOTE: The outdoor air sensor can be removed from the back of the enthalpy controller and mounted remotely.

1. Use a 4-conductor, 18 or 20 AWG cable to connect the enthalpy control to the PremierLink controller and power transformer.
2. Connect the following 4 wires from the wire harness located in rooftop unit to the enthalpy controller:
 - a. Connect the BRN wire to the 24 vac terminal (TR1) on enthalpy control and to pin 1 on 12-pin harness.

- b. Connect the RED wire to the 24 vac GND terminal (TR) on enthalpy sensor and to pin 4 on 12-pin harness.
- c. Connect the GRAY/ORN wire to J4-2 on PremierLink controller and to terminal (3) on enthalpy sensor.
- d. Connect the GRAY/RED wire to J4-1 on PremierLink controller and to terminal (2) on enthalpy sensor.

NOTE: If installing in a Carrier rooftop, use the two gray wires provided from the control section to the economizer to connect PremierLink controller to terminals 2 and 3 on enthalpy sensor.



NOTES:

1. Remove factory-installed jumper across SR and + before connecting wires from return air sensor.
2. Switches shown in high outdoor air enthalpy state. Terminals 2 and 3 close on low outdoor air enthalpy relative to indoor air enthalpy.
3. Remove sensor mounted on back of control and locate in outdoor airstream.

Fig. 23 — Outdoor and Return Air Sensor Wiring Connections for Differential Enthalpy Control

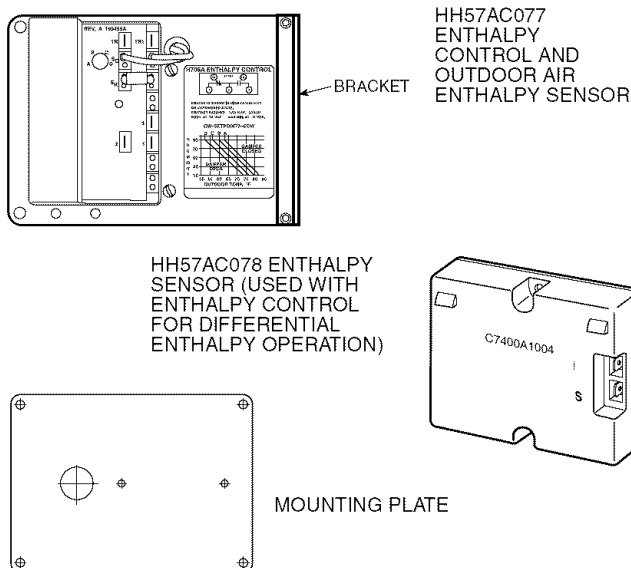


Fig. 24 — Differential Enthalpy Control, Sensor and Mounting Plate (33AMKIENT006)

Return Air Enthalpy Sensor — Mount the return-air enthalpy sensor (HH57AC078) in the return-air duct. The return air sensor is wired to the enthalpy controller (HH57AC077). The outdoor enthalpy changeover set point is set at the controller.

To wire the return air enthalpy sensor, perform the following (see Fig. 23):

1. Use a 2-conductor, 18 or 20 AWG, twisted pair cable to connect the return air enthalpy sensor to the enthalpy controller.
2. At the enthalpy control remove the factory-installed resistor from the (SR) and (+) terminals.
3. Connect the field-supplied RED wire to (+) spade connector on the return air enthalpy sensor and the (SR+) terminal on the enthalpy controller. Connect the BLK wire to (S) spade connector on the return air enthalpy sensor and the (SR) terminal on the enthalpy controller.

OPTIONAL ECONOMISER IV AND ECONOMISER2 — See Fig. 25 for EconoMiSer IV component locations. See Fig. 26 for EconoMiSer2 component locations.

NOTE: These instructions are for installing the optional EconoMiSer IV and EconoMiSer2 only. Refer to the accessory EconoMiSer IV or EconoMiSer2 installation instructions when field installing an EconoMiSer IV or EconoMiSer2 accessory.

1. To remove the existing unit filter access panel, raise the panel and swing the bottom outward. The panel is now disengaged from the track and can be removed. See Fig. 27.
2. The box with the economizer hood components is shipped in the compartment behind the economizer. The EconoMiSer IV controller is mounted on top of the EconoMiSer IV in the position shown in Fig. 25. The optional EconoMiSer2 with 4 to 20 mA actuator signal control does not include the EconoMiSer IV controller. To remove the component box from its shipping position, remove the screw holding the hood box bracket to the top of the economizer. Slide the hood box out of the unit. See Fig. 28.

IMPORTANT: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. **Save the aluminum filter for use in the power exhaust hood assembly.**

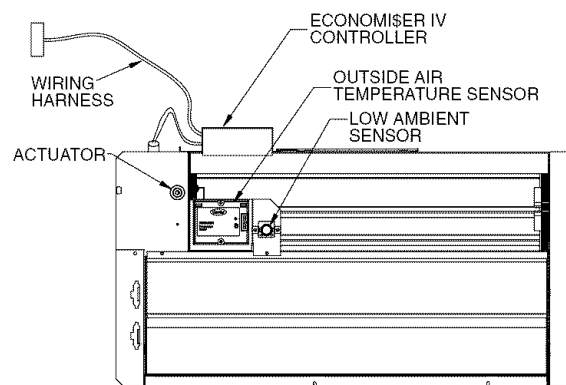


Fig. 25 — EconoMiSer IV Component Locations

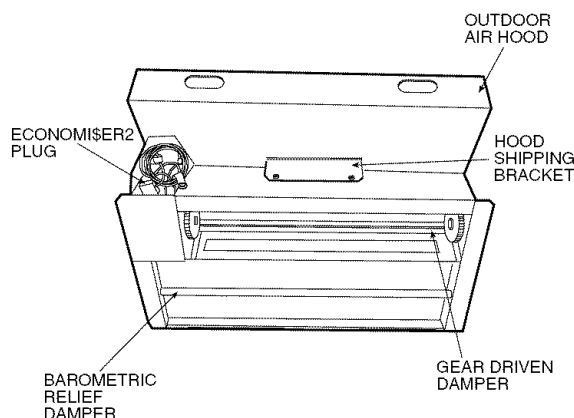


Fig. 26 — EconoMiSer2 Component Locations

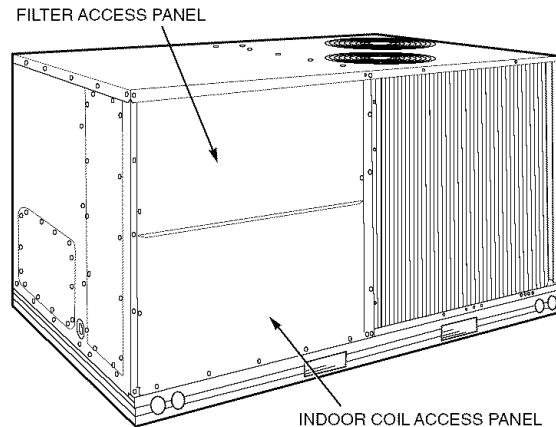


Fig. 27 — Typical Access Panel Locations

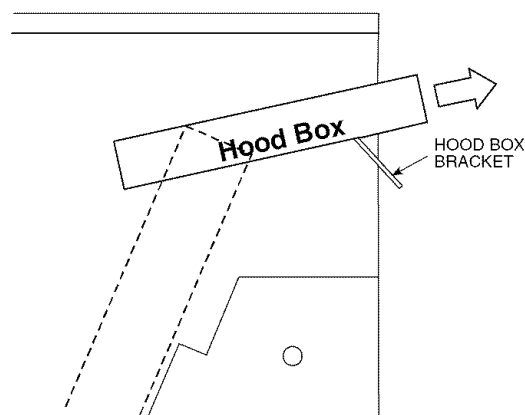


Fig. 28 — Hood Box Removal

3. The indoor coil access panel will be used as the top of the hood. Remove the screws along the sides and bottom of the indoor coil access panel. See Fig. 29.
4. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. See Fig. 30.
5. Remove the shipping tape holding the economizer barometric relief damper in place.
6. Insert the hood divider between the hood sides. See Fig. 30 and 31. Secure hood divider with 2 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
7. Open the filter clips which are located underneath the hood top. Insert the aluminum filter into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place. See Fig. 31.
8. Caulk the ends of the joint between the unit top panel and the hood top. See Fig. 29.
9. Replace the filter access panel.
10. Install all EconoMi\$er IV accessories. EconoMi\$er IV wiring is shown in Fig. 32. EconoMi\$er2 wiring is shown in Fig. 33.

Barometric flow capacity is shown in Fig. 34. Outdoor air leakage is shown in Fig. 35. Return air pressure drop is shown in Fig. 36.

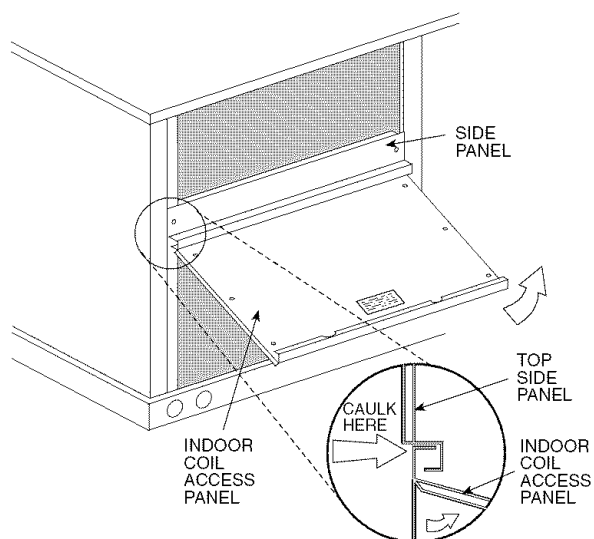


Fig. 29 — Indoor Coil Access Panel Relocation

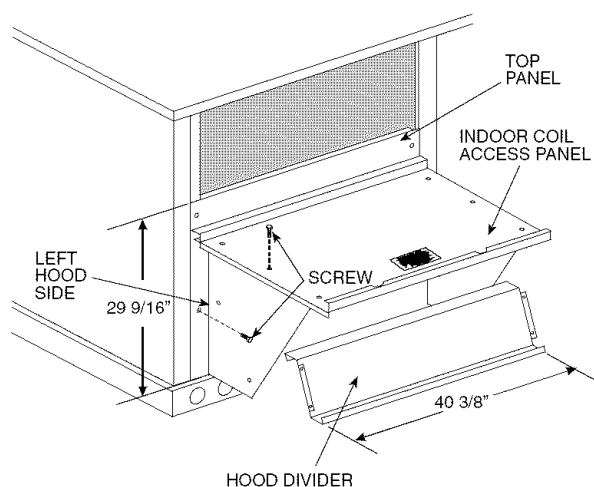


Fig. 30 — Outdoor-Air Hood Construction

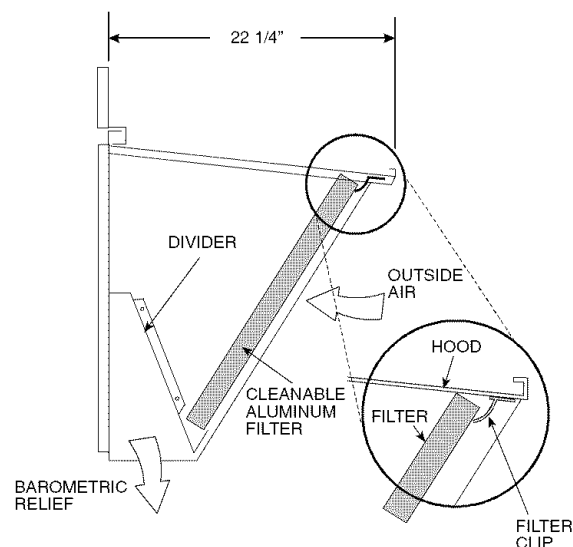


Fig. 31 — Filter Installation

ECONOMISER IV STANDARD SENSORS

Outdoor Air Temperature (OAT) Sensor — The outdoor air temperature sensor (HH57AC074) is a 10 to 20 mA device used to measure the outdoor-air temperature. The outdoor air temperature is used to determine when the EconoMi\$er IV can be used for free cooling. The sensor is factory-installed on the EconoMi\$er IV in the outdoor airstream. See Fig. 25. The operating range of temperature measurement is 40 to 100 F.

Supply Air Temperature (SAT) Sensor — The supply air temperature sensor is a 3 K thermistor located at the inlet of the indoor fan. See Fig. 37. This sensor is factory installed. The operating range of temperature measurement is 0° to 158 F. See Table 4 for sensor temperature/resistance values.

The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the “crimp end” and is sealed from moisture.

Outdoor Air Lockout Sensor — The EconoMi\$er IV is equipped with an ambient temperature lockout switch located in the outdoor airstream which is used to lockout the compressors below a 42 F ambient temperature. See Fig. 25.

Table 4 — Supply Air Sensor Temperature/Resistance Values

TEMPERATURE (F)	RESISTANCE (ohms)
-58	200,250
-40	100,680
-22	53,010
-4	29,091
14	16,590
32	9,795
50	5,970
68	3,747
77	3,000
86	2,416
104	1,597
122	1,080
140	746
158	525
176	376
185	321
194	274
212	203
230	153
248	116
257	102
266	89
284	70
302	55

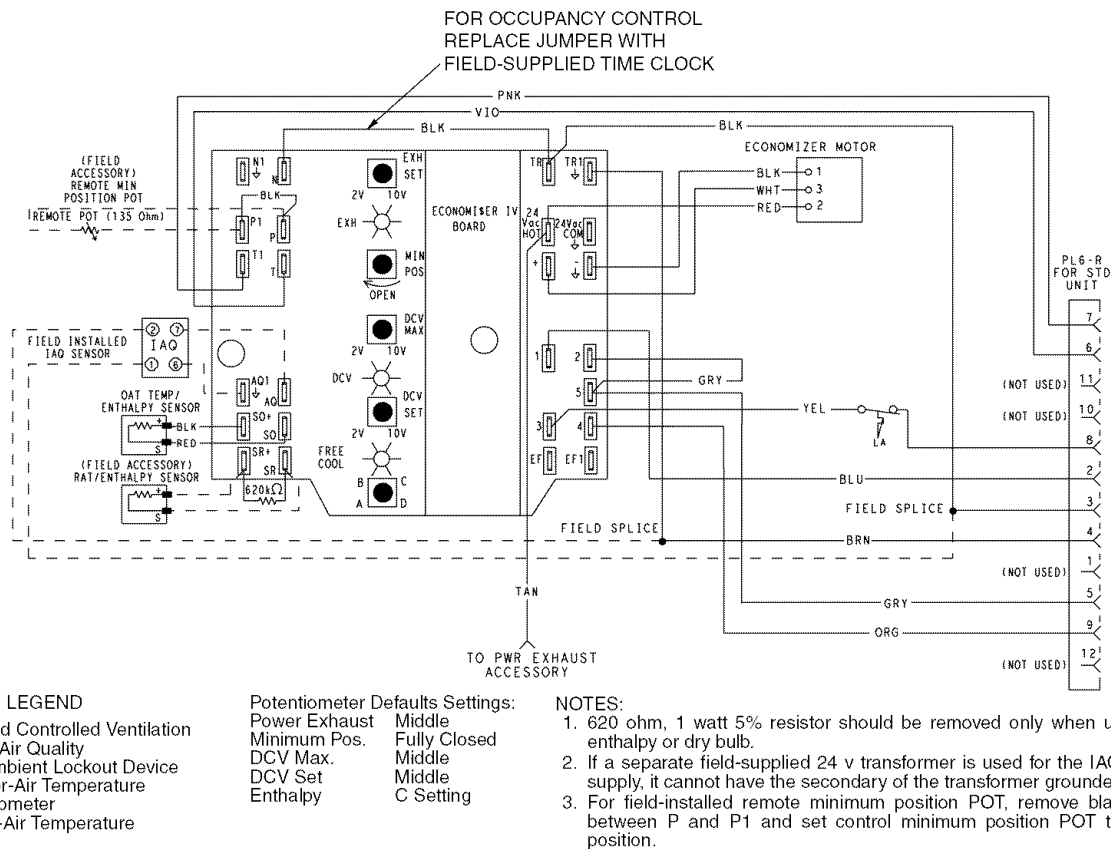


Fig. 32 — EconoMiSer IV Wiring

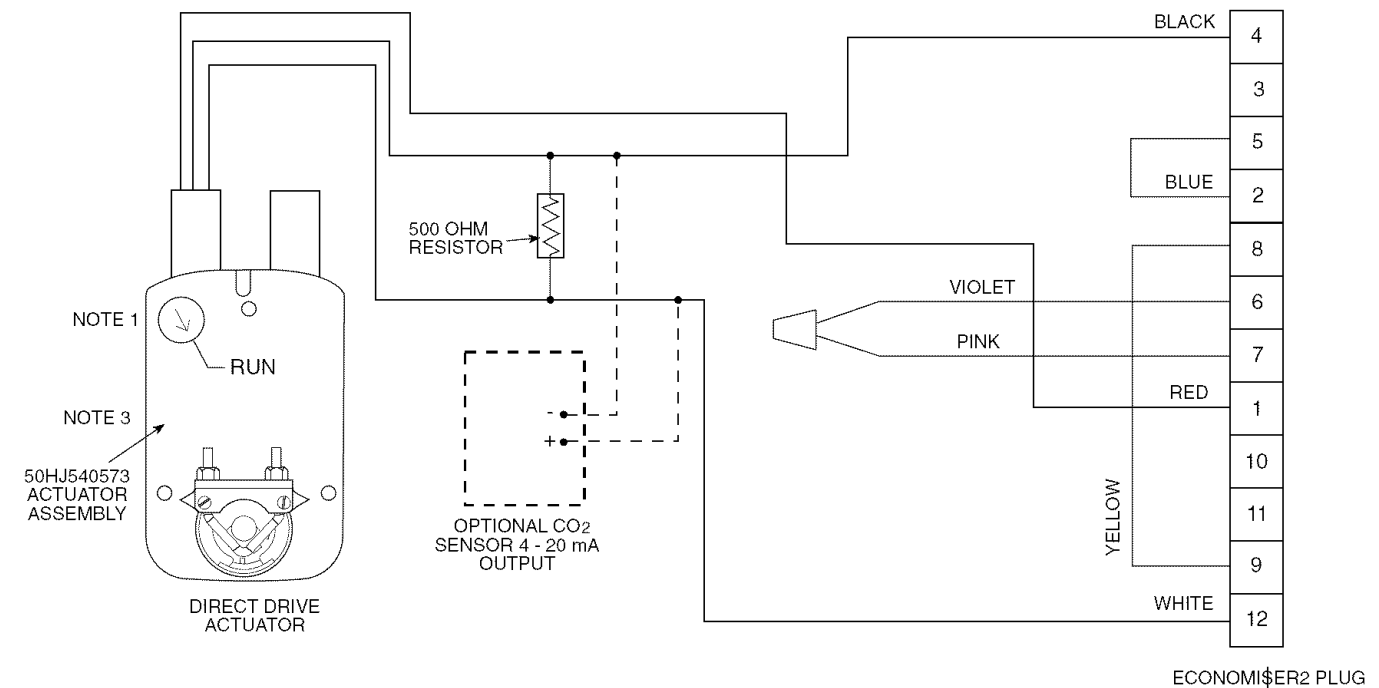


Fig. 33 — EconoMiSer2 with 4 to 20 mA Control Wiring

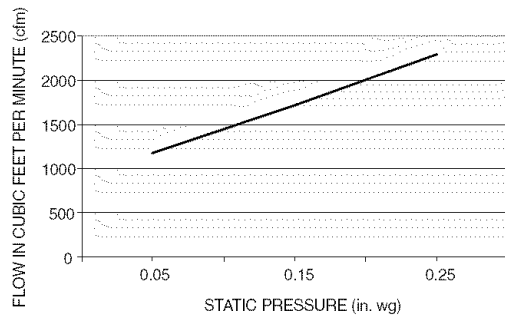


Fig. 34 — Barometric Relief Flow Capacity

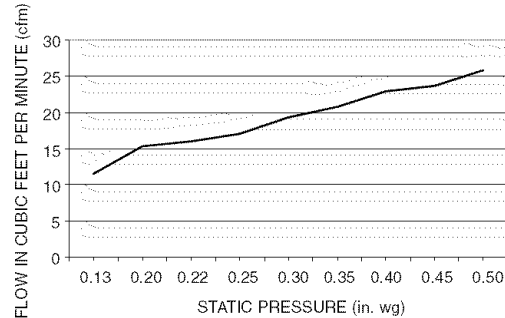


Fig. 35 — Outdoor Air Damper Leakage

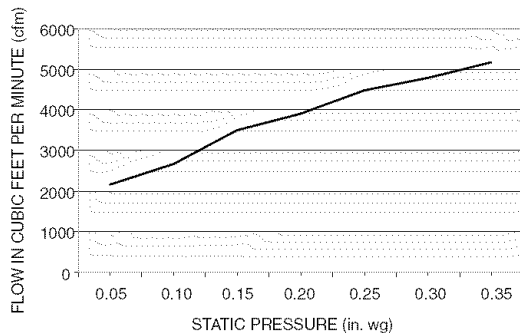


Fig. 36 — Return Air Pressure Drop

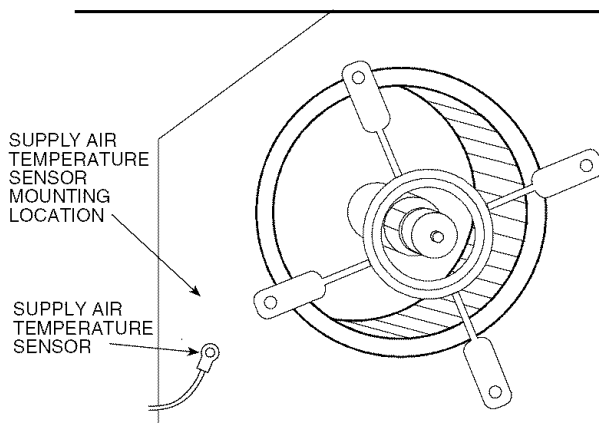


Fig. 37 — Supply Air Sensor Location

ECONOMISER IV CONTROL MODES

IMPORTANT: The optional EconoMi\$er2 does not include a controller. The EconoMi\$er2 is operated by a 4 to 20 mA signal from an existing field-supplied controller (such as PremierLink™ control). See Fig. 33 for wiring information.

Determine the EconoMi\$er IV control mode before set up of the control. Some modes of operation may require different sensors. Refer to Table 5. The EconoMi\$er IV is supplied from the factory with a supply air temperature sensor and an outdoor air temperature sensor. This allows for operation of the EconoMi\$er IV with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the EconoMi\$er IV and unit.

Table 5 — EconoMi\$er IV Sensor Usage

APPLICATION	ECONOMISER IV WITH OUTDOOR AIR DRY BULB SENSOR		
	Accessories Required		
Outdoor Air Dry Bulb	None. The outdoor air dry bulb sensor is factory installed.		
Differential Dry Bulb	CRTEMPN002A00*		
Single Enthalpy	HH57AC078		
Differential Enthalpy	HH57AC078 and CRENTDIF004A00*		
CO ₂ for DCV Control using a Wall-Mounted CO ₂ Sensor	33ZCSENCO2		
CO ₂ for DCV Control using a Duct-Mounted CO ₂ Sensor	33ZCSENCO2† and 33ZCASP02**	or	CRCBDIOX005A00††

*CRENTDIF004A00 and CRTEMPN002A00 accessories are used on many different base units. As such, these kits may contain parts that will not be needed for installation.

†33ZCSENCO2 is an accessory CO₂ sensor.

**33ZCASP02 is an accessory aspirator box required for duct-mounted applications.

††CRCBDIOX005A00 is an accessory that contains both 33ZCSENCO2 and 33ZCASP02 accessories.

Outdoor Dry Bulb Changeover — The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. The outdoor air and supply air temperature sensors are included as standard. For this control mode, the outdoor temperature is compared to an adjustable set point selected on the control. If the outdoor-air temperature is above the set point, the EconoMi\$er IV will adjust the outdoor-air dampers to minimum position. If the outdoor-air temperature is below the set point, the position of the outdoor-air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the LED next to the free cooling set point potentiometer will be on. The changeover temperature set point is controlled by the free cooling set point potentiometer located on the control. See Fig. 38. The scale on the potentiometer is A, B, C, and D. See Fig. 39 for the corresponding temperature changeover values.

Differential Dry Bulb Control — For differential dry bulb control the standard outdoor dry bulb sensor is used in conjunction with an additional accessory dry bulb sensor (part number CRTEMPN002A00). The accessory sensor must be mounted in the return airstream. See Fig. 40. Wiring is provided in the EconoMi\$er IV wiring harness. See Fig. 32.

In this mode of operation, the outdoor-air temperature is compared to the return-air temperature and the lower temperature air stream is used for cooling. When using this mode of changeover control, turn the enthalpy setpoint potentiometer fully clockwise to the D setting. See Fig. 38.

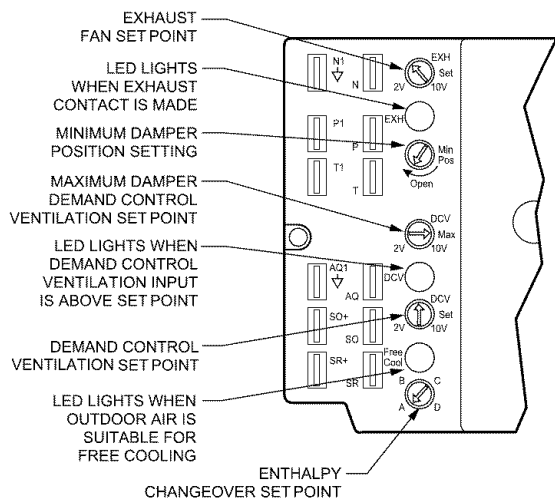


Fig. 38 — EconoMiSer IV Controller Potentiometer and LED Locations

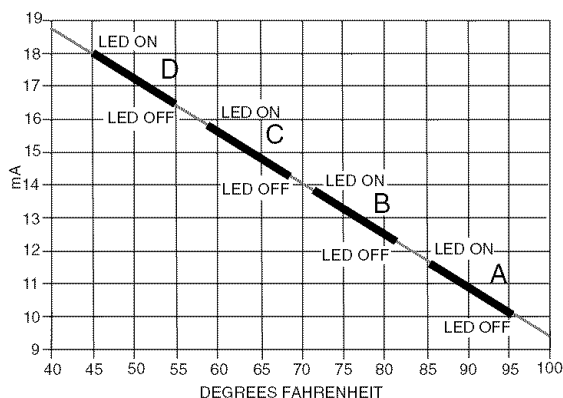


Fig. 39 — Outdoor Air Temperature Changeover Set Points

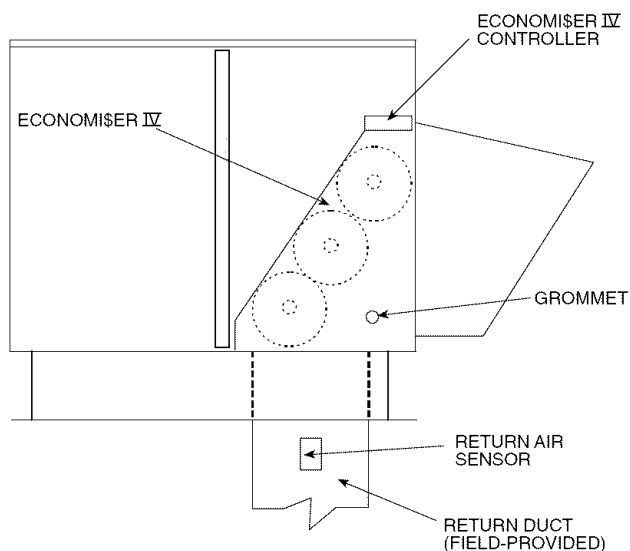


Fig. 40 — Return Air Temperature or Enthalpy Sensor Mounting Location

Outdoor Enthalpy Changeover — For enthalpy control, accessory enthalpy sensor (part number HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 25. When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the EconoMiSer IV controller. The set points are A, B, C, and D. See Fig. 41. The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on the EconoMiSer IV controller. See Fig. 25 and 42.

Differential Enthalpy Control — For differential enthalpy control, the EconoMiSer IV controller uses two enthalpy sensors (HH57AC078 and CRENTDIF004A00), one in the outside air and one in the return air duct. The EconoMiSer IV controller compares the outdoor air enthalpy to the return air enthalpy to determine EconoMiSer IV use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air, the EconoMiSer IV opens to bring in outdoor air for free cooling.

Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 25. Mount the return air enthalpy sensor in the return air duct. See Fig. 40. Wiring is provided in the EconoMiSer IV wiring harness. See Fig. 32. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the EconoMiSer IV controller. When using this mode of changeover control, turn the enthalpy set-point potentiometer fully clockwise to the D setting.

Indoor Air Quality (IAQ) Sensor Input — The IAQ input can be used for demand control ventilation control based on the level of CO₂ measured in the space or return air duct.

Mount the accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user-determined set point. See Fig. 43.

If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the EconoMiSer IV control board will be damaged.

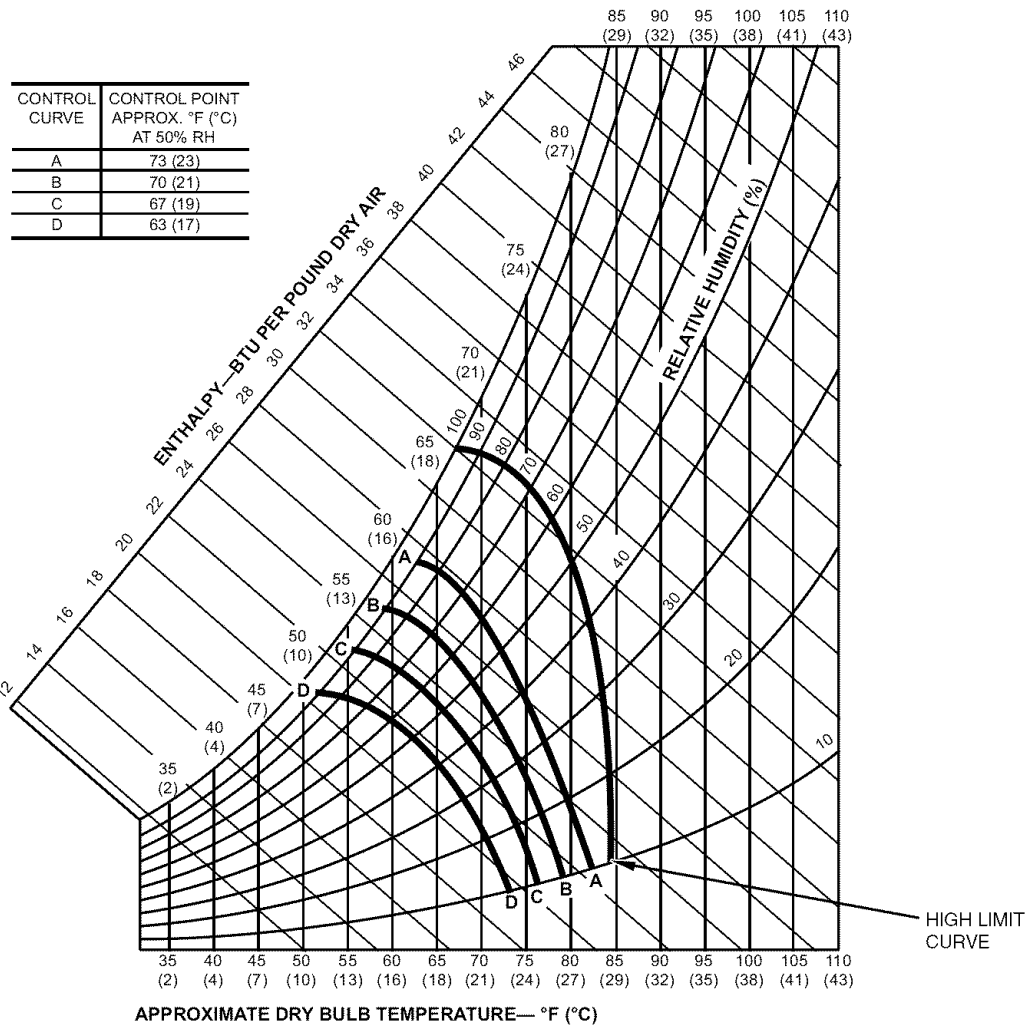


Fig. 41 — Enthalpy Changeover Set Points

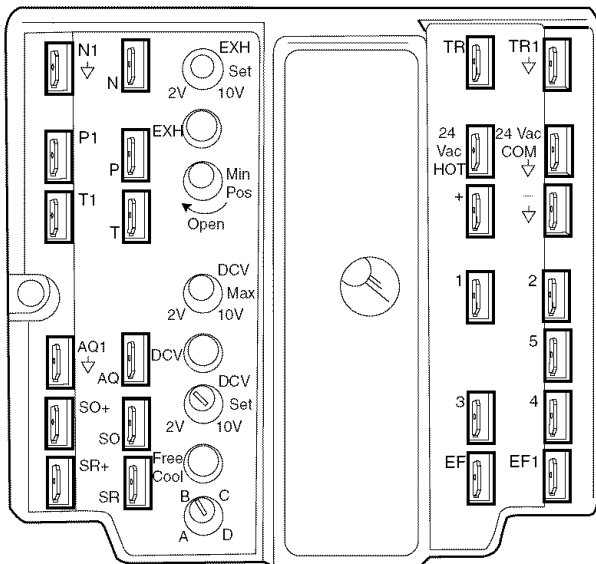


Fig. 42 — EconoMiSer IV Control

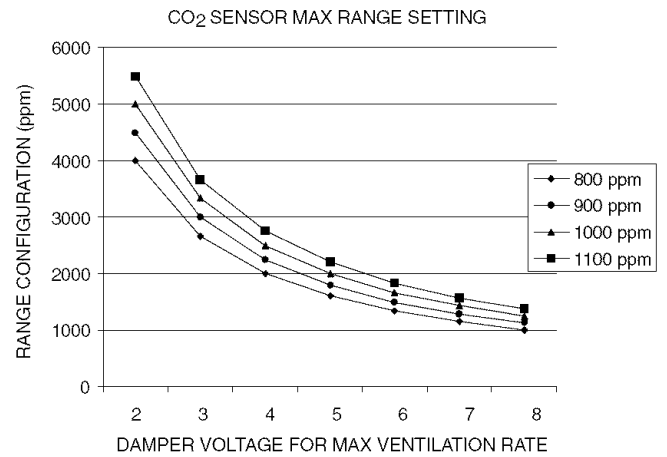


Fig. 43 — CO₂ Sensor Maximum Range Setting

Exhaust Set Point Adjustment — The exhaust set point will determine when the exhaust fan runs based on damper position (if accessory power exhaust is installed). The set point is modified with the Exhaust Fan Set Point (EXH SET) potentiometer. See Fig. 38. The set point represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the EconoMi\$er IV controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

Minimum Position Control — There is a minimum damper position potentiometer on the EconoMi\$er IV controller. See Fig. 38. The minimum damper position maintains the minimum airflow into the building during the occupied period.

When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compound) ventilation requirements. The maximum demand ventilation position is used for fully occupied ventilation.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise.

Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10 F temperature difference between the outdoor and return-air temperatures.

To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed air temperature using the following formula:

$$(T_O \times \frac{OA}{100}) + (T_R \times \frac{RA}{100}) = T_M$$

T_O = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T_R = Return-Air Temperature

RA = Percent of Return Air

T_M = Mixed-Air Temperature

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60 F, and return-air temperature is 75 F.

$$(60 \times .10) + (75 \times .90) = 73.5 \text{ F}$$

2. Disconnect the supply air sensor from terminals T and T1.
3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 32 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured supply air temperature matches the calculated value.
6. Reconnect the supply-air sensor to terminals T and T1.

Remote control of the EconoMi\$er IV damper is desirable when requiring additional temporary ventilation. If a field-supplied remote potentiometer (Honeywell part number S963B1128) is wired to the EconoMi\$er IV controller, the minimum position of the damper can be controlled from a remote location.

To control the minimum damper position remotely, remove the factory-installed jumper on the P and P1 terminals on the EconoMi\$er IV controller. Wire the field-supplied potentiometer to the P and P1 terminals on the EconoMi\$er IV controller. See Fig. 42.

Damper Movement — Damper movement from full open to full closed (or vice versa) takes $2\frac{1}{2}$ minutes.

Thermostats — The EconoMi\$er IV control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The EconoMi\$er IV control does not support space temperature sensors. Connections are made at the thermostat terminal connection board located in the main control box.

Occupancy Control — The factory default configuration for the EconoMi\$er IV control is occupied mode. Occupied status is provided by the black jumper from terminal TR to terminal N. When unoccupied mode is desired, install a field-supplied timeclock function in place of the jumper between TR and N. See Fig. 32. When the timeclock contacts are closed, the EconoMi\$er IV control will be in occupied mode. When the timeclock contacts are open (removing the 24-v signal from terminal N), the EconoMi\$er IV will be in unoccupied mode.

Demand Controlled Ventilation (DCV) — When using the EconoMi\$er IV for demand controlled ventilation, there are some equipment selection criteria which should be considered. When selecting the heat capacity and cool capacity of the equipment, the maximum ventilation rate must be evaluated for design conditions. The maximum damper position must be calculated to provide the desired fresh air.

Typically the maximum ventilation rate will be about 5 to 10% more than the typical cfm required per person, using normal outside air design criteria.

A proportional anticipatory strategy should be taken with the following conditions: a zone with a large area, varied occupancy, and equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy. A proportional-anticipatory strategy will cause the fresh air supplied to increase as the room CO₂ level increases even though the CO₂ set point has not been reached. By the time the CO₂ level reaches the set point, the damper will be at maximum ventilation and should maintain the set point.

In order to have the CO₂ sensor control the economizer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The following equation may be used to determine the percent of outside-air entering the building for a given damper position. For best results there should be at least a 10 degree difference in outside and return-air temperatures.

$$(T_O \times \frac{OA}{100}) + (T_R \times \frac{RA}{100}) = T_M$$

T_O = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T_R = Return-Air Temperature

RA = Percent of Return Air

T_M = Mixed-Air Temperature

Once base ventilation has been determined, set the minimum damper position potentiometer to the correct position.

The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 cfm per person). Use Fig. 43 to determine the maximum setting of the CO₂ sensor. For example, a 1100 ppm set point relates to a 15 cfm per person design. Use the 1100 ppm curve on Fig. 43 to find the point when the CO₂ sensor output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the CO₂ sensor should be 1800 ppm. The

EconoMi\$er IV controller will output the 6.7 volts from the CO₂ sensor to the actuator when the CO₂ concentration in the space is at 1100 ppm. The DCV set point may be left at 2 volts since the CO₂ sensor voltage will be ignored by the EconoMi\$er IV controller until it rises above the 3.6 volt setting of the minimum position potentiometer.

Once the fully occupied damper position has been determined, set the maximum damper demand control ventilation potentiometer to this position. Do not set to the maximum position as this can result in over-ventilation to the space and potential high-humidity levels.

CO₂ Sensor Configuration — The CO₂ sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. See Table 6.

Use setting 1 or 2 for Carrier equipment. See Table 6.

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. See Table 6.
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

The custom settings of the CO₂ sensor can be changed anytime after the sensor is energized. Follow the steps below to change the non-standard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to toggle to the NONSTD menu and press Enter.
4. Use the Up/Down button to toggle through each of the nine variables, starting with Altitude, until the desired setting is reached.
5. Press Mode to move through the variables.
6. Press Enter to lock in the selection, then press Mode to continue to the next variable.

Dehumidification of Fresh Air with DCV Control — Information from ASHRAE indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, a device such as a 62AQ energy recovery unit is added to reduce the moisture content of the fresh air being brought into the building when the enthalpy is high. In most cases, the normal heating and cooling processes are more than adequate to remove the humidity loads for most commercial applications.

If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.

Step 9 — Adjust Evaporator-Fan Speed — Adjust evaporator-fan speed to meet jobsite conditions. Tables 7A and 7B show fan rpm at motor pulley settings for standard and alternate motors. See Table 8 and Fig. 44 for accessory and option static pressure drops. See Tables 9A and 9B for evaporator fan motor performance. Refer to Tables 10-23 to determine fan speed settings. Fan motor pulleys are factory set for speed shown in Table 1.

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

To change fan speed:

1. Shut off unit power supply.
2. Loosen belt by loosening fan motor mounting nuts. See Fig. 45 and 46.
3. Loosen movable pulley flange setscrew (see Fig. 47).
4. Screw movable flange toward fixed flange to increase fan speed and away from fixed flange to decrease fan speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Table 1.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table 1 for speed change for each full turn of pulley flange.)

To align fan and motor pulleys:

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

To adjust belt tension:

1. Loosen fan motor mounting nuts.
2. *Size 008* — Slide motor mounting plate away from fan scroll for proper belt tension (1/2-in. deflection with one finger) and tighten mounting nuts (see Fig. 45).
Sizes 009-014 — Slide motor mounting plate downward to tighten belt tension. Secure motor mounting plate nuts. See Fig. 46.
3. Adjust bolt and nut on mounting plate to secure motor in fixed position.

Table 6 — CO₂ Sensor Standard Settings

SETTING	EQUIPMENT	OUTPUT	VENTILATION RATE (cfm/Person)	ANALOG OUTPUT	CO ₂ CONTROL RANGE (ppm)	OPTIONAL RELAY SETPOINT (ppm)	RELAY HYSTERESIS (ppm)
1	Interface w/Standard Building Control System	Proportional	Any	0-10V 4-20 mA	0-2000	1000	50
2		Proportional	Any	2-10V 7-20 mA	0-2000	1000	50
3		Exponential	Any	0-10V 4-20 mA	0-2000	1100	50
4	Economizer	Proportional	15	0-10V 4-20 mA	0-1100	1100	50
5		Proportional	20	0-10V 4-20 mA	0- 900	900	50
6		Exponential	15	0-10V 4-20 mA	0-1100	1100	50
7		Exponential	20	0-10V 4-20 mA	0- 900	900	50
8	Health & Safety	Proportional	—	0-10V 4-20 mA	0-9999	5000	500
9	Parking/Air Intakes/ Loading Docks	Proportional	—	0-10V 4-20 mA	0-2000	700	50

LEGEND

ppm — Parts Per Million

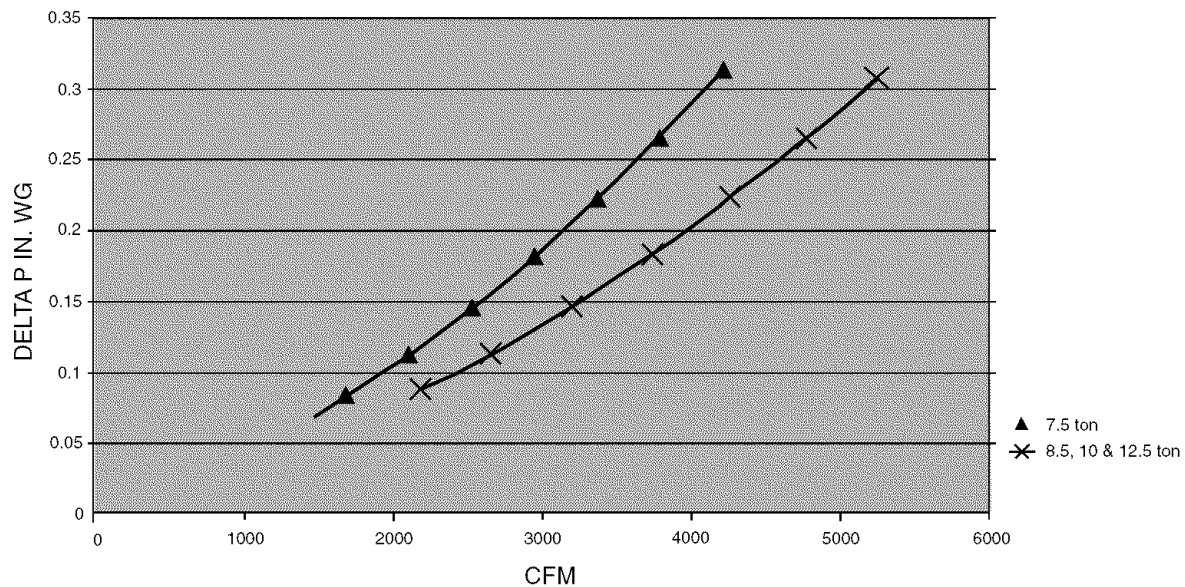


Fig. 44 — Humidi-MiZer™ Adaptive Dehumidification System Static Pressure Drop (in. wg)

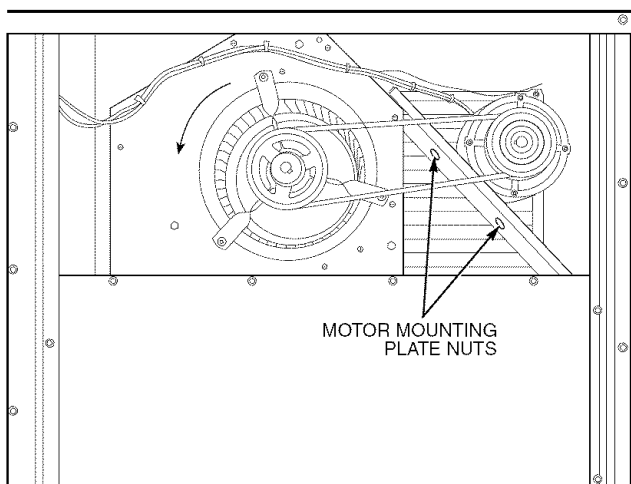


Fig. 45 — Typical Belt-Drive Motor Mounting for Size 008

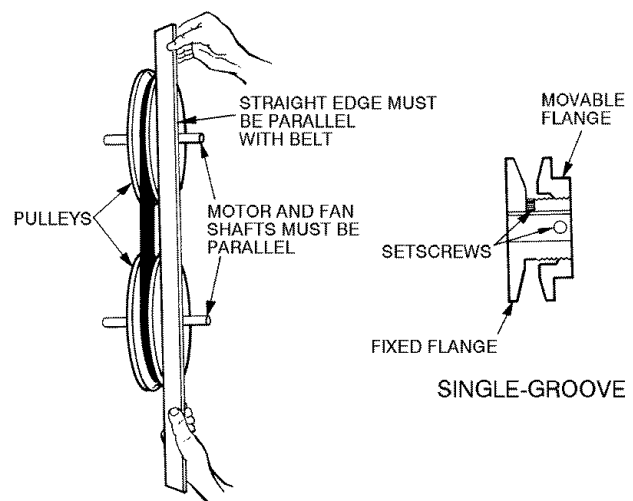


Fig. 47 — Evaporator-Fan Pulley Adjustment

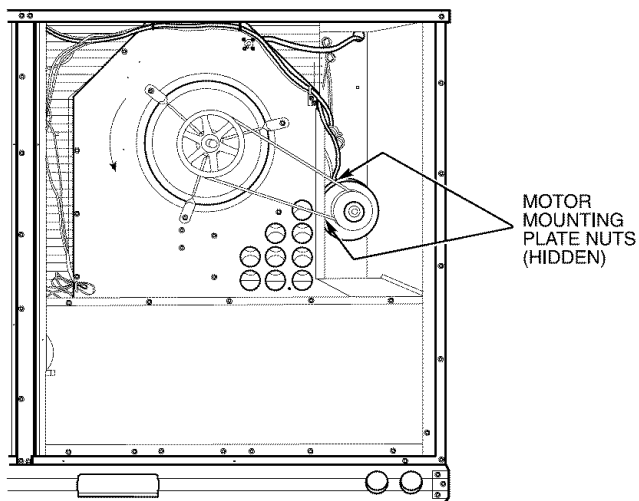


Fig. 46 — Typical Belt-Drive Motor Mounting for Sizes 009-014

Table 7A — Fan Rpm at Motor Pulley Setting (Standard Motor)*

UNIT 48HJ	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
008,009	1085	1060	1035	1010	985	960	935	910	890	865	840	—	—
012	1080	1060	1035	1015	990	970	950	925	905	880	860	—	—
014	1130	1112	1087	1062	1037	1212	987	962	937	912	887	962	830

*Approximate fan rpm shown.

Table 7B — Fan Rpm at Motor Pulley Setting (High-Static Motor)*

UNIT 48HJ	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
008	1080	1025	1007	988	970	952	933	915	897	878	860	—	—
009	1080	1025	1007	988	970	952	933	915	897	878	860	—	—
012	1130	1112	1087	1062	1037	1212	987	962	937	912	887	962	830

*Approximate fan rpm shown.

Table 8 — Accessory/FIOP EconoMiSer IV and EconoMiSer2 Static Pressure* (in. wg)

COMPONENT	CFM														
	2250	2500	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000	5250	6250	
Vertical EconoMiSer IV and EconoMiSer2	0.06	0.075	0.09	0.115	0.13	0.15	0.17	0.195	0.22	0.25	0.285	0.325	0.36	—	
Horizontal EconoMiSer IV and EconoMiSer2	—	0.1	0.125	0.15	0.18	0.21	0.25	0.275	0.3	0.34	0.388	—	—	—	

LEGEND

FIOP — Factory-Installed Option

*The static pressure must be added to external static pressure. The sum and the evaporator entering-air cfm should be used in conjunction with the Fan Performance tables to determine indoor blower rpm and watts.

Table 9A — Evaporator-Fan Motor Performance — Standard Motor

UNIT 48HJ	UNIT PHASE	MAXIMUM CONTINUOUS BHP*	MAXIMUM OPERATING WATTS*	UNIT VOLTAGE	MAXIMUM AMP DRAW
008,009	Three	2.90	2615	208/230	8.6
				460	3.9
				575	3.9
012	Three	3.70	3775	208/230	12.2
				460	5.5
				575	5.5
014	Three	5.25	4400	208/230	17.3
				460	8.5
				575	8.5

LEGEND

Bhp — Brake Horsepower

*Extensive motor and electrical testing on these units ensures that the full horsepower and watts range of the motors can be utilized with confidence. Using the 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.

Table 9B — Evaporator-Fan Motor Performance — High-Static Motors

UNIT 48HJ	UNIT PHASE	MAXIMUM CONTINUOUS BHP*	MAXIMUM OPERATING WATTS*	UNIT VOLTAGE	MAXIMUM AMP DRAW
008,009	Three	4.20	3775	208/230	12.2
				460	5.5
				575	5.5
012	Three	5.25	4400	208/230	17.3
				460	8.5
				575	8.5

LEGEND

Bhp — Brake Horsepower

*Extensive motor and electrical testing on these units ensures that the full horsepower and watts range of the motors can be utilized with confidence. Using the 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.

Table 10 — Fan Performance 48HJ008 — Vertical Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	513	0.54	505	595	0.76	713	665	1.01	940	728	1.27	1187	786	1.56	1453
2300	521	0.57	531	601	0.79	741	671	1.04	972	734	1.31	1222	791	1.60	1489
2400	535	0.63	584	615	0.86	802	684	1.11	1038	745	1.39	1293	802	1.68	1566
2500	551	0.69	642	628	0.93	866	696	1.19	1109	757	1.47	1369	813	1.77	1647
2550	558	0.72	673	635	0.97	900	702	1.23	1146	763	1.51	1409	818	1.81	1689
2600	566	0.76	705	642	1.00	935	709	1.27	1183	769	1.55	1450	824	1.86	1732
2700	582	0.83	771	656	1.08	1008	721	1.35	1263	781	1.65	1535	835	1.95	1823
2800	597	0.90	842	670	1.16	1086	734	1.44	1347	793	1.74	1625	847	2.06	1917
2900	613	0.98	918	684	1.25	1169	748	1.54	1436	805	1.84	1720	859	2.16	2019
3000	629	1.07	999	699	1.35	1256	761	1.64	1530	818	1.95	1820	871	2.28	2125
3100	645	1.16	1085	713	1.45	1349	775	1.75	1630	831	2.06	1925	883	2.40	2235
3200	662	1.26	1176	728	1.55	1448	788	1.86	1734	844	2.18	2036	895	2.52	2352
3300	678	1.36	1272	743	1.66	1551	802	1.98	1845	857	2.31	2152	908	2.65	2475
3400	694	1.47	1374	758	1.78	1660	816	2.10	1961	870	2.44	2275	920	2.79	2603
3500	711	1.59	1482	773	1.90	1775	831	2.23	2082	884	2.58	2402	—	—	—
3600	727	1.71	1596	789	2.03	1896	845	2.37	2210	897	2.72	2537	—	—	—
3700	744	1.84	1716	804	2.17	2023	860	2.51	2343	911	2.87	2677	—	—	—
3750	752	1.91	1778	812	2.24	2089	867	2.59	2413	—	—	—	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	839	1.86	1735	889	2.18	2032	935	2.52	2345	980	2.87	2673	—	—	—
2300	844	1.90	1773	893	2.22	2073	940	2.56	2389	—	—	—	—	—	—
2400	854	1.99	1855	903	2.32	2159	950	2.66	2478	—	—	—	—	—	—
2500	865	2.08	1940	913	2.41	2249	959	2.76	2573	—	—	—	—	—	—
2550	870	2.13	1985	918	2.46	2296	964	2.81	2622	—	—	—	—	—	—
2600	875	2.18	2031	923	2.51	2344	969	2.87	2673	—	—	—	—	—	—
2700	886	2.28	2126	934	2.62	2445	—	—	—	—	—	—	—	—	—
2800	897	2.39	2227	944	2.73	2550	—	—	—	—	—	—	—	—	—
2900	908	2.50	2333	955	2.85	2661	—	—	—	—	—	—	—	—	—
3000	920	2.62	2443	—	—	—	—	—	—	—	—	—	—	—	—
3100	931	2.75	2560	—	—	—	—	—	—	—	—	—	—	—	—
3200	943	2.88	2682	—	—	—	—	—	—	—	—	—	—	—	—
3300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3750	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 2.90.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.

Table 11 — Fan Performance 48HJ008 — Vertical Discharge Units; High-Static Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	513	0.54	505	595	0.76	713	665	1.01	940	728	1.27	1187	786	1.56	1453
2300	521	0.57	531	601	0.79	741	671	1.04	972	734	1.31	1222	791	1.60	1489
2400	535	0.63	584	615	0.86	802	684	1.11	1038	745	1.39	1293	802	1.68	1566
2500	551	0.69	642	628	0.93	866	696	1.19	1109	757	1.47	1369	813	1.77	1647
2550	558	0.72	673	635	0.97	900	702	1.23	1146	763	1.51	1409	818	1.81	1689
2600	566	0.76	705	642	1.00	935	709	1.27	1183	769	1.55	1450	824	1.86	1732
2700	582	0.83	771	656	1.08	1008	721	1.35	1263	781	1.65	1535	835	1.95	1823
2800	597	0.90	842	670	1.16	1086	734	1.44	1347	793	1.74	1625	847	2.06	1917
2900	613	0.98	918	684	1.25	1169	748	1.54	1436	805	1.84	1720	859	2.16	2019
3000	629	1.07	999	699	1.35	1256	761	1.64	1530	818	1.95	1820	871	2.28	2125
3100	645	1.16	1085	713	1.45	1349	775	1.75	1630	831	2.06	1925	883	2.40	2235
3200	662	1.26	1176	728	1.55	1448	788	1.86	1734	844	2.18	2036	895	2.52	2352
3300	678	1.36	1272	743	1.66	1551	802	1.98	1845	857	2.31	2152	908	2.65	2475
3400	694	1.47	1374	758	1.78	1660	816	2.10	1961	870	2.44	2275	920	2.79	2603
3500	711	1.59	1482	773	1.90	1775	831	2.23	2082	884	2.58	2402	933	2.93	2737
3600	727	1.71	1596	789	2.03	1896	845	2.37	2210	897	2.72	2537	946	3.09	2877
3700	744	1.84	1716	804	2.17	2023	860	2.51	2343	911	2.87	2677	959	3.24	3023
3750	752	1.91	1778	812	2.24	2089	867	2.59	2413	918	2.95	2750	966	3.32	3100

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	839	1.86	1735	889	2.18	2032	935	2.52	2345	980	2.87	2673	1022	3.23	3015
2300	844	1.90	1773	893	2.22	2073	940	2.56	2389	984	2.91	2718	1027	3.28	3062
2400	854	1.99	1855	903	2.32	2159	950	2.66	2478	993	3.02	2812	1035	3.39	3159
2500	865	2.08	1940	913	2.41	2249	959	2.76	2573	1003	3.12	2911	1044	3.50	3261
2550	870	2.13	1985	918	2.46	2296	964	2.81	2622	1008	3.18	2962	1049	3.55	3315
2600	875	2.18	2031	923	2.51	2344	969	2.87	2673	1012	3.23	3014	1054	3.61	3370
2700	886	2.28	2126	934	2.62	2445	979	2.98	2777	1022	3.35	3123	1063	3.74	3483
2800	897	2.39	2227	944	2.73	2550	989	3.10	2888	1032	3.47	3238	1073	3.86	3601
2900	908	2.50	2333	955	2.85	2661	1000	3.22	3003	1042	3.60	3358	1083	4.00	3725
3000	920	2.62	2443	966	2.98	2777	1010	3.35	3123	1052	3.74	3484	1093	4.14	3856
3100	931	2.75	2560	977	3.11	2899	1021	3.49	3250	1063	3.88	3615	—	—	—
3200	943	2.88	2682	989	3.25	3026	1032	3.63	3383	1074	4.02	3752	—	—	—
3300	955	3.01	2810	1000	3.39	3159	1043	3.78	3521	1084	4.18	3896	—	—	—
3400	967	3.16	2945	1012	3.54	3299	1055	3.93	3667	—	—	—	—	—	—
3500	980	3.31	3084	1024	3.69	3445	1066	4.09	3817	—	—	—	—	—	—
3600	992	3.46	3230	1036	3.86	3596	—	—	—	—	—	—	—	—	—
3700	1005	3.63	3383	1048	4.03	3755	—	—	—	—	—	—	—	—	—
3750	1011	3.71	3462	1054	4.11	3836	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 4.20.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 12 — Fan Performance 48HJ009 — Vertical Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	541	0.50	467	624	0.66	614	701	0.83	771	771	1.00	936	837	1.19	1109
2600	556	0.55	513	637	0.71	665	711	0.89	827	781	1.07	996	845	1.26	1173
2700	571	0.60	562	650	0.77	720	722	0.95	885	790	1.14	1059	854	1.33	1241
2800	586	0.66	615	663	0.83	777	734	1.02	948	800	1.21	1126	863	1.41	1312
2900	601	0.72	672	676	0.90	839	745	1.09	1014	811	1.28	1197	872	1.49	1387
3000	616	0.79	732	689	0.97	904	757	1.16	1083	821	1.36	1271	882	1.57	1465
3100	632	0.85	796	703	1.04	972	769	1.24	1157	832	1.45	1349	892	1.66	1548
3200	648	0.93	864	717	1.12	1045	782	1.32	1235	843	1.53	1431	902	1.75	1635
3300	663	1.00	936	731	1.20	1122	795	1.41	1316	855	1.63	1517	912	1.85	1725
3400	679	1.09	1012	745	1.29	1203	808	1.50	1402	867	1.72	1608	923	1.95	1820
3500	695	1.17	1092	760	1.38	1288	821	1.60	1492	879	1.83	1703	934	2.06	1920
3600	711	1.26	1177	774	1.48	1379	834	1.70	1587	891	1.93	1802	945	2.17	2024
3700	728	1.36	1266	789	1.58	1473	848	1.81	1686	904	2.04	1906	957	2.29	2132
3800	744	1.46	1361	804	1.69	1572	861	1.92	1790	916	2.16	2015	969	2.41	2246
3900	760	1.57	1460	819	1.80	1676	875	2.04	1899	929	2.28	2128	981	2.53	2364
4000	777	1.68	1563	834	1.91	1785	889	2.16	2012	942	2.41	2247	993	2.67	2487
4100	793	1.79	1672	850	2.04	1899	904	2.29	2132	956	2.54	2371	1006	2.80	2615
4200	810	1.92	1786	865	2.16	2018	918	2.42	2255	969	2.68	2499	—	—	—
4300	826	2.04	1906	880	2.30	2142	932	2.56	2385	983	2.82	2633	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	900	1.38	1289	959	1.58	1476	1015	1.79	1669	1069	2.00	1868	1121	2.22	2073
2600	907	1.46	1357	965	1.66	1548	1021	1.87	1745	1074	2.09	1948	1125	2.31	2158
2700	914	1.53	1429	972	1.74	1624	1027	1.96	1825	1079	2.18	2032	1130	2.41	2245
2800	922	1.61	1505	979	1.83	1704	1033	2.05	1909	1085	2.27	2120	1135	2.51	2337
2900	931	1.70	1584	986	1.92	1787	1040	2.14	1996	1091	2.37	2211	1141	2.61	2432
3000	939	1.79	1667	994	2.01	1874	1047	2.24	2087	1098	2.47	2307	1147	2.71	2532
3100	948	1.88	1753	1002	2.11	1965	1054	2.34	2183	1105	2.58	2406	1153	2.83	2635
3200	957	1.98	1844	1011	2.21	2060	1062	2.45	2283	1112	2.69	2510	—	—	—
3300	967	2.08	1939	1020	2.32	2160	1070	2.56	2386	1119	2.81	2618	—	—	—
3400	977	2.19	2039	1029	2.43	2264	1079	2.67	2494	—	—	—	—	—	—
3500	987	2.30	2143	1038	2.54	2372	1088	2.80	2607	—	—	—	—	—	—
3600	998	2.41	2251	1048	2.66	2485	—	—	—	—	—	—	—	—	—
3700	1008	2.54	2364	1058	2.79	2602	—	—	—	—	—	—	—	—	—
3800	1019	2.66	2482	—	—	—	—	—	—	—	—	—	—	—	—
3900	1031	2.79	2605	—	—	—	—	—	—	—	—	—	—	—	—
4000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 2.90.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.

Table 13 — Fan Performance 48HJ009 — Vertical Discharge Units; High-Static Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	541	0.50	467	624	0.66	614	701	0.83	771	771	1.00	936	837	1.19	1109
2600	556	0.55	513	637	0.71	665	711	0.89	827	781	1.07	996	845	1.26	1173
2700	571	0.60	562	650	0.77	720	722	0.95	885	790	1.14	1059	854	1.33	1241
2800	586	0.66	615	663	0.83	777	734	1.02	948	800	1.21	1126	863	1.41	1312
2900	601	0.72	672	676	0.90	839	745	1.09	1014	811	1.28	1197	872	1.49	1387
3000	616	0.79	732	689	0.97	904	757	1.16	1083	821	1.36	1271	882	1.57	1465
3100	632	0.85	796	703	1.04	972	769	1.24	1157	832	1.45	1349	892	1.66	1548
3200	648	0.93	864	717	1.12	1045	782	1.32	1235	843	1.53	1431	902	1.75	1635
3300	663	1.00	936	731	1.20	1122	795	1.41	1316	855	1.63	1517	912	1.85	1725
3400	679	1.09	1012	745	1.29	1203	808	1.50	1402	867	1.72	1608	923	1.95	1820
3500	695	1.17	1092	760	1.38	1288	821	1.60	1492	879	1.83	1703	934	2.06	1920
3600	711	1.26	1177	774	1.48	1379	834	1.70	1587	891	1.93	1802	945	2.17	2024
3700	728	1.36	1266	789	1.58	1473	848	1.81	1686	904	2.04	1906	957	2.29	2132
3800	744	1.46	1361	804	1.69	1572	861	1.92	1790	916	2.16	2015	969	2.41	2246
3900	760	1.57	1460	819	1.80	1676	875	2.04	1899	929	2.28	2128	981	2.53	2364
4000	777	1.68	1563	834	1.91	1785	889	2.16	2012	942	2.41	2247	993	2.67	2487
4100	793	1.79	1672	850	2.04	1899	904	2.29	2132	956	2.54	2371	1006	2.80	2615
4200	810	1.92	1786	865	2.16	2018	918	2.42	2255	969	2.68	2499	1018	2.95	2748
4300	826	2.04	1906	880	2.30	2142	932	2.56	2385	983	2.82	2633	1031	3.10	2888

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	900	1.38	1289	959	1.58	1476	1015	1.79	1669	1069	2.00	1868	1121	2.22	2073
2600	907	1.46	1357	965	1.66	1548	1021	1.87	1745	1074	2.09	1948	1125	2.31	2158
2700	914	1.53	1429	972	1.74	1624	1027	1.96	1825	1079	2.18	2032	1130	2.41	2245
2800	922	1.61	1505	979	1.83	1704	1033	2.05	1909	1085	2.27	2120	1135	2.51	2337
2900	931	1.70	1584	986	1.92	1787	1040	2.14	1996	1091	2.37	2211	1141	2.61	2432
3000	939	1.79	1667	994	2.01	1874	1047	2.24	2087	1098	2.47	2307	1147	2.71	2532
3100	948	1.88	1753	1002	2.11	1965	1054	2.34	2183	1105	2.58	2406	1153	2.83	2635
3200	957	1.98	1844	1011	2.21	2060	1062	2.45	2283	1112	2.69	2510	1160	2.94	2743
3300	967	2.08	1939	1020	2.32	2160	1070	2.56	2386	1119	2.81	2618	1167	3.06	2855
3400	977	2.19	2039	1029	2.43	2264	1079	2.67	2494	1127	2.93	2730	1174	3.19	2971
3500	987	2.30	2143	1038	2.54	2372	1088	2.80	2607	1135	3.05	2847	1181	3.32	3092
3600	998	2.41	2251	1048	2.66	2485	1097	2.92	2724	1144	3.18	2968	1189	3.45	3218
3700	1008	2.54	2364	1058	2.79	2602	1106	3.05	2846	1152	3.32	3094	1198	3.59	3348
3800	1019	2.66	2482	1068	2.92	2725	1116	3.19	2972	1162	3.46	3226	1206	3.74	3484
3900	1031	2.79	2605	1079	3.06	2852	1126	3.33	3104	1171	3.61	3362	1215	3.89	3624
4000	1042	2.93	2733	1090	3.20	2984	1136	3.48	3241	1180	3.76	3503	1224	4.04	3770
4100	1054	3.07	2866	1101	3.35	3122	1146	3.63	3383	1190	3.91	3649	1233	4.20	3921
4200	1066	3.22	3004	1112	3.50	3264	1157	3.79	3530	1200	4.08	3801	—	—	—
4300	1078	3.38	3148	1123	3.66	3413	1167	3.95	3683	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 4.20.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 14 — Fan Performance 48HJ012 — Vertical Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	616	0.79	732	689	0.97	904	757	1.16	1083	821	1.36	1271	882	1.57	1465
3100	632	0.85	796	703	1.04	972	769	1.24	1157	832	1.45	1349	892	1.66	1548
3200	648	0.93	864	717	1.12	1045	782	1.32	1235	843	1.53	1431	902	1.75	1635
3300	663	1.00	936	731	1.20	1122	795	1.41	1316	855	1.63	1517	912	1.85	1725
3400	679	1.09	1012	745	1.29	1203	808	1.50	1402	867	1.72	1608	923	1.95	1820
3500	695	1.17	1092	760	1.38	1288	821	1.60	1492	879	1.83	1703	934	2.06	1920
3600	711	1.26	1177	774	1.48	1379	834	1.70	1587	891	1.93	1802	945	2.17	2024
3700	728	1.36	1266	789	1.58	1473	848	1.81	1686	904	2.04	1906	957	2.29	2132
3800	744	1.46	1361	804	1.69	1572	861	1.92	1790	916	2.16	2015	969	2.41	2246
3900	760	1.57	1460	819	1.80	1676	875	2.04	1899	929	2.28	2128	981	2.53	2364
4000	777	1.68	1563	834	1.91	1785	889	2.16	2012	942	2.41	2247	993	2.67	2487
4100	793	1.79	1672	850	2.04	1899	904	2.29	2132	956	2.54	2371	1006	2.80	2615
4200	810	1.92	1786	865	2.16	2018	918	2.42	2255	969	2.68	2499	1018	2.95	2748
4300	826	2.04	1906	880	2.30	2142	932	2.56	2385	983	2.82	2633	1031	3.10	2888
4400	843	2.18	2031	896	2.44	2272	947	2.70	2520	996	2.97	2773	1044	3.25	3032
4500	860	2.32	2161	912	2.58	2408	962	2.85	2660	1010	3.13	2918	1057	3.41	3182
4600	876	2.46	2297	927	2.73	2549	977	3.01	2807	1024	3.29	3070	1070	3.58	3338
4700	893	2.62	2439	943	2.89	2696	992	3.17	2958	1038	3.46	3226	—	—	—
4800	910	2.77	2587	959	3.06	2849	1007	3.34	3116	1053	3.63	3390	—	—	—
4900	927	2.94	2741	975	3.23	3008	1022	3.52	3280	—	—	—	—	—	—
5000	944	3.11	2901	991	3.40	3173	1037	3.70	3451	—	—	—	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	939	1.79	1667	994	2.01	1874	1047	2.24	2087	1098	2.47	2307	1147	2.71	2532
3100	948	1.88	1753	1002	2.11	1965	1054	2.34	2183	1105	2.58	2406	1153	2.83	2635
3200	957	1.98	1844	1011	2.21	2060	1062	2.45	2283	1112	2.69	2510	1160	2.94	2743
3300	967	2.08	1939	1020	2.32	2160	1070	2.56	2386	1119	2.81	2618	1167	3.06	2855
3400	977	2.19	2039	1029	2.43	2264	1079	2.67	2494	1127	2.93	2730	1174	3.19	2971
3500	987	2.30	2143	1038	2.54	2372	1088	2.80	2607	1135	3.05	2847	1181	3.32	3092
3600	998	2.41	2251	1048	2.66	2485	1097	2.92	2724	1144	3.18	2968	1189	3.45	3218
3700	1008	2.54	2364	1058	2.79	2602	1106	3.05	2846	1152	3.32	3094	1198	3.59	3348
3800	1019	2.66	2482	1068	2.92	2725	1116	3.19	2972	1162	3.46	3226	—	—	—
3900	1031	2.79	2605	1079	3.06	2852	1126	3.33	3104	1171	3.61	3362	—	—	—
4000	1042	2.93	2733	1090	3.20	2984	1136	3.48	3241	—	—	—	—	—	—
4100	1054	3.07	2866	1101	3.35	3122	1146	3.63	3383	—	—	—	—	—	—
4200	1066	3.22	3004	1112	3.50	3264	—	—	—	—	—	—	—	—	—
4300	1078	3.38	3148	1123	3.66	3413	—	—	—	—	—	—	—	—	—
4400	1090	3.54	3297	—	—	—	—	—	—	—	—	—	—	—	—
4500	1103	3.70	3451	—	—	—	—	—	—	—	—	—	—	—	—
4600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 3.70.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 15 — Fan Performance 48HJ012 — Vertical Discharge Units; High-Static Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	616	0.79	732	689	0.97	904	757	1.16	1083	821	1.36	1271	882	1.57	1465
3100	632	0.85	796	703	1.04	972	769	1.24	1157	832	1.45	1349	892	1.66	1548
3200	648	0.93	864	717	1.12	1045	782	1.32	1235	843	1.53	1431	902	1.75	1635
3300	663	1.00	936	731	1.20	1122	795	1.41	1316	855	1.63	1517	912	1.85	1725
3400	679	1.09	1012	745	1.29	1203	808	1.50	1402	867	1.72	1608	923	1.95	1820
3500	695	1.17	1092	760	1.38	1288	821	1.60	1492	879	1.83	1703	934	2.06	1920
3600	711	1.26	1177	774	1.48	1379	834	1.70	1587	891	1.93	1802	945	2.17	2024
3700	728	1.36	1266	789	1.58	1473	848	1.81	1686	904	2.04	1906	957	2.29	2132
3800	744	1.46	1361	804	1.69	1572	861	1.92	1790	916	2.16	2015	969	2.41	2246
3900	760	1.57	1460	819	1.80	1676	875	2.04	1899	929	2.28	2128	981	2.53	2364
4000	777	1.68	1563	834	1.91	1785	889	2.16	2012	942	2.41	2247	993	2.67	2487
4100	793	1.79	1672	850	2.04	1899	904	2.29	2132	956	2.54	2371	1006	2.80	2615
4200	810	1.92	1786	865	2.16	2018	918	2.42	2255	969	2.68	2499	1018	2.95	2748
4300	826	2.04	1906	880	2.30	2142	932	2.56	2385	983	2.82	2633	1031	3.10	2888
4400	843	2.18	2031	896	2.44	2272	947	2.70	2520	996	2.97	2773	1044	3.25	3032
4500	860	2.32	2161	912	2.58	2408	962	2.85	2660	1010	3.13	2918	1057	3.41	3182
4600	876	2.46	2297	927	2.73	2549	977	3.01	2807	1024	3.29	3070	1070	3.58	3338
4700	893	2.62	2439	943	2.89	2696	992	3.17	2958	1038	3.46	3226	1084	3.75	3500
4800	910	2.77	2587	959	3.06	2849	1007	3.34	3116	1053	3.63	3390	1098	3.93	3668
4900	927	2.94	2741	975	3.23	3008	1022	3.52	3280	1067	3.82	3558	1111	4.12	3841
5000	944	3.11	2901	991	3.40	3173	1037	3.70	3451	1082	4.00	3733	1125	4.31	4021

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	939	1.79	1667	994	2.01	1874	1047	2.24	2087	1098	2.47	2307	1147	2.71	2532
3100	948	1.88	1753	1002	2.11	1965	1054	2.34	2183	1105	2.58	2406	1153	2.83	2635
3200	957	1.98	1844	1011	2.21	2060	1062	2.45	2283	1112	2.69	2510	1160	2.94	2743
3300	967	2.08	1939	1020	2.32	2160	1070	2.56	2386	1119	2.81	2618	1167	3.06	2855
3400	977	2.19	2039	1029	2.43	2264	1079	2.67	2494	1127	2.93	2730	1174	3.19	2971
3500	987	2.30	2143	1038	2.54	2372	1088	2.80	2607	1135	3.05	2847	1181	3.32	3092
3600	998	2.41	2251	1048	2.66	2485	1097	2.92	2724	1144	3.18	2968	1189	3.45	3218
3700	1008	2.54	2364	1058	2.79	2602	1106	3.05	2846	1152	3.32	3094	1198	3.59	3348
3800	1019	2.66	2482	1068	2.92	2725	1116	3.19	2972	1162	3.46	3226	1206	3.74	3484
3900	1031	2.79	2605	1079	3.06	2852	1126	3.33	3104	1171	3.61	3362	1215	3.89	3624
4000	1042	2.93	2733	1090	3.20	2984	1136	3.48	3241	1180	3.76	3503	1224	4.04	3770
4100	1054	3.07	2866	1101	3.35	3122	1146	3.63	3383	1190	3.91	3649	1233	4.20	3921
4200	1066	3.22	3004	1112	3.50	3264	1157	3.79	3530	1200	4.08	3801	1243	4.37	4077
4300	1078	3.38	3148	1123	3.66	3413	1167	3.95	3683	1210	4.24	3958	1252	4.54	4238
4400	1090	3.54	3297	1135	3.82	3566	1179	4.12	3841	1221	4.42	4121	1262	4.72	4405
4500	1103	3.70	3451	1147	4.00	3726	1190	4.29	4005	1232	4.60	4289	1273	4.91	4578
4600	1115	3.87	3612	1159	4.17	3891	1201	4.48	4175	1243	4.79	4464	1283	5.10	4757
4700	1128	4.05	3778	1171	4.36	4062	1213	4.67	4350	1254	4.98	4644	—	—	—
4800	1141	4.24	3951	1183	4.55	4239	1225	4.86	4532	1265	5.18	4830	—	—	—
4900	1154	4.43	4130	1196	4.74	4422	1237	5.06	4720	—	—	—	—	—	—
5000	1167	4.63	4314	1209	4.95	4611	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 5.25.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 830 to 1130 rpm. All other rpms require field-supplied drive.

Table 16 — Fan Performance 48HJ014 — Vertical Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3700	728	1.36	1266	789	1.58	1473	848	1.81	1686	904	2.04	1906	957	2.29	2132
3800	744	1.46	1361	804	1.69	1572	861	1.92	1790	916	2.16	2015	969	2.41	2246
3900	760	1.57	1460	819	1.80	1676	875	2.04	1899	929	2.28	2128	981	2.53	2364
4000	777	1.68	1563	834	1.91	1785	889	2.16	2012	942	2.41	2247	993	2.67	2487
4100	793	1.79	1672	850	2.04	1899	904	2.29	2132	956	2.54	2371	1006	2.80	2615
4200	810	1.92	1786	865	2.16	2018	918	2.42	2255	969	2.68	2499	1018	2.95	2748
4300	826	2.04	1906	880	2.30	2142	932	2.56	2385	983	2.82	2633	1031	3.10	2888
4400	843	2.18	2031	896	2.44	2272	947	2.70	2520	996	2.97	2773	1044	3.25	3032
4500	860	2.32	2161	912	2.58	2408	962	2.85	2660	1010	3.13	2918	1057	3.41	3182
4600	876	2.46	2297	927	2.73	2549	977	3.01	2807	1024	3.29	3070	1070	3.58	3338
4700	893	2.62	2439	943	2.89	2696	992	3.17	2958	1038	3.46	3226	1084	3.75	3500
4800	910	2.77	2587	959	3.06	2849	1007	3.34	3116	1053	3.63	3390	1098	3.93	3688
4900	927	2.94	2741	975	3.23	3008	1022	3.52	3280	1067	3.82	3558	1111	4.12	3841
5000	944	3.11	2901	991	3.40	3173	1037	3.70	3451	1082	4.00	3733	1125	4.31	4021
5100	961	3.29	3068	1007	3.59	3345	1053	3.89	3627	1096	4.20	3915	1139	4.51	4208
5200	978	3.48	3241	1024	3.78	3523	1068	4.09	3811	1111	4.40	4103	1153	4.72	4400
5300	995	3.67	3420	1040	3.98	3707	1084	4.29	4000	1126	4.61	4298	1168	4.93	4600
5400	1012	3.87	3606	1056	4.18	3899	1099	4.50	4196	1141	4.82	4499	1182	5.15	4806
5500	1029	4.07	3799	1073	4.39	4097	1115	4.72	4400	1156	5.05	4707	—	—	—
5600	1046	4.29	3999	1089	4.61	4302	1131	4.94	4610	—	—	—	—	—	—
5700	1063	4.51	4207	1105	4.84	4515	1146	5.18	4827	—	—	—	—	—	—
5800	1080	4.74	4420	1122	5.08	4734	—	—	—	—	—	—	—	—	—
5900	1098	4.98	4642	—	—	—	—	—	—	—	—	—	—	—	—
6000	1115	5.22	4872	—	—	—	—	—	—	—	—	—	—	—	—
6100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3700	1008	2.54	2364	1058	2.79	2602	1106	3.05	2846	1152	3.32	3094	1198	3.59	3348
3800	1019	2.66	2482	1068	2.92	2725	1116	3.19	2972	1162	3.46	3226	1206	3.74	3484
3900	1031	2.79	2605	1079	3.06	2852	1126	3.33	3104	1171	3.61	3362	1215	3.89	3624
4000	1042	2.93	2733	1090	3.20	2984	1136	3.48	3241	1180	3.76	3503	1224	4.04	3770
4100	1054	3.07	2866	1101	3.35	3122	1146	3.63	3383	1190	3.91	3649	1233	4.20	3921
4200	1066	3.22	3004	1112	3.50	3264	1157	3.79	3530	1200	4.08	3801	1243	4.37	4077
4300	1078	3.38	3148	1123	3.66	3413	1167	3.95	3683	1210	4.24	3958	1252	4.54	4238
4400	1090	3.54	3297	1135	3.82	3566	1179	4.12	3841	1221	4.42	4121	1262	4.72	4405
4500	1103	3.70	3451	1147	4.00	3726	1190	4.29	4005	1232	4.60	4289	1273	4.91	4578
4600	1115	3.87	3612	1159	4.17	3891	1201	4.48	4175	1243	4.79	4464	1283	5.10	4757
4700	1128	4.05	3778	1171	4.36	4062	1213	4.67	4350	1254	4.98	4644	—	—	—
4800	1141	4.24	3951	1183	4.55	4239	1225	4.86	4532	1265	5.18	4830	—	—	—
4900	1154	4.43	4130	1196	4.74	4422	1237	5.06	4720	—	—	—	—	—	—
5000	1167	4.63	4314	1209	4.95	4611	—	—	—	—	—	—	—	—	—
5100	1181	4.83	4505	1221	5.16	4808	—	—	—	—	—	—	—	—	—
5200	1194	5.04	4703	—	—	—	—	—	—	—	—	—	—	—	—
5300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 5.25.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 830 to 1130 rpm. All other rpms require field-supplied drive.

Table 17 — Fan Performance 48HJ008 — Horizontal Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	505	0.52	484	586	0.73	681	657	0.97	901	722	1.22	1142	782	1.50	1403
2300	513	0.55	509	592	0.76	708	663	1.00	931	727	1.26	1174	787	1.54	1437
2400	527	0.60	561	605	0.82	766	674	1.07	993	738	1.33	1241	796	1.62	1508
2500	543	0.66	617	618	0.89	828	686	1.14	1060	748	1.41	1312	806	1.70	1583
2550	550	0.69	647	625	0.92	860	692	1.17	1095	754	1.45	1349	811	1.74	1623
2600	558	0.73	677	632	0.96	894	698	1.21	1131	759	1.49	1388	816	1.78	1664
2700	574	0.80	742	645	1.03	964	710	1.29	1207	770	1.58	1469	826	1.88	1749
2800	589	0.87	811	659	1.11	1039	723	1.38	1287	782	1.67	1554	837	1.97	1839
2900	605	0.95	885	673	1.20	1119	736	1.47	1372	794	1.76	1644	848	2.07	1933
3000	621	1.03	963	688	1.29	1204	749	1.57	1463	806	1.87	1740	859	2.18	2033
3100	637	1.12	1046	702	1.39	1293	762	1.67	1558	818	1.97	1840	871	2.29	2139
3200	654	1.22	1135	717	1.49	1388	776	1.78	1658	831	2.09	1946	882	2.41	2249
3300	670	1.32	1228	732	1.60	1488	789	1.89	1764	843	2.21	2057	894	2.54	2365
3400	686	1.42	1328	747	1.71	1593	803	2.01	1876	856	2.33	2174	907	2.67	2488
3500	703	1.54	1433	762	1.83	1705	817	2.14	1993	870	2.46	2297	919	2.81	2616
3600	720	1.66	1543	777	1.95	1822	832	2.27	2116	883	2.60	2425	—	—	—
3700	736	1.78	1660	793	2.09	1944	846	2.41	2245	896	2.75	2560	—	—	—
3750	745	1.85	1721	801	2.15	2008	853	2.48	2312	903	2.82	2630	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	838	1.81	1683	891	2.12	1981	941	2.46	2297	988	2.82	2629	—	—	—
2300	842	1.84	1719	895	2.17	2019	944	2.51	2336	992	2.86	2669	—	—	—
2400	851	1.92	1793	903	2.25	2097	952	2.59	2416	—	—	—	—	—	—
2500	860	2.01	1873	911	2.34	2180	960	2.68	2502	—	—	—	—	—	—
2550	865	2.05	1914	916	2.38	2223	964	2.73	2547	—	—	—	—	—	—
2600	869	2.10	1957	920	2.43	2267	968	2.78	2593	—	—	—	—	—	—
2700	879	2.19	2046	929	2.53	2360	976	2.88	2689	—	—	—	—	—	—
2800	889	2.29	2140	938	2.64	2458	—	—	—	—	—	—	—	—	—
2900	899	2.40	2239	948	2.75	2561	—	—	—	—	—	—	—	—	—
3000	910	2.51	2343	958	2.86	2670	—	—	—	—	—	—	—	—	—
3100	921	2.63	2453	—	—	—	—	—	—	—	—	—	—	—	—
3200	932	2.75	2569	—	—	—	—	—	—	—	—	—	—	—	—
3300	943	2.88	2690	—	—	—	—	—	—	—	—	—	—	—	—
3400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3750	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 2.90.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.

Table 18 — Fan Performance 48HJ008 — Horizontal Discharge Units; High-Static Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	505	0.52	484	586	0.73	681	657	0.97	901	722	1.22	1142	782	1.50	1403
2300	513	0.55	509	592	0.76	708	663	1.00	931	727	1.26	1174	787	1.54	1437
2400	527	0.60	561	605	0.82	766	674	1.07	993	738	1.33	1241	796	1.62	1508
2500	543	0.66	617	618	0.89	828	686	1.14	1060	748	1.41	1312	806	1.70	1583
2550	550	0.69	647	625	0.92	860	692	1.17	1095	754	1.45	1349	811	1.74	1623
2600	558	0.73	677	632	0.96	894	698	1.21	1131	759	1.49	1388	816	1.78	1664
2700	574	0.80	742	645	1.03	964	710	1.29	1207	770	1.58	1469	826	1.88	1749
2800	589	0.87	811	659	1.11	1039	723	1.38	1287	782	1.67	1554	837	1.97	1839
2900	605	0.95	885	673	1.20	1119	736	1.47	1372	794	1.76	1644	848	2.07	1933
3000	621	1.03	963	688	1.29	1204	749	1.57	1463	806	1.87	1740	859	2.18	2033
3100	637	1.12	1046	702	1.39	1293	762	1.67	1558	818	1.97	1840	871	2.29	2139
3200	654	1.22	1135	717	1.49	1388	776	1.78	1658	831	2.09	1946	882	2.41	2249
3300	670	1.32	1228	732	1.60	1488	789	1.89	1764	843	2.21	2057	894	2.54	2365
3400	686	1.42	1328	747	1.71	1593	803	2.01	1876	856	2.33	2174	907	2.67	2488
3500	703	1.54	1433	762	1.83	1705	817	2.14	1993	870	2.46	2297	919	2.81	2616
3600	720	1.66	1543	777	1.95	1822	832	2.27	2116	883	2.60	2425	932	2.95	2750
3700	736	1.78	1660	793	2.09	1944	846	2.41	2245	896	2.75	2560	944	3.10	2889
3750	745	1.85	1721	801	2.15	2008	853	2.48	2312	903	2.82	2630	951	3.18	2962

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	838	1.81	1683	891	2.12	1981	941	2.46	2297	988	2.82	2629	1033	3.19	2976
2300	842	1.84	1719	895	2.17	2019	944	2.51	2336	992	2.86	2669	1037	3.24	3018
2400	851	1.92	1793	903	2.25	2097	952	2.59	2416	999	2.95	2752	1043	3.33	3104
2500	860	2.01	1873	911	2.34	2180	960	2.68	2502	1006	3.05	2842	1051	3.43	3196
2550	865	2.05	1914	916	2.38	2223	964	2.73	2547	1010	3.10	2888	1054	3.48	3243
2600	869	2.10	1957	920	2.43	2267	968	2.78	2593	1014	3.15	2935	1058	3.53	3292
2700	879	2.19	2046	929	2.53	2360	976	2.88	2689	1022	3.25	3035	1066	3.64	3395
2800	889	2.29	2140	938	2.64	2458	985	2.99	2791	1030	3.37	3140	1073	3.76	3503
2900	899	2.40	2239	948	2.75	2561	994	3.11	2898	1039	3.49	3250	1082	3.88	3616
3000	910	2.51	2343	958	2.86	2670	1004	3.23	3011	1048	3.61	3366	1090	4.01	3736
3100	921	2.63	2453	968	2.98	2783	1013	3.35	3128	1057	3.74	3488	1099	4.14	3861
3200	932	2.75	2569	978	3.11	2903	1023	3.49	3252	1066	3.88	3616	—	—	—
3300	943	2.88	2690	989	3.25	3029	1033	3.63	3382	1076	4.02	3749	—	—	—
3400	954	3.02	2816	1000	3.39	3159	1044	3.77	3518	1086	4.17	3889	—	—	—
3500	966	3.16	2950	1011	3.54	3297	1054	3.92	3660	—	—	—	—	—	—
3600	978	3.31	3088	1022	3.69	3442	1065	4.08	3808	—	—	—	—	—	—
3700	990	3.47	3233	1034	3.85	3591	—	—	—	—	—	—	—	—	—
3750	996	3.55	3308	1040	3.93	3669	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 4.20.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 19 — Fan Performance 48HJ009 — Horizontal Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	513	0.45	423	603	0.62	576	682	0.78	732	753	0.96	892	817	1.13	1055
2600	526	0.50	463	614	0.67	621	692	0.84	783	761	1.02	948	825	1.20	1117
2700	539	0.54	505	625	0.72	670	702	0.90	837	770	1.08	1008	834	1.27	1182
2800	552	0.59	551	637	0.77	721	712	0.96	894	780	1.15	1070	842	1.34	1250
2900	565	0.64	599	648	0.83	775	722	1.02	954	789	1.22	1136	851	1.42	1321
3000	579	0.70	651	660	0.89	832	732	1.09	1017	799	1.29	1204	860	1.50	1395
3100	592	0.76	706	672	0.96	893	743	1.16	1083	808	1.37	1276	869	1.58	1471
3200	606	0.82	764	684	1.03	957	754	1.24	1153	818	1.45	1351	878	1.66	1552
3300	620	0.88	825	696	1.10	1024	765	1.31	1225	829	1.53	1429	888	1.75	1636
3400	634	0.95	890	709	1.17	1095	777	1.40	1302	839	1.62	1511	897	1.85	1723
3500	648	1.03	958	721	1.25	1169	788	1.48	1381	850	1.71	1597	907	1.95	1815
3600	662	1.10	1030	734	1.34	1246	800	1.57	1465	860	1.81	1686	917	2.05	1909
3700	676	1.19	1106	747	1.42	1328	811	1.66	1552	871	1.91	1779	927	2.15	2008
3800	690	1.27	1185	760	1.52	1414	823	1.76	1644	882	2.01	1876	938	2.26	2111
3900	705	1.36	1269	773	1.61	1503	835	1.86	1739	894	2.12	1977	948	2.38	2217
4000	719	1.45	1357	786	1.71	1597	848	1.97	1838	905	2.23	2082	959	2.50	2328
4100	734	1.55	1449	799	1.82	1695	860	2.08	1942	917	2.35	2192	970	2.62	2443
4200	748	1.66	1545	813	1.93	1797	872	2.20	2050	928	2.47	2305	981	2.75	2562
4300	763	1.76	1646	826	2.04	1903	885	2.32	2162	940	2.60	2423	992	2.88	2686

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	877	1.31	1222	933	1.49	1392	986	1.68	1565	1037	1.87	1742	1085	2.06	1921
2600	885	1.38	1289	940	1.57	1464	993	1.76	1643	1043	1.96	1824	1091	2.15	2008
2700	892	1.46	1359	948	1.65	1540	1000	1.85	1723	1049	2.05	1909	1097	2.25	2099
2800	900	1.54	1432	955	1.74	1618	1007	1.94	1807	1056	2.14	1998	1103	2.35	2192
2900	908	1.62	1508	963	1.82	1699	1014	2.03	1893	1063	2.24	2089	1110	2.45	2289
3000	917	1.70	1587	970	1.91	1784	1021	2.13	1983	1070	2.34	2185	1117	2.56	2389
3100	925	1.79	1670	979	2.01	1872	1029	2.23	2076	1077	2.45	2283	1123	2.67	2492
3200	934	1.88	1756	987	2.10	1963	1037	2.33	2172	1085	2.56	2384	1131	2.79	2599
3300	943	1.98	1845	995	2.21	2057	1045	2.44	2272	1092	2.67	2490	—	—	—
3400	952	2.08	1939	1004	2.31	2156	1053	2.55	2376	1100	2.79	2599	—	—	—
3500	961	2.18	2035	1013	2.42	2258	1062	2.66	2483	—	—	—	—	—	—
3600	971	2.29	2135	1022	2.53	2364	1070	2.78	2595	—	—	—	—	—	—
3700	981	2.40	2240	1031	2.65	2473	—	—	—	—	—	—	—	—	—
3800	990	2.52	2348	1040	2.77	2587	—	—	—	—	—	—	—	—	—
3900	1000	2.64	2459	1050	2.90	2705	—	—	—	—	—	—	—	—	—
4000	1011	2.76	2576	—	—	—	—	—	—	—	—	—	—	—	—
4100	1021	2.89	2697	—	—	—	—	—	—	—	—	—	—	—	—
4200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 2.90.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 840 to 1085 rpm. All other rpms require field-supplied drive.

Table 20 — Fan Performance 48HJ009 — Horizontal Discharge Units; High-Static Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	513	0.45	423	603	0.62	576	682	0.78	732	753	0.96	892	817	1.13	1055
2600	526	0.50	463	614	0.67	621	692	0.84	783	761	1.02	948	825	1.20	1117
2700	539	0.54	505	625	0.72	670	702	0.90	837	770	1.08	1008	834	1.27	1182
2800	552	0.59	551	637	0.77	721	712	0.96	894	780	1.15	1070	842	1.34	1250
2900	565	0.64	599	648	0.83	775	722	1.02	954	789	1.22	1136	851	1.42	1321
3000	579	0.70	651	660	0.89	832	732	1.09	1017	799	1.29	1204	860	1.50	1395
3100	592	0.76	706	672	0.96	893	743	1.16	1083	808	1.37	1276	869	1.58	1471
3200	606	0.82	764	684	1.03	957	754	1.24	1153	818	1.45	1351	878	1.66	1552
3300	620	0.88	825	696	1.10	1024	765	1.31	1225	829	1.53	1429	888	1.75	1636
3400	634	0.95	890	709	1.17	1095	777	1.40	1302	839	1.62	1511	897	1.85	1723
3500	648	1.03	958	721	1.25	1169	788	1.48	1381	850	1.71	1597	907	1.95	1815
3600	662	1.10	1030	734	1.34	1246	800	1.57	1465	860	1.81	1686	917	2.05	1909
3700	676	1.19	1106	747	1.42	1328	811	1.66	1552	871	1.91	1779	927	2.15	2008
3800	690	1.27	1185	760	1.52	1414	823	1.76	1644	882	2.01	1876	938	2.26	2111
3900	705	1.36	1269	773	1.61	1503	835	1.86	1739	894	2.12	1977	948	2.38	2217
4000	719	1.45	1357	786	1.71	1597	848	1.97	1838	905	2.23	2082	959	2.50	2328
4100	734	1.55	1449	799	1.82	1695	860	2.08	1942	917	2.35	2192	970	2.62	2443
4200	748	1.66	1545	813	1.93	1797	872	2.20	2050	928	2.47	2305	981	2.75	2562
4300	763	1.76	1646	826	2.04	1903	885	2.32	2162	940	2.60	2423	992	2.88	2686

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2500	877	1.31	1222	933	1.49	1392	986	1.68	1565	1037	1.87	1742	1085	2.06	1921
2600	885	1.38	1289	940	1.57	1464	993	1.76	1643	1043	1.96	1824	1091	2.15	2008
2700	892	1.46	1359	948	1.65	1540	1000	1.85	1723	1049	2.05	1909	1097	2.25	2099
2800	900	1.54	1432	955	1.74	1618	1007	1.94	1807	1056	2.14	1998	1103	2.35	2192
2900	908	1.62	1508	963	1.82	1699	1014	2.03	1893	1063	2.24	2089	1110	2.45	2289
3000	917	1.70	1587	970	1.91	1784	1021	2.13	1983	1070	2.34	2185	1117	2.56	2389
3100	925	1.79	1670	979	2.01	1872	1029	2.23	2076	1077	2.45	2283	1123	2.67	2492
3200	934	1.88	1756	987	2.10	1963	1037	2.33	2172	1085	2.56	2384	1131	2.79	2599
3300	943	1.98	1845	995	2.21	2057	1045	2.44	2272	1092	2.67	2490	1138	2.91	2710
3400	952	2.08	1939	1004	2.31	2156	1053	2.55	2376	1100	2.79	2599	1145	3.03	2824
3500	961	2.18	2035	1013	2.42	2258	1062	2.66	2483	1108	2.91	2711	1153	3.15	2942
3600	971	2.29	2135	1022	2.53	2364	1070	2.78	2595	1116	3.03	2827	1161	3.29	3063
3700	981	2.40	2240	1031	2.65	2473	1079	2.91	2709	1125	3.16	2948	1169	3.42	3189
3800	990	2.52	2348	1040	2.77	2587	1088	3.03	2828	1133	3.30	3073	1177	3.56	3319
3900	1000	2.64	2459	1050	2.90	2705	1097	3.17	2951	1142	3.43	3201	1186	3.70	3452
4000	1011	2.76	2576	1059	3.03	2826	1106	3.30	3079	1151	3.58	3334	1194	3.85	3591
4100	1021	2.89	2697	1069	3.17	2953	1116	3.44	3210	1160	3.72	3471	1203	4.00	3733
4200	1031	3.03	2822	1079	3.31	3083	1125	3.59	3347	1169	3.87	3612	1212	4.16	3880
4300	1042	3.16	2951	1089	3.45	3218	1135	3.74	3487	1179	4.03	3758	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 4.20.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 21 — Fan Performance 48HJ012 — Horizontal Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	579	0.70	651	660	0.89	832	732	1.09	1017	799	1.29	1204	860	1.50	1395
3100	592	0.76	706	672	0.96	893	743	1.16	1083	808	1.37	1276	869	1.58	1471
3200	606	0.82	764	684	1.03	957	754	1.24	1153	818	1.45	1351	878	1.66	1552
3300	620	0.88	825	696	1.10	1024	765	1.31	1225	829	1.53	1429	888	1.75	1636
3400	634	0.95	890	709	1.17	1095	777	1.40	1302	839	1.62	1511	897	1.85	1723
3500	648	1.03	958	721	1.25	1169	788	1.48	1381	850	1.71	1597	907	1.95	1815
3600	662	1.10	1030	734	1.34	1246	800	1.57	1465	860	1.81	1686	917	2.05	1909
3700	676	1.19	1106	747	1.42	1328	811	1.66	1552	871	1.91	1779	927	2.15	2008
3800	690	1.27	1185	760	1.52	1414	823	1.76	1644	882	2.01	1876	938	2.26	2111
3900	705	1.36	1269	773	1.61	1503	835	1.86	1739	894	2.12	1977	948	2.38	2217
4000	719	1.45	1357	786	1.71	1597	848	1.97	1838	905	2.23	2082	959	2.50	2328
4100	734	1.55	1449	799	1.82	1695	860	2.08	1942	917	2.35	2192	970	2.62	2443
4200	748	1.66	1545	813	1.93	1797	872	2.20	2050	928	2.47	2305	981	2.75	2562
4300	763	1.76	1646	826	2.04	1903	885	2.32	2162	940	2.60	2423	992	2.88	2686
4400	778	1.88	1751	840	2.16	2014	898	2.44	2279	952	2.73	2546	1004	3.02	2814
4500	792	1.99	1860	853	2.28	2130	910	2.57	2401	964	2.87	2673	1015	3.16	2947
4600	807	2.12	1975	867	2.41	2250	923	2.71	2527	976	3.01	2805	1027	3.31	3085
4700	822	2.25	2094	881	2.55	2375	936	2.85	2658	989	3.15	2942	1038	3.46	3227
4800	837	2.38	2218	895	2.69	2505	949	3.00	2794	1001	3.31	3083	1050	3.62	3375
4900	852	2.52	2347	909	2.83	2640	963	3.15	2935	1014	3.46	3230	—	—	—
5000	867	2.66	2482	923	2.98	2781	976	3.30	3081	1026	3.63	3383	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	917	1.70	1587	970	1.91	1784	1021	2.13	1983	1070	2.34	2185	1117	2.56	2389
3100	925	1.79	1670	979	2.01	1872	1029	2.23	2076	1077	2.45	2283	1123	2.67	2492
3200	934	1.88	1756	987	2.10	1963	1037	2.33	2172	1085	2.56	2384	1131	2.79	2599
3300	943	1.98	1845	995	2.21	2057	1045	2.44	2272	1092	2.67	2490	1138	2.91	2710
3400	952	2.08	1939	1004	2.31	2156	1053	2.55	2376	1100	2.79	2599	1145	3.03	2824
3500	961	2.18	2035	1013	2.42	2258	1062	2.66	2483	1108	2.91	2711	1153	3.15	2942
3600	971	2.29	2135	1022	2.53	2364	1070	2.78	2595	1116	3.03	2827	1161	3.29	3063
3700	981	2.40	2240	1031	2.65	2473	1079	2.91	2709	1125	3.16	2948	1169	3.42	3189
3800	990	2.52	2348	1040	2.77	2587	1088	3.03	2828	1133	3.30	3073	1177	3.56	3319
3900	1000	2.64	2459	1050	2.90	2705	1097	3.17	2951	1142	3.43	3201	1186	3.70	3452
4000	1011	2.76	2576	1059	3.03	2826	1106	3.30	3079	1151	3.58	3334	—	—	—
4100	1021	2.89	2697	1069	3.17	2953	1116	3.44	3210	—	—	—	—	—	—
4200	1031	3.03	2822	1079	3.31	3083	1125	3.59	3347	—	—	—	—	—	—
4300	1042	3.16	2951	1089	3.45	3218	—	—	—	—	—	—	—	—	—
4400	1053	3.31	3085	1100	3.60	3357	—	—	—	—	—	—	—	—	—
4500	1064	3.46	3224	—	—	—	—	—	—	—	—	—	—	—	—
4600	1075	3.61	3367	—	—	—	—	—	—	—	—	—	—	—	—
4700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 3.70.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 860 to 1080 rpm. All other rpms require field-supplied drive.

Table 22 — Fan Performance 48HJ012 — Horizontal Discharge Units; High-Static Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	579	0.70	651	660	0.89	832	732	1.09	1017	799	1.29	1204	860	1.50	1395
3100	592	0.76	706	672	0.96	893	743	1.16	1083	808	1.37	1276	869	1.58	1471
3200	606	0.82	764	684	1.03	957	754	1.24	1153	818	1.45	1351	878	1.66	1552
3300	620	0.88	825	696	1.10	1024	765	1.31	1225	829	1.53	1429	888	1.75	1636
3400	634	0.95	890	709	1.17	1095	777	1.40	1302	839	1.62	1511	897	1.85	1723
3500	648	1.03	958	721	1.25	1169	788	1.48	1381	850	1.71	1597	907	1.95	1815
3600	662	1.10	1030	734	1.34	1246	800	1.57	1465	860	1.81	1686	917	2.05	1909
3700	676	1.19	1106	747	1.42	1328	811	1.66	1552	871	1.91	1779	927	2.15	2008
3800	690	1.27	1185	760	1.52	1414	823	1.76	1644	882	2.01	1876	938	2.26	2111
3900	705	1.36	1269	773	1.61	1503	835	1.86	1739	894	2.12	1977	948	2.38	2217
4000	719	1.45	1357	786	1.71	1597	848	1.97	1838	905	2.23	2082	959	2.50	2328
4100	734	1.55	1449	799	1.82	1695	860	2.08	1942	917	2.35	2192	970	2.62	2443
4200	748	1.66	1545	813	1.93	1797	872	2.20	2050	928	2.47	2305	981	2.75	2562
4300	763	1.76	1646	826	2.04	1903	885	2.32	2162	940	2.60	2423	992	2.88	2686
4400	778	1.88	1751	840	2.16	2014	898	2.44	2279	952	2.73	2546	1004	3.02	2814
4500	792	1.99	1860	853	2.28	2130	910	2.57	2401	964	2.87	2673	1015	3.16	2947
4600	807	2.12	1975	867	2.41	2250	923	2.71	2527	976	3.01	2805	1027	3.31	3085
4700	822	2.25	2094	881	2.55	2375	936	2.85	2658	989	3.15	2942	1038	3.46	3227
4800	837	2.38	2218	895	2.69	2505	949	3.00	2794	1001	3.31	3083	1050	3.62	3375
4900	852	2.52	2347	909	2.83	2640	963	3.15	2935	1014	3.46	3230	1062	3.78	3528
5000	867	2.66	2482	923	2.98	2781	976	3.30	3081	1026	3.63	3383	1074	3.95	3685

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	917	1.70	1587	970	1.91	1784	1021	2.13	1983	1070	2.34	2185	1117	2.56	2389
3100	925	1.79	1670	979	2.01	1872	1029	2.23	2076	1077	2.45	2283	1123	2.67	2492
3200	934	1.88	1756	987	2.10	1963	1037	2.33	2172	1085	2.56	2384	1131	2.79	2599
3300	943	1.98	1845	995	2.21	2057	1045	2.44	2272	1092	2.67	2490	1138	2.91	2710
3400	952	2.08	1939	1004	2.31	2156	1053	2.55	2376	1100	2.79	2599	1145	3.03	2824
3500	961	2.18	2035	1013	2.42	2258	1062	2.66	2483	1108	2.91	2711	1153	3.15	2942
3600	971	2.29	2135	1022	2.53	2364	1070	2.78	2595	1116	3.03	2827	1161	3.29	3063
3700	981	2.40	2240	1031	2.65	2473	1079	2.91	2709	1125	3.16	2948	1169	3.42	3189
3800	990	2.52	2348	1040	2.77	2587	1088	3.03	2828	1133	3.30	3073	1177	3.56	3319
3900	1000	2.64	2459	1050	2.90	2705	1097	3.17	2951	1142	3.43	3201	1186	3.70	3452
4000	1011	2.76	2576	1059	3.03	2826	1106	3.30	3079	1151	3.58	3334	1194	3.85	3591
4100	1021	2.89	2697	1069	3.17	2953	1116	3.44	3210	1160	3.72	3471	1203	4.00	3733
4200	1031	3.03	2822	1079	3.31	3083	1125	3.59	3347	1169	3.87	3612	1212	4.16	3880
4300	1042	3.16	2951	1089	3.45	3218	1135	3.74	3487	1179	4.03	3758	1221	4.32	4031
4400	1053	3.31	3085	1100	3.60	3357	1145	3.90	3632	1188	4.19	3909	1230	4.49	4187
4500	1064	3.46	3224	1110	3.76	3502	1155	4.06	3782	1198	4.36	4064	1239	4.66	4348
4600	1075	3.61	3367	1121	3.91	3650	1165	4.22	3937	1208	4.53	4224	1249	4.84	4514
4700	1086	3.77	3515	1131	4.08	3805	1175	4.39	4096	1217	4.71	4389	1258	5.02	4684
4800	1097	3.93	3668	1142	4.25	3963	1186	4.57	4260	1228	4.89	4559	1268	5.21	4860
4900	1109	4.10	3826	1153	4.43	4128	1196	4.75	4430	1238	5.08	4734	—	—	—
5000	1120	4.28	3990	1164	4.61	4296	1207	4.94	4604	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 5.25.
3. See page 41 for General Fan Performance Notes.

*Motor drive range: 830 to 1130 rpm. All other rpms require field-supplied drive.

Table 23 — Fan Performance 48HJ014 — Horizontal Discharge Units; Standard Motor (Belt Drive)*

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3700	676	1.19	1106	747	1.42	1328	811	1.66	1552	871	1.91	1779	927	2.15	2008
3800	690	1.27	1185	760	1.52	1414	823	1.76	1644	882	2.01	1876	938	2.26	2111
3900	705	1.36	1269	773	1.61	1503	835	1.86	1739	894	2.12	1977	948	2.38	2217
4000	719	1.45	1357	786	1.71	1597	848	1.97	1838	905	2.23	2082	959	2.50	2328
4100	734	1.55	1449	799	1.82	1695	860	2.08	1942	917	2.35	2192	970	2.62	2443
4200	748	1.66	1545	813	1.93	1797	872	2.20	2050	928	2.47	2305	981	2.75	2562
4300	763	1.76	1646	826	2.04	1903	885	2.32	2162	940	2.60	2423	992	2.88	2686
4400	778	1.88	1751	840	2.16	2014	898	2.44	2279	952	2.73	2546	1004	3.02	2814
4500	792	1.99	1860	853	2.28	2130	910	2.57	2401	964	2.87	2673	1015	3.16	2947
4600	807	2.12	1975	867	2.41	2250	923	2.71	2527	976	3.01	2805	1027	3.31	3085
4700	822	2.25	2094	881	2.55	2375	936	2.85	2658	989	3.15	2942	1038	3.46	3227
4800	837	2.38	2218	895	2.69	2505	949	3.00	2794	1001	3.31	3083	1050	3.62	3375
4900	852	2.52	2347	909	2.83	2640	963	3.15	2935	1014	3.46	3230	1062	3.78	3528
5000	867	2.66	2482	923	2.98	2781	976	3.30	3081	1026	3.63	3383	1074	3.95	3685
5100	882	2.81	2622	937	3.14	2926	989	3.47	3232	1039	3.80	3540	1086	4.13	3849
5200	897	2.97	2766	951	3.30	3077	1003	3.63	3389	1052	3.97	3702	1099	4.31	4017
5300	912	3.13	2917	966	3.47	3233	1016	3.81	3551	1065	4.15	3870	1111	4.49	4191
5400	927	3.30	3073	980	3.64	3395	1030	3.99	3719	1078	4.34	4044	1123	4.69	4370
5500	943	3.47	3234	994	3.82	3563	1044	4.17	3892	1091	4.53	4223	1136	4.88	4555
5600	958	3.65	3402	1009	4.01	3736	1057	4.37	4071	1104	4.73	4408	1149	5.09	4746
5700	973	3.83	3575	1023	4.20	3915	1071	4.56	4256	1117	4.93	4599	—	—	—
5800	988	4.03	3754	1038	4.40	4100	1085	4.77	4447	1130	5.14	4796	—	—	—
5900	1004	4.22	3939	1052	4.60	4292	1099	4.98	4645	—	—	—	—	—	—
6000	1019	4.43	4131	1067	4.81	4489	1113	5.20	4848	—	—	—	—	—	—
6100	1034	4.64	4329	1082	5.03	4693	—	—	—	—	—	—	—	—	—
6200	1050	4.86	4533	—	—	—	—	—	—	—	—	—	—	—	—
6300	1065	5.09	4744	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3700	981	2.40	2240	1031	2.65	2473	1079	2.91	2709	1125	3.16	2948	1169	3.42	3189
3800	990	2.52	2348	1040	2.77	2587	1088	3.03	2828	1133	3.30	3073	1177	3.56	3319
3900	1000	2.64	2459	1050	2.90	2705	1097	3.17	2951	1142	3.43	3201	1186	3.70	3452
4000	1011	2.76	2576	1059	3.03	2826	1106	3.30	3079	1151	3.58	3334	1194	3.85	3591
4100	1021	2.89	2697	1069	3.17	2953	1116	3.44	3210	1160	3.72	3471	1203	4.00	3733
4200	1031	3.03	2822	1079	3.31	3083	1125	3.59	3347	1169	3.87	3612	1212	4.16	3880
4300	1042	3.16	2951	1089	3.45	3218	1135	3.74	3487	1179	4.03	3758	1221	4.32	4031
4400	1053	3.31	3085	1100	3.60	3357	1145	3.90	3632	1188	4.19	3909	1230	4.49	4187
4500	1064	3.46	3224	1110	3.76	3502	1155	4.06	3782	1198	4.36	4064	1239	4.66	4348
4600	1075	3.61	3367	1121	3.91	3650	1165	4.22	3937	1208	4.53	4224	1249	4.84	4514
4700	1086	3.77	3515	1131	4.08	3805	1175	4.39	4096	1217	4.71	4389	1258	5.02	4684
4800	1097	3.93	3668	1142	4.25	3963	1186	4.57	4260	1228	4.89	4559	1268	5.21	4860
4900	1109	4.10	3826	1153	4.43	4128	1196	4.75	4430	1238	5.08	4734	—	—	—
5000	1120	4.28	3990	1164	4.61	4296	1207	4.94	4604	—	—	—	—	—	—
5100	1132	4.46	4159	1175	4.79	4471	1218	5.13	4784	—	—	—	—	—	—
5200	1144	4.65	4333	1187	4.99	4651	—	—	—	—	—	—	—	—	—
5300	1155	4.84	4512	1198	5.19	4836	—	—	—	—	—	—	—	—	—
5400	1167	5.04	4697	—	—	—	—	—	—	—	—	—	—	—	—
5500	1179	5.24	4889	—	—	—	—	—	—	—	—	—	—	—	—
5600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower Input to Fan
Watts — Input Watts to Motor

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. Maximum continuous bhp is 5.25.
3. See this page for General Fan Performance Notes.

*Motor drive range: 830 to 1130 rpm. All other rpms require field-supplied drive.

GENERAL NOTES FOR FAN PERFORMANCE DATA TABLES

1. Values include losses for filters, unit casing, and wet coils. See Table 8 and Fig. 44 for accessory/FIOP static pressure information.
2. 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 wattage ratings shown will not result in nuisance tripping or premature

- motor failure. Unit warranty will not be affected. See Evaporator-Fan Motor Performance data in Tables 9A and 9B for additional information.
3. Use of a field-supplied motor may affect wire sizing. Contact your Carrier representative for details.
4. Interpolation is permissible. Do not extrapolate.

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 the servicing refrigerant system.
2. Do not operate the compressor or provide any electric power to the unit unless the compressor terminal cover is in place and secured.
3. Do not remove the compressor terminal cover until all electrical sources are disconnected.
4. Relieve all pressure from the system before touching or disturbing anything inside the compressor terminal box if refrigerant leak is suspected around the compressor terminals.
5. Never attempt to repair a soldered connection while the refrigerant system is under pressure.
6. Do not use torch to remove any component. The 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 the unit. Install lockout tag.
 - b. Relieve all pressure from the system using both high-pressure and low-pressure ports.
 - c. Cut the component connection tubing with a tubing cutter, and remove the component from the unit.
 - d. Carefully unsweat the 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, the unit.
3. Make the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, or 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 an electronic leak detector, halide torch, or liquid-soap solution.
 - c. Inspect all field-wiring and factory-wiring connections. Be sure that connections are completed and tight.
 - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten the fins with a fin comb.
4. Verify the following conditions:
 - a. Make sure that condenser fan blade is correctly positioned in the fan orifice. See Condenser-Fan Adjustment section on page 48 for more details.
 - b. Make sure that air filter(s) is in place.
 - c. Make sure that condensate drain trap is filled with water to ensure proper drainage.
 - d. Make sure that all tools and miscellaneous loose parts have been removed.

START-UP

Unit Preparation — Make sure that unit has been installed in accordance with installation instructions and applicable codes. Complete the Start-Up Checklist, located on the back page of this booklet.

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

Outdoor-Air Inlet Screens — Outdoor-air inlet screen(s) must be in place before operating unit.

Compressor Mounting — Compressors are internally spring mounted. Do not loosen or remove compressor hold-down bolts.

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

Gas Piping — Check gas piping for leaks.

⚠ WARNING



Disconnect gas piping from unit when leak testing at pressure greater than $\frac{1}{2}$ psig. Pressures greater than $\frac{1}{2}$ psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than $\frac{1}{2}$ psig, it *must* be replaced before use. When pressure testing field-supplied gas piping at pressures of $\frac{1}{2}$ psig or less, a unit connected to such piping must be isolated by manually closing the gas valve.

Refrigerant Service Ports — To service refrigerant service ports, remove compressor access panel. Each unit system has 4 Schrader-type service gage ports: one on the suction line, one on the liquid line, one on the compressor discharge line and one on the discharge line underneath the high-pressure switch. Be sure that caps on the ports are tight. The Schrader-type valve on the discharge line is located under the low-pressure switch.

High Flow Valves — High flow refrigerant valves are located on the compressor hot gas and suction tubes. Large black plastic caps distinguish these valves with O-rings located inside the caps. These valves cannot be accessed for service in the field. Ensure that the plastic caps are in place and tight or the possibility of refrigerant leakage could occur.

Compressor Rotation — It is important to be certain that 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 the 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 and install lockout tag.
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.

⚠ CAUTION

When the compressors are rotating in the wrong direction, the unit will have increased noise levels and will not provide heating and cooling. Compressor failure will occur if the unit continues to operate in this condition.

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 contactors.

Check unit charge. Refer to Refrigerant Charge section on page 48.

Reset thermostat at a position above room temperature. Compressor will shut off. Evaporator fan will shut off after 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 turn off.

Refer to Table 24 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 24 — Altitude Compensation*

ELEVATION (Ft)	90,000-224,000 BTUH NOMINAL INPUT		250,000 BTUH NOMINAL INPUT	
	Natural Gas Orifice Size†	Liquid Propane Orifice Size†	Natural Gas Orifice Size†	Liquid Propane Orifice Size†
0-2,000	31	41	30	38
2,000	32	42	30	39
3,000	32	42	31	40
4,000	32	42	32	41
5,000	33	43	33	42
6,000	34	43	34	43
7,000	35	44	35	43
8,000	36	44	36	44
9,000	37	45	37	44
10,000	38	46	38	45
11,000	39	47	39	45
12,000	40	47	40	46
13,000	41	48	41	47
14,000	42	48	42	47

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes.
†Orifice available through your local Carrier distributor.

Heating

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

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

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

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

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

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

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

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

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

Operating Sequence

COOLING, UNITS WITHOUT ECONOMIZER — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor-fan contactor (IFC) and compressor contactor are energized and indoor-fan motor, compressor, and outdoor fan starts. The outdoor fan motor runs continuously while unit is cooling.

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. On units equipped for two stages of heat, when additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45-second time-off delay.

COOLING, UNITS WITH ECONOMIZER IV — When free cooling is not available, the compressors will be controlled by the zone thermostat. When free cooling is available, the outdoor-air damper is modulated by the EconoMi\$er IV control to provide a 50 to 55 F supply-air temperature into the zone. As the supply-air temperature fluctuates above 55 or below 50 F, the dampers will be modulated (open or close) to bring the supply-air temperature back within the set points.

Integrated EconoMi\$er IV operation on single-stage units requires a 2-stage thermostat (Y1 and Y2).

For EconoMi\$er IV operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position during the occupied mode.

Above 50 F supply-air temperature, the dampers will modulate from 100% open to the minimum open position. From 50 F to 45 F supply-air temperature, the dampers will maintain at the minimum open position. Below 45 F the dampers will be completely shut. As the supply-air temperature rises, the dampers will come back open to the minimum open position once the supply-air temperature rises to 48 F.

If optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory CO₂ sensors are connected to the EconoMi\$er IV control, a demand controlled ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ set point, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. Damper position will follow the higher demand condition from DCV mode or free cooling mode.

Damper movement from full closed to full open (or vice versa) will take between 1½ and 2½ minutes.

If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the control to modulate the dampers open to maintain the supply air temperature set point at 50 to 55 F.

As the supply air temperature drops below the set point range of 50 to 55 F, the control will modulate the outdoor-air dampers closed to maintain the proper supply-air temperature.

HEATING, UNITS WITH ECONOMIZER IV — When the room temperature calls for heat, the heating controls are energized as described in the Heating, Units Without Economizer section. When the thermostat is satisfied, the economizer damper moves to the minimum position.

COOLING, UNITS WITH ECONOMIZER2, PREMIER-LINK™ CONTROL AND A THERMOSTAT — When free cooling is not available, the compressors will be controlled by the PremierLink control in response to the Y1 and Y2 inputs from the thermostat.

The PremierLink control will use the following information to determine if free cooling is available:

- Indoor fan has been on for at least 30 seconds.
- The SPT, SAT, and OAT inputs must have valid readings.
- OAT must be less than 75 F.
- OAT must be less than SPT.
- Enthalpy must be LOW (may be jumpered if an enthalpy sensor not available).

- Economizer position is NOT forced.

Pre-cooling occurs when there is no call from the thermostat except G. Pre-cooling is defined as the economizer modulates to provide 70 F supply air.

When free cooling is available the PremierLink control will control the compressors and economizer to provide a supply-air temperature determined to meet the Y1 and Y2 calls from the thermostat using the following three routines. The three control routines are based on OAT.

The 3 routines are based on OAT where:

SASP = Supply Air Set Point

DXCTLO = Direct Expansion Cooling Lockout Set Point

PID = Proportional Integral

Routine 1 (OAT < DXCTLO)

- Y1 energized – economizer maintains a SASP = (SATLO1 + 3).
- Y2 energized – economizer maintains a SASP = (SATLO2 + 3).

Routine 2 (DXCTLO < OAT < 68 F)

- If only Y1 energized, the economizer maintains a SASP = (SATLO1 + 3).
- If SAT > SASP + 5 and economizer position > 80%, economizer will go to minimum position for 3 minutes or until SAT > 68 F.
- First stage of mechanical cooling will be energized.
- Integrator resets.
- Economizer opens again and controls to current SASP after stage one on for 90 seconds.
- With Y1 and Y2 energized economizer maintains an SASP = SATLO2 + 3.
- If SAT > SASP + 5 and economizer position > 80%, economizer will go to minimum position for 3 minutes or until SAT > 68 F.
- If compressor one is on then second stage of mechanical cooling will be energized. Otherwise the first stage will be energized.
- Integrator resets.
- Economizer opens again and controls to SASP after stage one on for 90 seconds.

Routine 3 (OAT > 68)

- Economizer is opened 100%.
- Compressors 1 and 2 are cycled based on Y1 and Y2 using minimum on and off times and watching the supply air temperature as compared to SATLO1 and SATLO2 set points.

If optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory CO₂ sensors are connected to the PremierLink control, a PID-controlled demand ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ set point, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed.

HEATING, UNITS WITH ECONOMIZER2, PREMIERLINK CONTROL AND A THERMOSTAT — When the thermostat calls for heating, terminal W1 is energized. The PremierLink control will move the economizer damper to the minimum position if there is a call for G and closed if there is a call for W1 without G. In order to prevent thermostat from short cycling, the unit is locked into the heating mode for at least 10 minutes when W1 is energized. The induced-draft motor is then energized and the burner ignition sequence begins.

On units equipped for two stages of heat, 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 is deenergized, the IFM stops after a 45-second time-off delay unless G is still maintained.

COOLING, UNITS WITH ECONOMIZER2, PREMIER-LINK™ CONTROL AND A ROOM SENSOR — When free cooling is not available, the compressors will be controlled by the PremierLink controller using a PID Error reduction calculation as indicated by Fig. 48.

The PremierLink controller will use the following information to determine if free cooling is available:

- Indoor fan has been on for at least 30 seconds.
- The SPT, SAT, and OAT inputs must have valid readings.
- OAT must be less than 75 F.
- OAT must be less than SPT.
- Enthalpy must be LOW (may be jumpered if and enthalpy sensor is not available).
- Economizer position is NOT forced.

When free cooling is available, the outdoor-air damper is positioned through the use of a Proportional Integral (PID) control process to provide a calculated supply-air temperature into the zone. The supply air will maintain the space temperature between the heating and cooling set points as indicated in Fig. 49.

The PremierLink control will integrate the compressors stages with the economizer based on similar logic as the three routines listed in the previous section. The SASP will float up and down based on the error reduction calculations that compare space temperature and space set point.

When outside-air temperature conditions require the economizer to close for a compressor stage-up sequence, the economizer control integrator is reset to zero after the stage-up sequence is completed. This prevents the supply-air temperature from dropping too quickly and creating a freeze condition that would make the compressor turn off prematurely.

The high space set point is used for DX (direct expansion) cooling control, while the economizer space set point is a calculated value between the heating and cooling set points. The economizer set point will always be at least one degree below the cooling set point, allowing for a smooth transition from mechanical cooling with economizer assist, back to economizer cooling as the cooling set point is achieved. The compressors may be used for initial cooling then the PremierLink controller will modulate the economizer using an error reduction calculation to hold the space temperature between the heating and cooling set points. See Fig. 49.

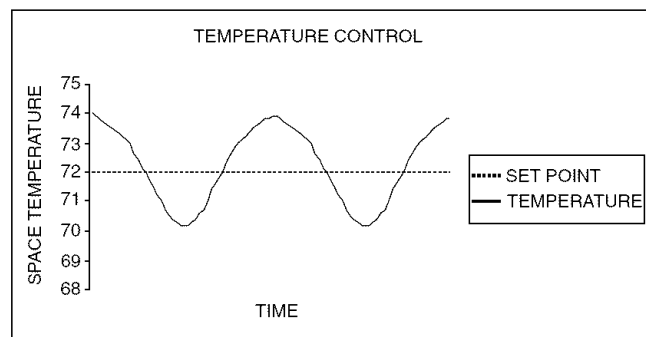
The controller uses the following conditions to determine economizer cooling:

- Enthalpy is Low
- SAT reading is available
- OAT reading is available
- SPT reading is available
- $OAT \leq SPT$
- Economizer Position is NOT forced

If any of the above conditions are **not** met, the economizer submaster reference (ECSR) is set to maximum limit and the damper moves to minimum position. The operating sequence is complete. The ECSR is recalculated every 30 seconds.

If an optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory CO₂ sensors are connected to the PremierLink control, a PID-controlled demand ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ set point, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed.



NOTE: PremierLink control performs smart staging of 2 stages of DX cooling and up to 3 stages of heat.

Fig. 48 — DX Cooling Temperature Control Example

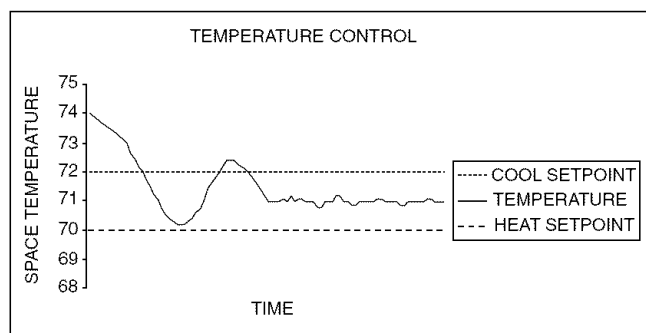


Fig. 49 — Economizer Temperature Control Example

HEATING, UNIT WITH ECONOMIZER2, PREMIERLINK CONTROL AND A ROOM SENSOR — Every 40 seconds the controller will calculate the required heat stages (maximum of 3) to maintain Supply-Air Temperature (SAT) if the following qualifying conditions are met:

- Indoor fan has been on for at least 30 seconds.
- COOL mode is not active.
- OCCUPIED, TEMP. COMPENSATED START or HEAT mode is active.
- SAT reading is available.
- Fire shutdown mode is not active.

If all of the above conditions are met, the number of heat stages is calculated; otherwise the required number of heat stages will be set to 0.

If the PremierLink controller determines that heat stages are required, the economizer damper will be moved to minimum position if occupied and closed if unoccupied.

Staging should be as follows:

If Heating PID STAGES=2

- HEAT STAGES=1 (50% capacity) will energize HS1
- HEAT STAGES=2 (100% capacity) will energize HS2

If Heating PID STAGES=3 and AUXOUT = HS3

- HEAT STAGES=1 (33% capacity) will energize HS1
- HEAT STAGES=2 (66% capacity) will energize HS2
- HEAT STAGES=3 (100% capacity) will energize HS3

In order to prevent short cycling, the unit is locked into the Heating mode for at least 10 minutes when HS1 is deenergized. When HS1 is energized the induced-draft motor is then energized and the burner ignition sequence begins. On units equipped for two stages of heat, when additional heat is needed, HS2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the space condition is satisfied and HS1 is deenergized the IFM stops after a 45-second

time-off delay unless in the occupied mode. The fan will run continuously in the occupied mode as required by national energy and fresh air standards.

UNITS WITH THE HUMIDI-MiZER™ ADAPTIVE DEHUMIDIFICATION SYSTEM

Normal Design Cooling Operation — When the rooftop operates under the normal sequence of operation, the compressors will cycle to maintain indoor conditions. See Fig. 50.

The Humidi-MiZer adaptive dehumidification system includes a factory installed Motormaster® low ambient control to keep the head and suction pressure high, allowing normal design cooling mode operation down to 0° F.

Subcooling Mode — When subcooling mode is initiated, this will energize (close) the liquid line solenoid valve (LLSV) forcing the hot liquid refrigerant to enter the subcooling coil (see Fig. 51).

As the hot liquid refrigerant passes through the subcooling/reheat dehumidification coil, it is exposed to the cold supply airflow coming through the evaporator coil. The liquid is further subcooled to a temperature approaching the evaporator leaving-air temperature. The liquid then enters a thermostatic expansion valve (TXV) where the liquid drops to a lower pressure. The TXV does not have a pressure drop great enough to change the liquid to a 2-phase fluid, so the liquid then enters the Acutrol™ device at the evaporator coil.

The liquid enters the evaporator coil at a temperature lower than in standard cooling operation. This lower temperature increases the latent capacity of the rooftop unit. The refrigerant passes through the evaporator and is turned into a vapor. The air passing over the evaporator coil will become colder than during normal operation. However, as this same air passes over the subcooling coil, it will be slightly warmed, partially reheating the air.

Subcooling mode operates only when the outside-air temperature is warmer than 40 F. A factory-installed temperature switch located in the condenser section will lock out subcooling mode when the outside temperature is cooler than 40 F.

The scroll compressors are equipped with crankcase heaters to provide protection for the compressors due to the additional refrigerant charge required by the subcooling/reheat coil.

When in subcooling mode, there is a slight decrease in system total gross capacity (5% less), a lower gross sensible capacity (20% less), and a greatly increased latent capacity (up to 40% more).

Hot Gas Reheat Mode — When the humidity levels in the space require humidity control, a hot gas solenoid valve (specific to hot gas reheat mode only) will open to bypass a portion of hot gas refrigerant around the condenser coil (see Fig. 52).

This hot gas will mix with liquid refrigerant leaving the condenser coil and flow to the subcooling/reheat dehumidification coil. Now the conditioned air coming off the evaporator will be cooled and dehumidified, but will be warmed to neutral conditions (72 F to 75 F) by the subcooling/reheat dehumidification coil.

NOTE: The 48HJ008-014 rooftop units can operate one circuit in subcooling mode and one circuit in hot gas reheat mode or both circuits in hot gas reheat mode, or both in normal design cooling mode.

The net effect of the rooftop when in hot gas reheat mode is to provide nearly all latent capacity removal from the space when sensible loads diminish (when outdoor temperature conditions are moderate). When in hot gas reheat mode, the unit will operate to provide mostly latent capacity and extremely low sensible heat ratio capability.

Similar to the subcooling mode of operation, hot gas reheat mode operates only when the outside-air temperature is warmer than 40 F. Below this temperature, a factory-installed

outside air temperature switch will lock out this mode of operation.

See Table 25 for the Humidi-MiZer adaptive dehumidification system sequence of operation.

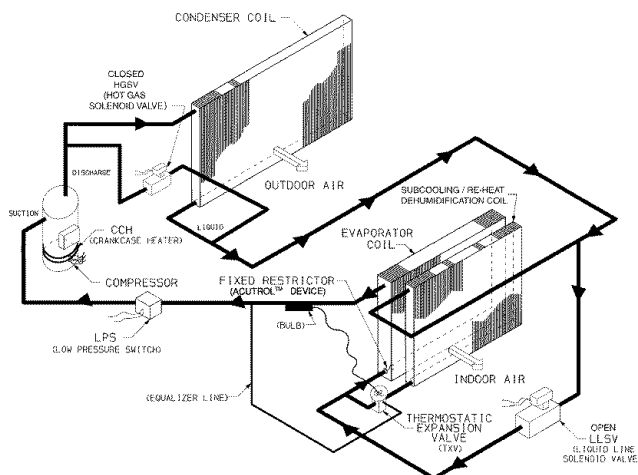


Fig. 50 — Humidi-MiZer Normal Design Cooling Mode Operation

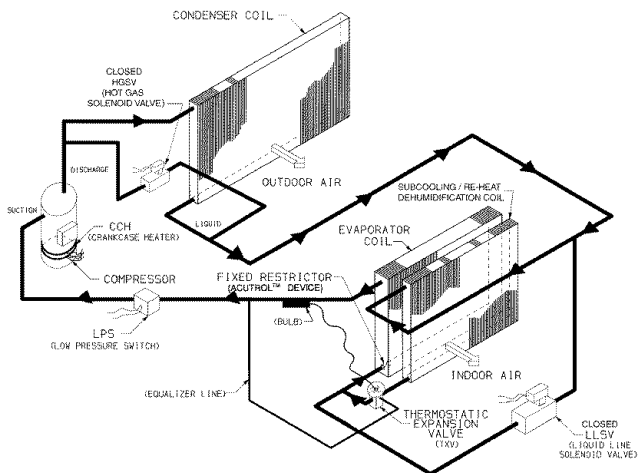


Fig. 51 — Humidi-MiZer Subcooling Mode Operation

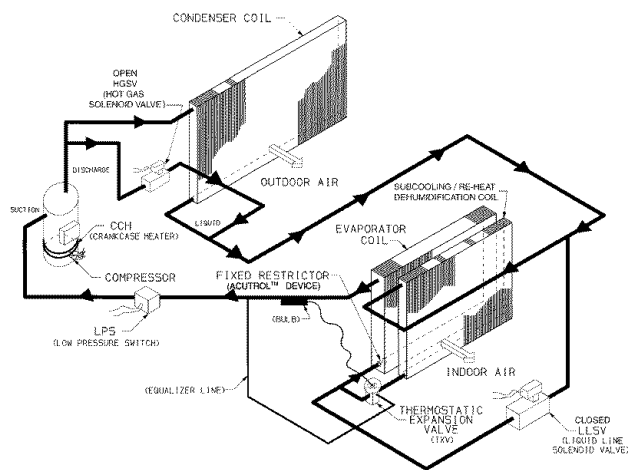


Fig. 52 — Humidi-MiZer Hot Gas Reheat Mode Operation

Table 25 — Humidi-MiZer™ Adaptive Dehumidification System Sequence of Operation and System Response — Dual Compressor Units (48HJ008-14)

THERMOSTAT INPUT			ECONOMIZER FUNCTION		48HJ UNIT OPERATION					
H	Y1	Y2	OAT < Economizer Set Point	Economizer	First Stage			Second Stage		
					Compressor 1	Subcooling Mode	Hot Gas Reheat Mode	Compressor 2	Subcooling Mode	Hot Gas Reheat Mode
Off	—	—			Unit Operates Under Normal Sequence of Operation					
On	On	On	No	Off	On	Yes	No	On	Yes	No
On	On	Off	No	Off	On	Yes	No	On	No	Yes
On	On	On	Yes	On	On	Yes	No	On	No	Yes
On	On	Off	Yes	On	On	No	Yes	On	No	Yes
On	Off	Off	No	Off	On	No	Yes	On	No	Yes

LEGEND

OAT — Outdoor Air Temperature

NOTE: On a thermostat call for W1, all cooling and dehumidification will be off.

SERVICE

⚠ CAUTION

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

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

EVAPORATOR COIL

1. Turn unit power. Install lockout tag. 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. Refer to Accessory Economizer or Two-Position Damper Installation Instructions 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, back-flush toward the 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. Install lockout tag.
2. Remove top panel screws on condenser end of unit.
3. Remove condenser coil corner post. See Fig. 53. To hold top panel open, place coil corner post between top panel and center post. See Fig. 54.
4. Remove screws securing coil to center post.
5. Remove fastener holding coil sections together at return end of condenser coil. Carefully separate the outer coil section 3 to 4 in. from the inner coil section. See Fig. 55.
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, 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.

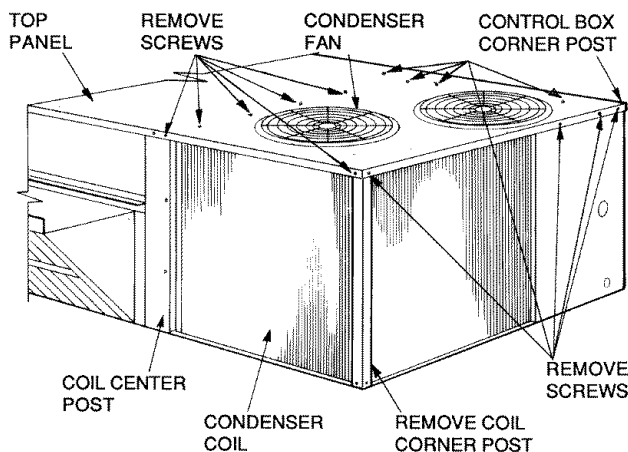


Fig. 53 — Cleaning Condenser Coil

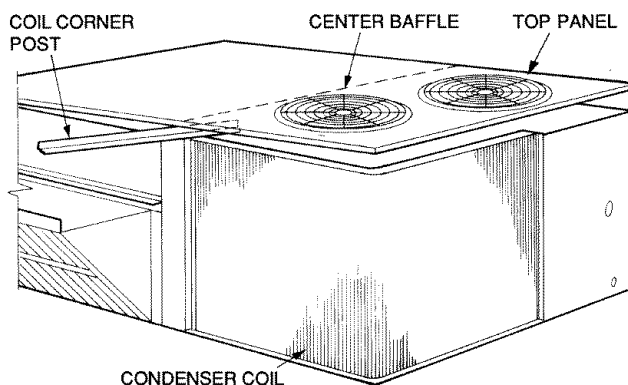


Fig. 54 — Propping Up Top Panel

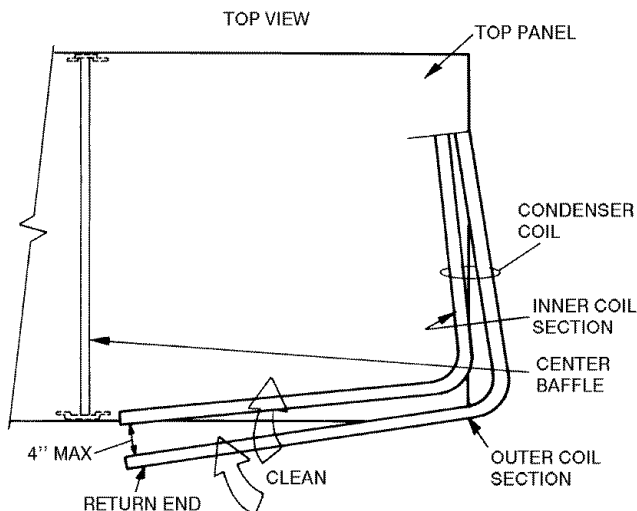


Fig. 55 — Separating Coil Sections

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. 56)

1. Shut off unit power supply. Install lockout tag.
2. Remove condenser-fan assembly (grille, motor, motor cover, and fan) and loosen fan hub setscrews.
3. Adjust fan height as shown in Fig. 56.
4. Tighten setscrews and replace condenser-fan assembly.

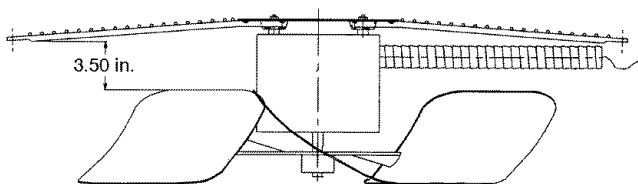


Fig. 56 — Condenser-Fan Adjustment

Economizer Adjustment — Refer to optional economizer section on page 18.

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

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

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

LOW CHARGE COOLING — Use Cooling Charging Charts, Fig. 57-60, vary refrigerant until the conditions of the charts are met. Note the charging charts are different from type normally used. Charts are based on charging the units to the correct superheat for the various operating conditions. Accurate

pressure gage and temperature sensing device are required. Connect the pressure gage to the service port on the suction line. Mount the temperature sensing device on the suction line and insulate it so that outdoor ambient temperature does not affect the reading. Indoor-air cfm must be within the normal operating range of the unit.

HUMIDI-MIZER™ ADAPTIVE DEHUMIDIFICATION SYSTEM — The system charge for units with the Humidi-MiZer adaptive dehumidification system is greater than that of the standard unit alone. The charge for units with this option is indicated on the unit nameplate drawing. Also refer to Fig. 61-63. To charge systems using the Humidi-MiZer adaptive dehumidification system, fully evacuate, recover, and recharge the system to the nameplate specified charge level. To check or adjust refrigerant charge on systems using the Humidi-MiZer adaptive dehumidification system, charge per Fig. 61-63.

NOTE: When using the charging charts, it is important that only the subcooling/reheat dehumidification coil liquid line solenoid valve be energized. The subcooling/reheat dehumidification coil liquid line solenoid valve **MUST** be energized to use the charging charts and the outdoor motor speed controller jumpered to run the fan at full speed.

The charts reference a liquid pressure (psig) and temperature at a point between the condenser coil and the subcooling/reheat dehumidification coil. A tap is provided on the unit to measure liquid pressure entering the subcooling/reheat dehumidification coil.

IMPORTANT: The subcooling mode charging charts (Fig. 61-63) are to be used **ONLY** with units having the optional Humidi-MiZer subcooling option. **DO NOT** use standard charts (Fig. 57-60) for units with Humidi-MiZer option, and **DO NOT** use Fig. 61-63 for standard units.

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

Example: (Fig. 57, Circuit 1)

Outdoor Temperature.....	85 F
Suction Pressure.....	70 psig
Suction Temperature should be.....	48 F
(Suction Temperature may vary $\pm 5^\circ$ F.)	

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

TO USE COOLING CHARGING CHART, UNITS WITH HUMIDI-MIZER ADAPTIVE DEHUMIDIFICATION SYSTEM — Refer to charts (Fig. 61-63) to determine the proper leaving condenser pressure and temperature.

Example (Fig. 61, Circuit 1):

Leaving Condenser Pressure.....	300 psig
Leaving Condenser Temperature.....	117 F

NOTE: When using the charging charts, it is important that only the subcooling/reheat dehumidification coil liquid line solenoid valve be energized. The subcooling/reheat dehumidification coil liquid line solenoid valve **MUST** be energized to use the charging charts and the outdoor motor speed controller jumpered to run the fan at full speed.

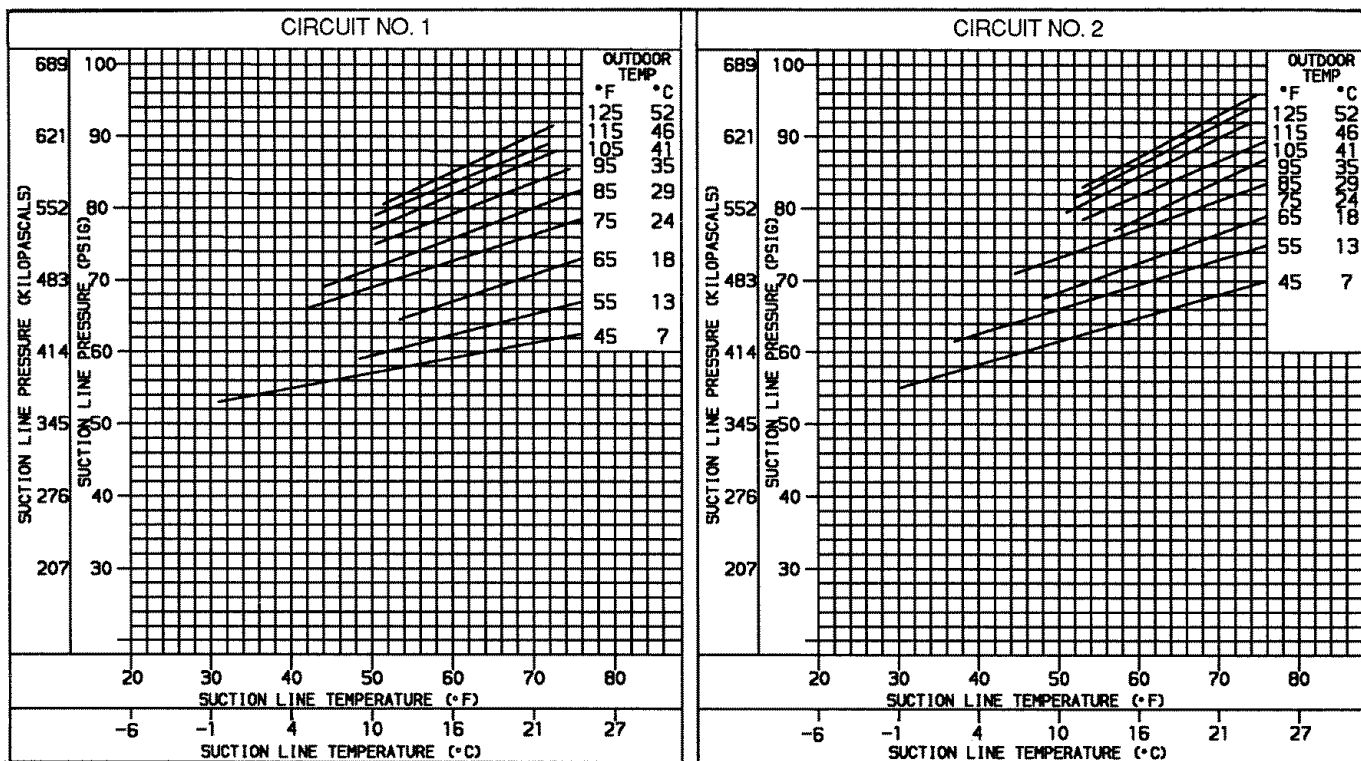


Fig. 57 — Cooling Charging Charts, Standard 48HJ008 Units

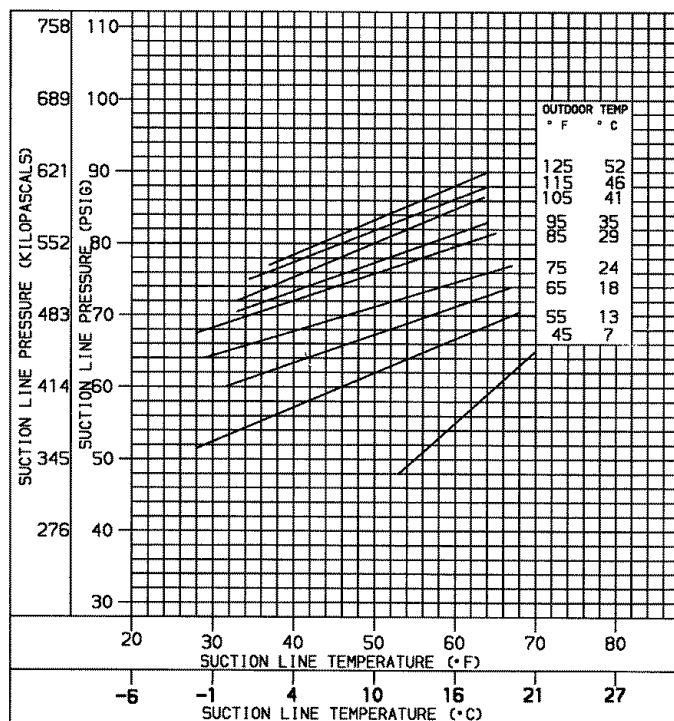


Fig. 58 — Cooling Charging Chart, Standard 48HJ009 Units

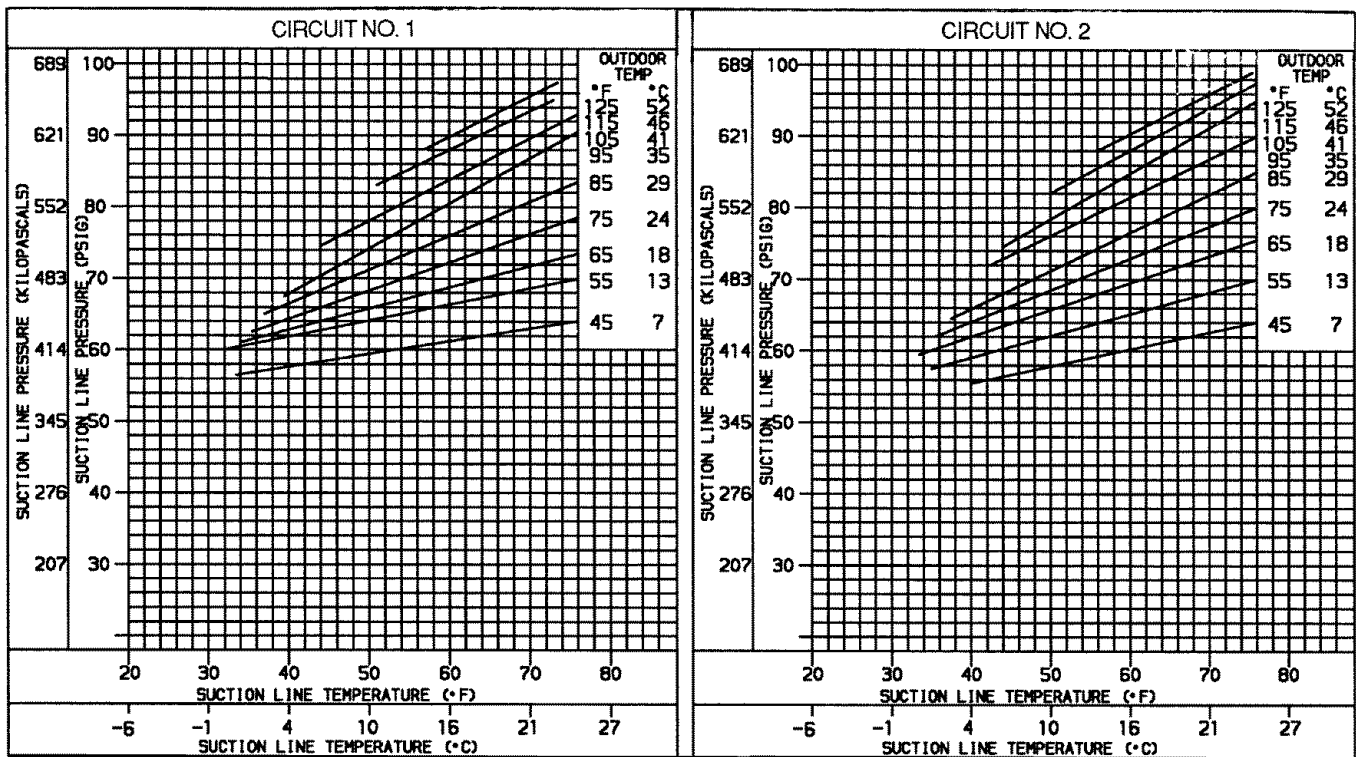


Fig. 59 — Cooling Charging Charts, Standard 48HJ012 Units

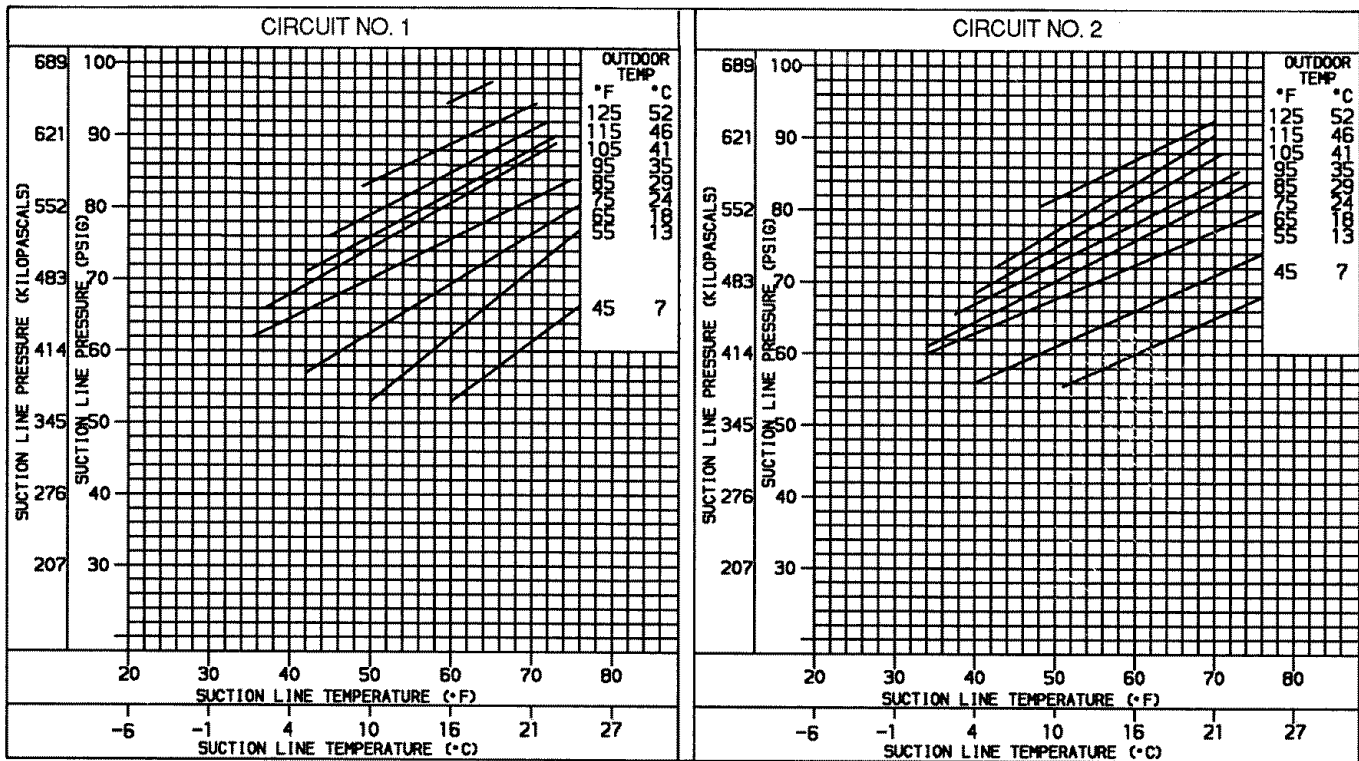
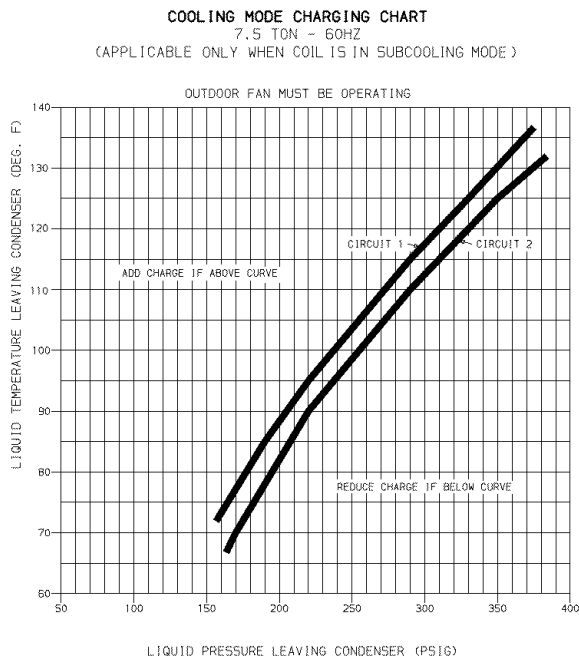
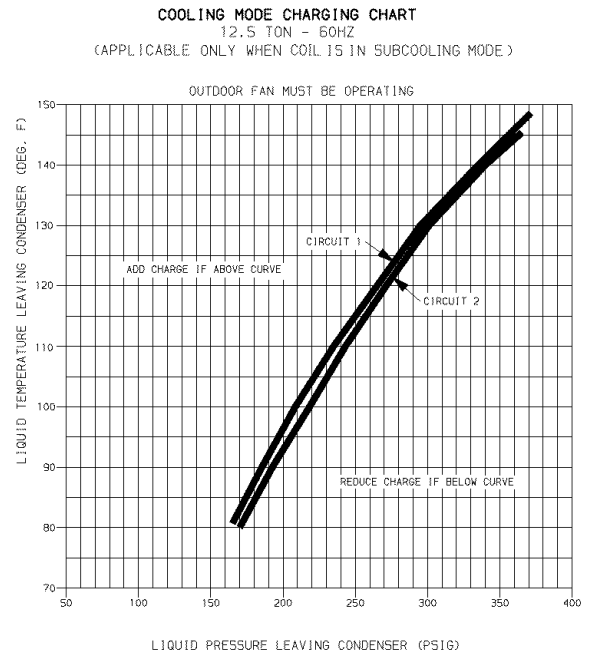


Fig. 60 — Cooling Charging Charts, Standard 48HJ014 Units



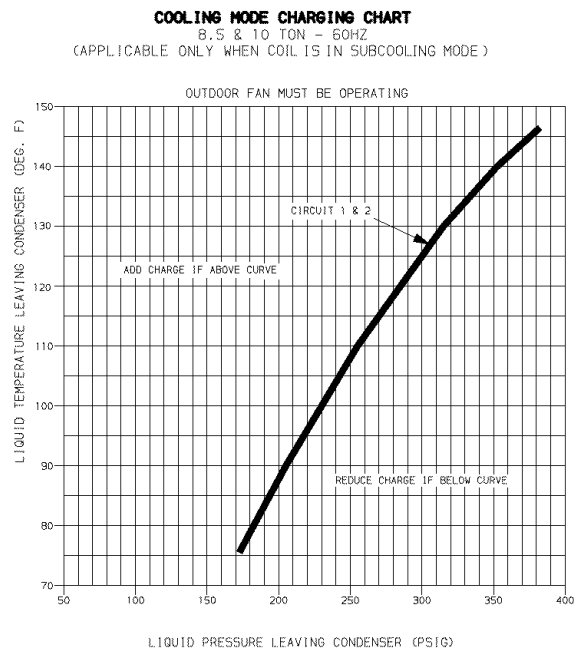
NOTE: When using the charging charts, it is important that only the subcooling/reheat dehumidification coil liquid line solenoid valve be energized. The subcooling/reheat dehumidification coil liquid line solenoid valve MUST be energized to use the charging charts and the outdoor motor speed controller jumpered to run the fan at full speed.

**Fig. 61 — Cooling Charging Chart, 48HJ008
With Optional Humidi-MiZer™ Adaptive
Dehumidification System**



NOTE: When using the charging charts, it is important that only the subcooling/reheat dehumidification coil liquid line solenoid valve be energized. The subcooling/reheat dehumidification coil liquid line solenoid valve MUST be energized to use the charging charts and the outdoor motor speed controller jumpered to run the fan at full speed.

**Fig. 63 — Cooling Charging Chart, 48HJ014
With Optional Humidi-MiZer Adaptive
Dehumidification System**



NOTE: When using the charging charts, it is important that only the subcooling/reheat dehumidification coil liquid line solenoid valve be energized. The subcooling/reheat dehumidification coil liquid line solenoid valve MUST be energized to use the charging charts and the outdoor motor speed controller jumpered to run the fan at full speed.

**Fig. 62 — Cooling Charging Chart, 48HJ009,012
With Optional Humidi-MiZer Adaptive
Dehumidification System**

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 now be cleaned. 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. 7). 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) is located in the control box (Fig. 12). The IGC contains a self-diagnostic LED (light-emitting diode) that can be observed through the viewport. During service, refer to the label on the control box cover or Table 26 for an explanation of LED error code descriptions.

A single LED on the Integrated Gas Unit Controller (IGC) provides a visual display of operational or sequential problems when the power supply is uninterrupted. When a break in power occurs, the IGC will be reset (resulting in a loss of fault history). The evaporator fan on/off time delay will also be reset. Refer to Start-Up, Heating section on page 43 for additional information.

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

REMOVAL AND REPLACEMENT OF GAS TRAIN (See Fig. 64 and 65)

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. 65).
11. To reinstall, reverse the procedure.

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. 66.
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.

Table 26 — 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
9 Flashes	Software Lockout

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 27-31 for additional information.

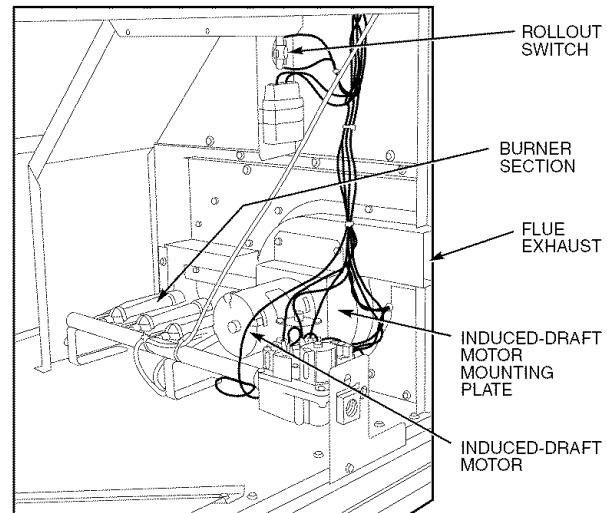


Fig. 64 — Burner Section Details

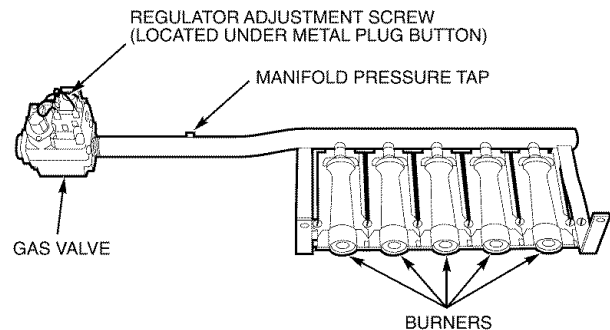


Fig. 65 — Burner Tray Details

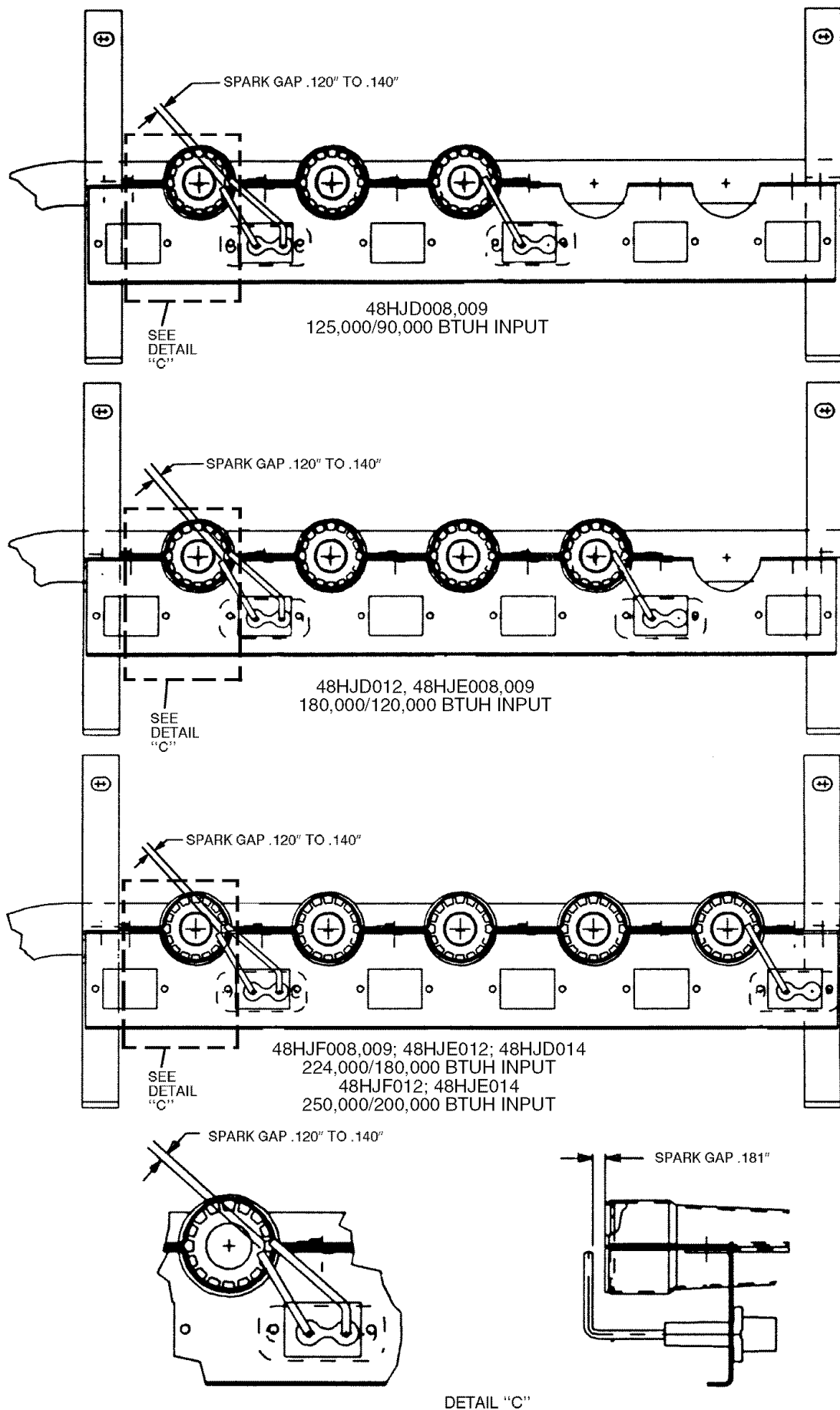


Fig. 66 — Spark Gap Adjustment

TROUBLESHOOTING

Unit Troubleshooting — Refer to Tables 27-32 and Fig. 67 for unit troubleshooting.

Table 27 — 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 28 — 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 wirenut 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.

Table 29 — Humidi-MiZer™ Adaptive Dehumidification System Subcooling Mode Service Analysis

PROBLEM	CAUSE	REMEDY
Subcooling Mode (Liquid Reheat) Will Not Energize.	No power to control transformer from evaporator-fan motor.	Check power source and evaporator-fan relay. Ensure all wire connections are tight.
	No power from control transformer to liquid line solenoid valve.	1. Fuse open; check fuse. Ensure continuity of wiring. 2. Low-pressure switch open. Cycle unit off and allow low-pressure switch to reset. Replace switch if it will not close. 3. Transformer bad; check transformer.
	Liquid line solenoid valve will not operate.	1. Solenoid coil defective; replace. 2. Solenoid valve stuck open; replace.
	Liquid line solenoid valve will not open.	Valve is stuck closed; replace valve.
Low System Capacity.	Low refrigerant charge or frosted evaporator coil.	1. Check charge amount. Charge per Fig. 61-63. 2. Evaporator coil frosted; check and replace low-pressure switch if necessary.
Loss of Compressor Superheat Conditions with Subcooling/Reheat Dehumidification Coil Energized.	Thermostatic expansion valve (TXV).	1. Check TXV bulb mounting, and secure tightly to suction line. 2. Replace TXV if stuck open or closed.

Table 30 — Humidi-MiZer™ Adaptive Dehumidification Hot Gas Reheat Mode Service Analysis

PROBLEM	CAUSE	REMEDY
Reheat Mode Will Not Energize.	No power to control transformer from evaporator-fan motor.	Check power source and evaporator-fan relay. Ensure all wire connections are tight.
	No power from control transformer to hot gas line solenoid valve.	1. Fuse open; check fuse. Ensure continuity of wiring. 2. Low-pressure switch open. Cycle unit off and allow low-pressure switch to reset. Replace switch if it will not close. 3. Transformer bad; check transformer.
	Hot gas line solenoid valve will not operate.	1. Solenoid coil defective; replace. 2. Solenoid valve stuck closed; replace.
	Low refrigerant charge or frosted evaporator coil.	1. Check charge amount. Charge per Fig. 61-63. 2. Evaporator coil frosted; check and replace low-pressure switch if necessary.
Loss of Compressor Superheat Conditions with Subcooling/Reheat Dehumidification Coil Energized.	Thermostatic expansion valve (TXV).	1. Check TXV bulb mounting, and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
Excessive Superheat.	Liquid line solenoid valve will not operate.	Valve is stuck; replace valve.
	Hot gas line solenoid valve will not close.	Valve is stuck; replace valve.

Table 31 — LED Error Code Service Analysis

SYMPTOM	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.
Internal Software Fault. (LED 9 flashes)	Microprocessor has sensed an error in the redundant software comparison.	If error code is not cleared by resetting unit power, replace the IGC.

LEGEND

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

⚠ CAUTION

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

IMPORTANT: Refer to Table 28 — Heating Service Analysis for additional heating section troubleshooting information.

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. Use copper conductors only.
4. TRAN is wired for 230 v unit. If unit is to be run with 208 v power supply, disconnect BLK wire from 230 v tap (ORN) and connect to 208 v tap (RED). Insulate end of 230 v tap.

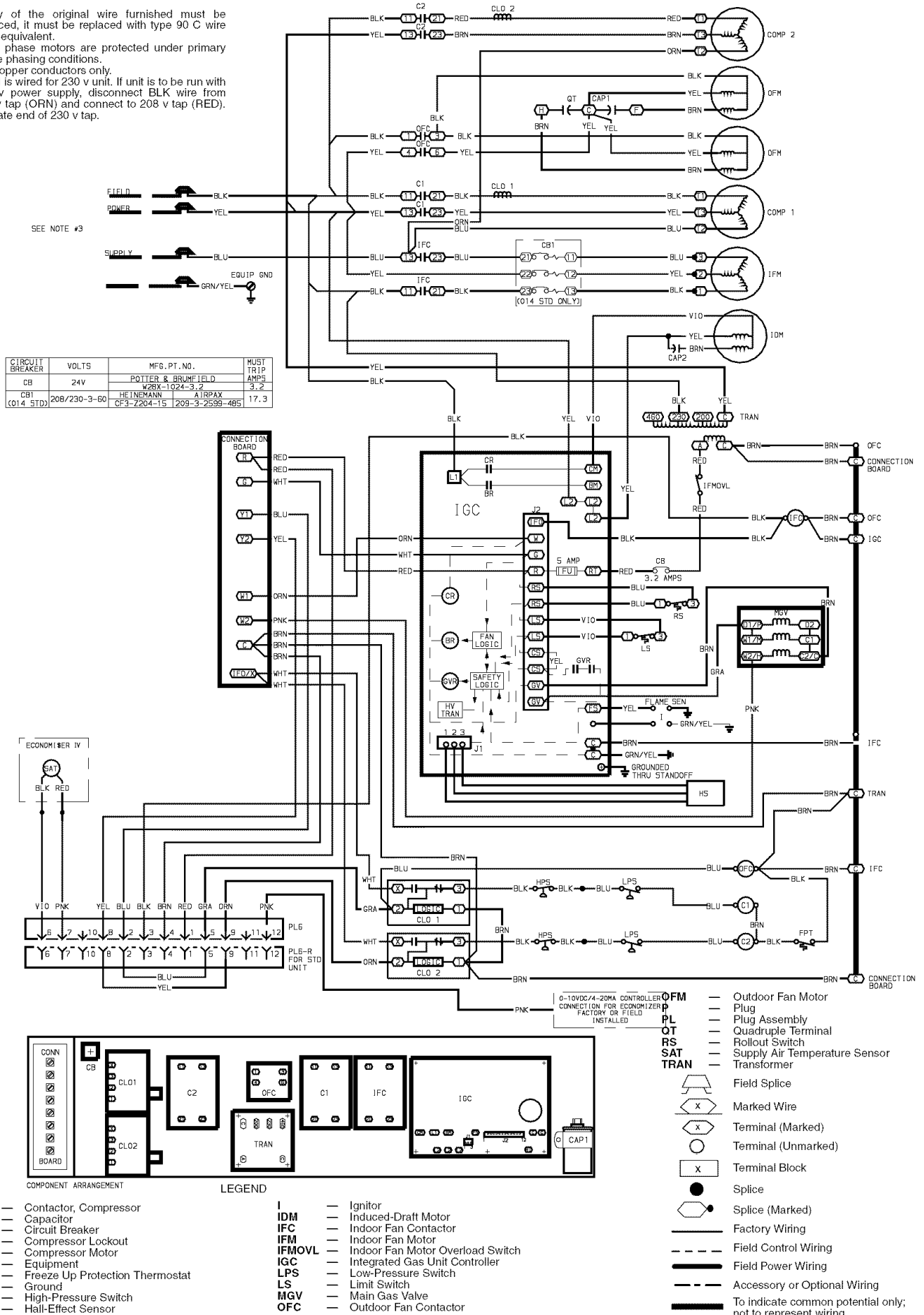


Fig. 67 — Typical Schematic (208/230-3-60 Shown)

EconoMi\$er IV Troubleshooting — See Table 32 for EconoMi\$er IV logic.

A functional view of the EconoMi\$er IV is shown in Fig. 68. Typical settings, sensor ranges, and jumper positions are also shown. An EconoMi\$er IV simulator program is available from Carrier to help with EconoMi\$er IV training and troubleshooting.

ECONOMISER IV PREPARATION — This procedure is used to prepare the EconoMi\$er IV for troubleshooting. No troubleshooting or testing is done by performing the following procedure.

NOTE: This procedure requires a 9-v battery, 1.2 kilo-ohm resistor, and a 5.6 kilo-ohm resistor which are not supplied with the EconoMi\$er IV.

IMPORTANT: Be sure to record the positions of all potentiometers before starting troubleshooting.

1. Disconnect power at TR and TR1. All LEDs should be off. Exhaust fan contacts should be open.
2. Disconnect device at P and P1.
3. Jumper P to P1.
4. Disconnect wires at T and T1. Place 5.6 kilo-ohm resistor across T and T1.
5. Jumper TR to I.
6. Jumper TR to N.
7. If connected, remove sensor from terminals S_O and +. Connect 1.2 kilo-ohm 4074EJM checkout resistor across terminals S_O and +.
8. Put 620-ohm resistor across terminals S_R and +.
9. Set minimum position, DCV set point, and exhaust potentiometers fully CCW (counterclockwise).
10. Set DCV maximum position potentiometer fully CW (clockwise).
11. Set enthalpy potentiometer to D.
12. Apply power (24 vac) to terminals TR and TR1.

DIFFERENTIAL ENTHALPY — To check differential enthalpy:

1. Make sure EconoMi\$er IV preparation procedure has been performed.
2. Place 620-ohm resistor across S_O and +.
3. Place 1.2 kilo-ohm resistor across S_R and +. The Free Cool LED should be lit.
4. Remove 620-ohm resistor across S_O and +. The Free Cool LED should turn off.
5. Return EconoMi\$er IV settings and wiring to normal after completing troubleshooting.

SINGLE ENTHALPY — To check single enthalpy:

1. Make sure EconoMi\$er IV preparation procedure has been performed.
2. Set the enthalpy potentiometer to A (fully CCW). The Free Cool LED should be lit.
3. Set the enthalpy potentiometer to D (fully CW). The Free Cool LED should turn off.
4. Return EconoMi\$er IV settings and wiring to normal after completing troubleshooting.

DCV (Demand Controlled Ventilation) AND POWER EXHAUST — To check DCV and Power Exhaust:

1. Make sure EconoMi\$er IV preparation procedure has been performed.
2. Ensure terminals AQ and AQ1 are open. The LED for both DCV and Exhaust should be off. The actuator should be fully closed.

3. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The LED for both DCV and Exhaust should turn on. The actuator should drive to between 90 and 95% open.
4. Turn the Exhaust potentiometer CW until the Exhaust LED turns off. The LED should turn off when the potentiometer is approximately 90%. The actuator should remain in position.
5. Turn the DCV set point potentiometer CW until the DCV LED turns off. The DCV LED should turn off when the potentiometer is approximately 9 v. The actuator should drive fully closed.
6. Turn the DCV and Exhaust potentiometers CCW until the Exhaust LED turns on. The exhaust contacts will close 30 to 120 seconds after the Exhaust LED turns on.
7. Return EconoMi\$er IV settings and wiring to normal after completing troubleshooting.

DCV MINIMUM AND MAXIMUM POSITION — To check the DCV minimum and maximum position:

1. Make sure EconoMi\$er IV preparation procedure has been performed.
2. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The DCV LED should turn on. The actuator should drive to between 90 and 95% open.
3. Turn the DCV Maximum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
4. Turn the DCV Maximum Position potentiometer to fully CCW. The actuator should drive fully closed.
5. Turn the Minimum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
6. Turn the Minimum Position Potentiometer fully CW. The actuator should drive fully open.
7. Remove the jumper from TR and N. The actuator should drive fully closed.
8. Return EconoMi\$er IV settings and wiring to normal after completing troubleshooting.

SUPPLY-AIR INPUT — To check supply-air input:

1. Make sure EconoMi\$er IV preparation procedure has been performed.
2. Set the Enthalpy potentiometer to A. The Free Cool LED turns on. The actuator should drive to between 20 and 80% open.
3. Remove the 5.6 kilo-ohm resistor and jumper T to T1. The actuator should drive fully open.
4. Remove the jumper across T and T1. The actuator should drive fully closed.
5. Return EconoMi\$er IV settings and wiring to normal after completing troubleshooting.

ECONOMISER IV TROUBLESHOOTING COMPLETION — This procedure is used to return the EconoMi\$er IV to operation. No troubleshooting or testing is done by performing the following procedure.

1. Disconnect power at TR and TR1.
2. Set enthalpy potentiometer to previous setting.
3. Set DCV maximum position potentiometer to previous setting.
4. Set minimum position, DCV set point, and exhaust potentiometers to previous settings.
5. Remove 620-ohm resistor from terminals S_R and +.
6. Remove 1.2 kilo-ohm checkout resistor from terminals S_O and +. If used, reconnect sensor from terminals S_O and +.

7. Remove jumper from TR to N.
8. Remove jumper from TR to L.
9. Remove 5.6 kilo-ohm resistor from T and T1. Reconnect wires at T and T1.
10. Remove jumper from P to P1. Reconnect device at P and P1.
11. Apply power (24 vac) to terminals TR and TR1.

Table 32 — EconoMiSer IV Input/Output Logic

INPUTS					OUTPUTS				
Demand Control Ventilation (DCV)	Enthalpy*		Y1	Y2	Compressor		N Terminal†		
	Outdoor	Return			Stage 1	Stage 2	Occupied	Unoccupied	
					Damper				
Below set (DCV LED Off)	High (Free Cooling LED Off)	Low	On	On	On	On	Minimum position	Closed	
			On	Off	On	Off			
			Off	Off	Off	Off			
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating** (between min. position and full-open)	Modulating** (between closed and full-open)	
			On	Off	Off	Off			
			Off	Off	Off	Off			
Above set (DCV LED On)	High (Free Cooling LED Off)	Low	On	On	On	On	Modulating†† (between min. position and DCV maximum)	Modulating†† (between closed and DCV maximum)	
			On	Off	On	Off			
			Off	Off	Off	Off			
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating***	Modulating†††	
			On	Off	Off	Off			
			Off	Off	Off	Off			

*For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.

†Power at N terminal determines Occupied/Unoccupied setting: 24 vac (Occupied), no power (Unoccupied).

**Modulation is based on the supply-air sensor signal.

††Modulation is based on the DCV signal.

***Modulation is based on the greater of DCV and supply-air sensor signals, between minimum position and either maximum position (DCV) or fully open (supply-air signal).

†††Modulation is based on the greater of DCV and supply-air sensor signals, between closed and either maximum position (DCV) or fully open (supply-air signal).

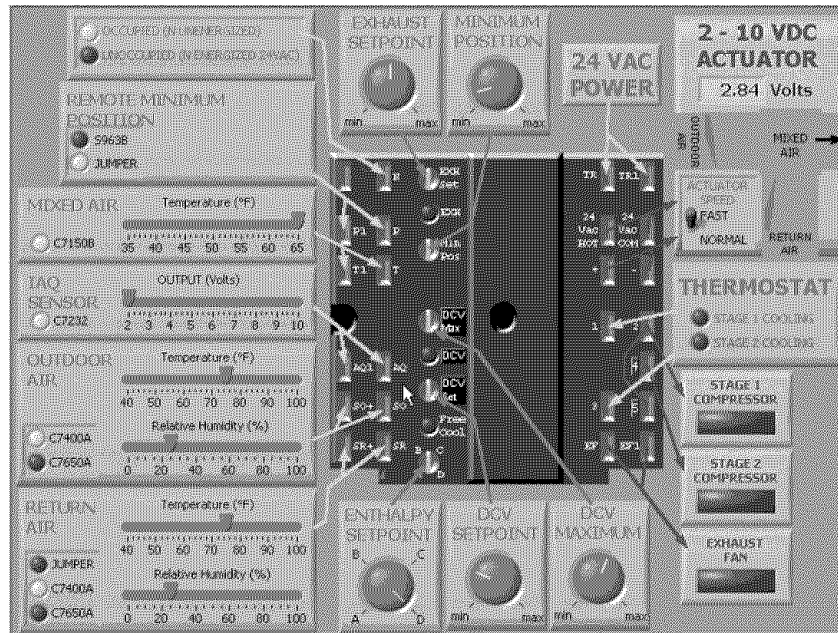


Fig. 68 — EconoMiSer IV Functional View

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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 JOBSITE VOLTAGE AGREES WITH VOLTAGE LISTED ON RATING PLATE
- ☐ 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 FILTERS ARE CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT INSTALLATION IS LEVEL
- ☐ CHECK FAN WHEELS AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND SETSCREW TIGHTNESS
- ☐ CHECK TO ENSURE THAT ELECTRICAL WIRING IS NOT IN CONTACT WITH REFRIGERANT LINES OR SHARP METAL EDGES
- ☐ CHECK PULLEY ALIGNMENT AND BELT TENSION PER INSTALLATION INSTRUCTIONS

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	_____	DB	
GAS HEAT SUPPLY AIR	_____	DB	

PRESSURES

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

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

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE