



# Installation, Start-Up and Service Instructions

## CONTENTS

	Page
<b>SAFETY CONSIDERATIONS</b> .....	1
<b>INSTALLATION</b> .....	1-31
<b>Step 1 — Provide Unit Support</b> .....	1
• ROOF CURB	
• ALTERNATE UNIT SUPPORT	
<b>Step 2 — Rig and Place Unit</b> .....	2
• POSITIONING	
• ROOF MOUNT	
<b>Step 3 — Field Fabricate Ductwork</b> .....	2
<b>Step 4 — Install Flue Hood</b> .....	12
<b>Step 5 — Trap Condensate Drain</b> .....	13
<b>Step 6 — Install Gas Piping</b> .....	13
<b>Step 7 — Controls Options</b> .....	13
• CONSTANT VOLUME APPLICATIONS	
• VARIABLE AIR VOLUME (VAV) APPLICATIONS	
<b>Step 8 — Make Electrical Connections</b> .....	16
• POWER WIRING	
• FIELD POWER SUPPLY	
• FIELD CONTROL WIRING	
<b>Step 9 — Make Outdoor-Air Inlet Adjustments</b> .....	24
• ECONOMIZER	
• ECONOMIZER SETTINGS	
<b>Step 10 — Position Power Exhaust/Barometric Relief Hood</b> .....	29
<b>Step 11 — Install All Accessories</b> .....	30
<b>START-UP</b> .....	31-44
<b>SERVICE</b> .....	44-55
<b>TROUBLESHOOTING</b> .....	56-61
<b>START-UP CHECKLIST</b> .....	CL-1,CL-2

## SAFETY CONSIDERATIONS

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

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

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

### ⚠ WARNING

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

### ⚠ WARNING

1. Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or loss of life. Refer to the User's Information Manual provided with this unit for more details.
2. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

#### What to do if you smell gas:

1. DO NOT try to light any appliance.
2. DO NOT touch any electrical switch, or use any phone in your building.
3. IMMEDIATELY call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
4. If you cannot reach your gas supplier, call the fire department.

### ⚠ WARNING

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

## INSTALLATION

### Step 1 — Provide Unit Support

### ⚠ CAUTION

1. All panels must be in place when rigging.
2. Unit is not designed for handling by fork truck.

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

**IMPORTANT:** The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket with the roof curb as shown in Fig. 1 and 2. Improperly applied gasket can also result in air leaks and poor unit performance.

**ALTERNATE UNIT SUPPORT** — When the preferred curb or slab mount cannot be used, support unit with sleepers on perimeter, using unit curb support area. If sleepers cannot be used, support long sides of unit (refer to Fig. 3-6) with a minimum number of 4-in. x 4-in. pads spaced as follows: 48EJ,EK,EW,EY024-034 units require 3 pads on each side; 48EJ,EK,EW,EY038-048 units require 4 pads on each side. Unit may sag if supported by corners only.

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

Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Level by using unit frame as a reference; leveling tolerance is shown in Fig. 1 and 2. See Fig. 7 for additional information. Unit operating weight is shown in Table 1.

**NOTE:** On retrofit jobs, ductwork may be attached to old unit instead of roof curb. Be careful not to damage ductwork when removing old unit. Attach existing ductwork to roof curb instead of unit.

Four lifting lugs are provided on the unit base rails as shown in Fig. 7. Refer to rigging instructions on unit.

**POSITIONING** — Maintain clearance, per Fig. 3-6, around and above unit to provide minimum distance from combustible materials, proper airflow, and service access.

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

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

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

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

### Step 3 — Field Fabricate Ductwork

**48EJ,EK UNITS** — Field-fabricated ductwork should be attached to the **roof curb**. Supply and return duct dimensions are shown in Fig. 3 and 4. Air distribution is shown in Fig. 8.

To attach ductwork to roof curb, insert duct approximately 10 to 11 in. up into roof curb. Connect ductwork to 14-gage roof curb material with sheet metal screws driven from inside the duct.

Secure all ducts to the building structure, using flexible duct connectors between roof curb and ducts as required. Ducts passing through an unoccupied space must be insulated and covered with a vapor barrier. Outlet grilles must not lie directly below unit discharge. The return duct must have a 90-degree elbow before opening into the building space if the unit is equipped with power exhaust.

#### **⚠ WARNING**

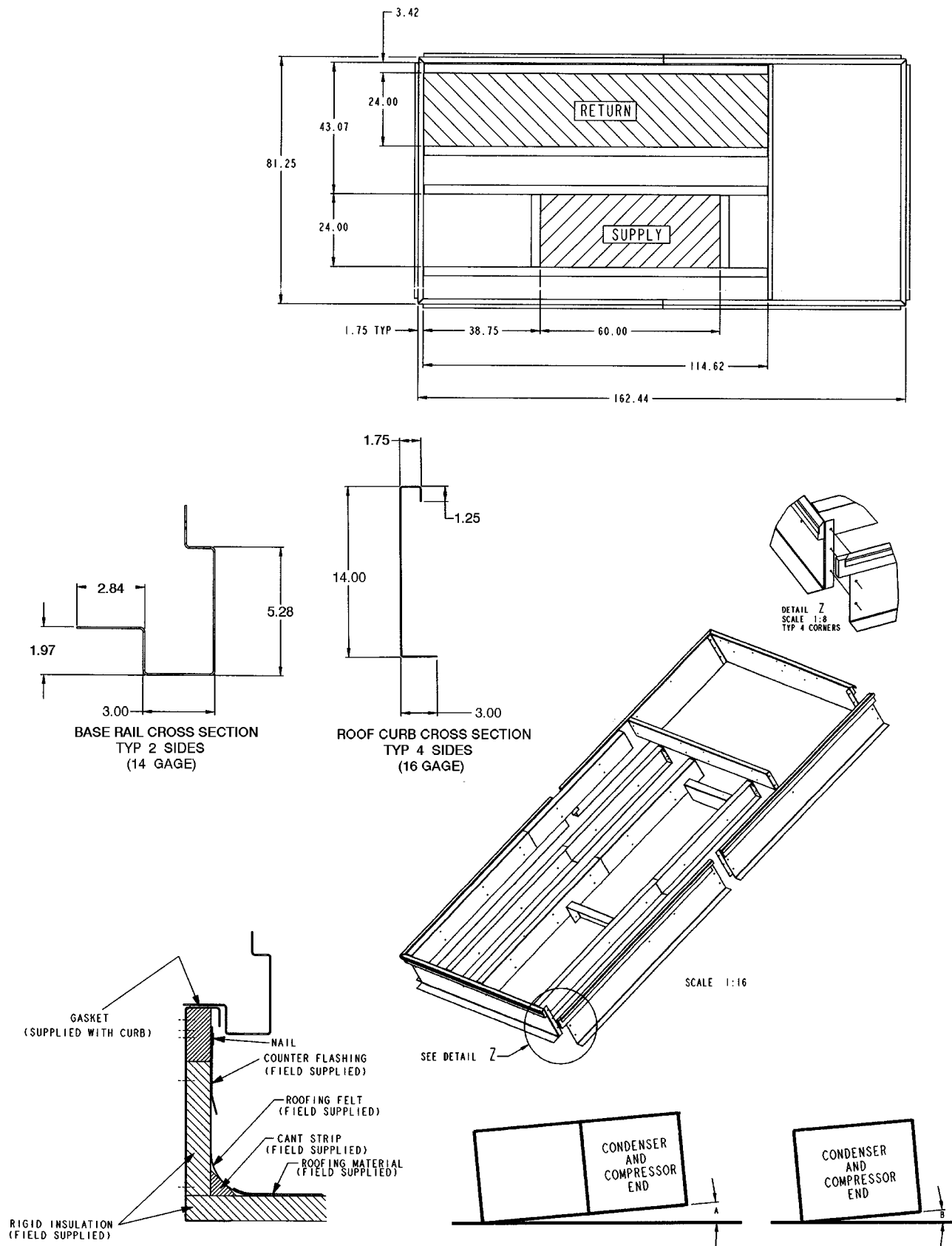
For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install 90 degree elbow turns in the supply and return ductwork between the unit and the conditioned space. If a 90 degree elbow cannot be installed, then grilles of sufficient strength and density should be installed to prevent objects from falling into the conditioned space.

**48EW,EY UNITS** — Remove shipping covers from supply and return air openings. Attach field-supplied ductwork to unit. Use a single duct over **both** return openings and a single duct over both supply openings. See Fig. 5 and 6 for duct opening dimensions. Secure all ducts to the building structure. See Fig. 9. Use flexible duct connectors between unit and ducts as required. Insulate and weatherproof all external ductwork, joints, and building 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.

Install accessory barometric relief or power exhaust in the field-fabricated return ductwork. Refer to Position Power Exhaust/Barometric Relief Damper Hood section on page 26 for more information.

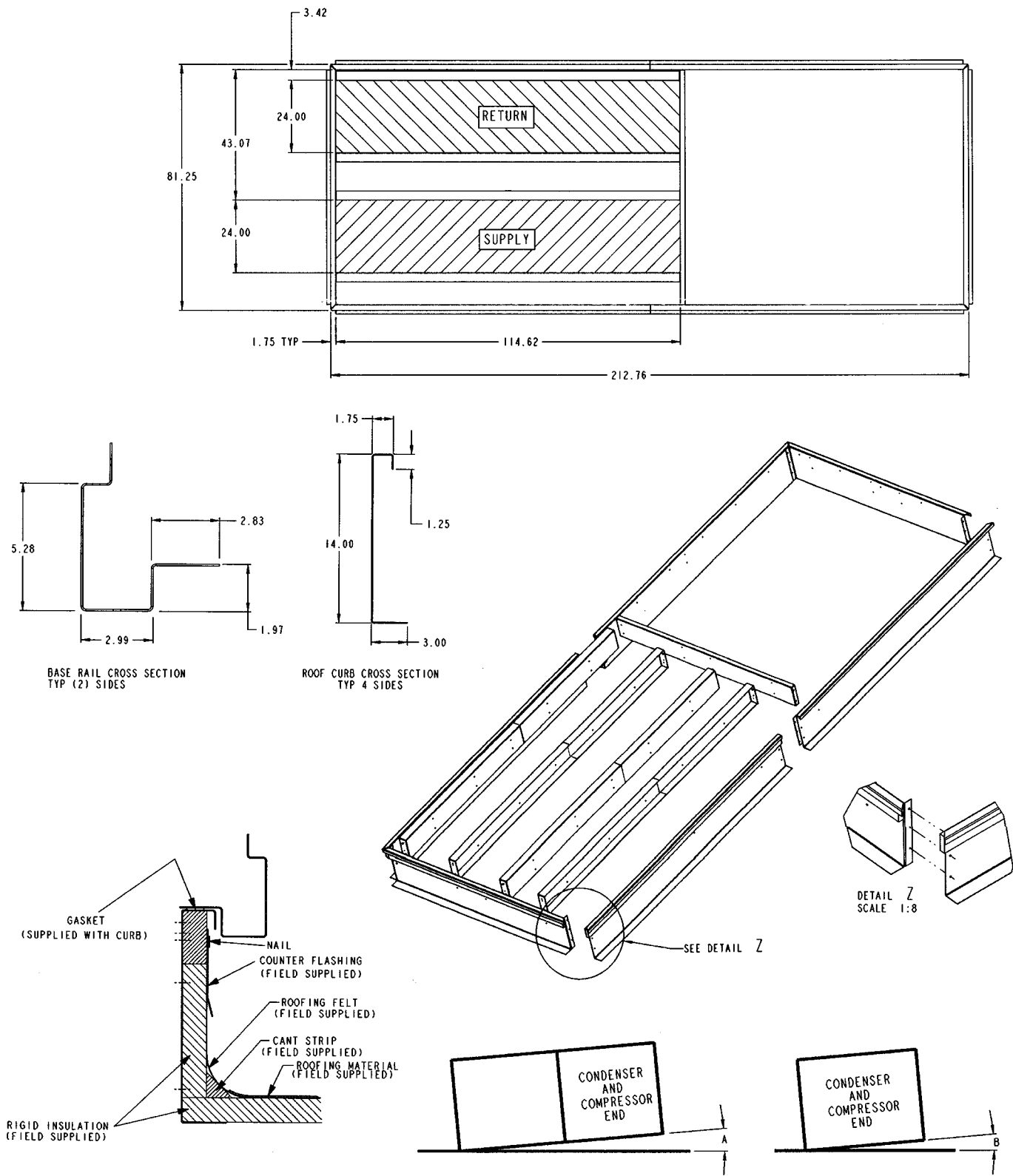
*Instructions continued on page 12.*



**NOTES:**

1. All roof curb parts are to be 16 ga galvanized steel.
2. Dimensions are in inches.
3. To prevent standing water in the drain pan of the indoor section and the heat exchangers, unit can only be pitched as shown.

**Fig. 1 — Roof Curb (Sizes 024-034)**



**NOTES:**

1. All roof curb parts are to be 16 ga galvanized steel.
2. Dimensions are in inches.
3. To prevent standing water in the drain pan of the indoor section and the heat exchangers, unit can only be pitched as shown.

**UNIT LEVELING TOLERANCES DIMENSIONS\***  
(Degrees and Inches)

A		B	
Deg.	in.	Deg.	in.
1.0	2.9	.50	.75

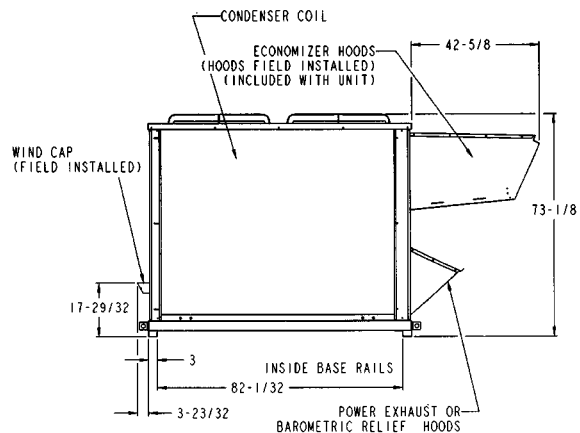
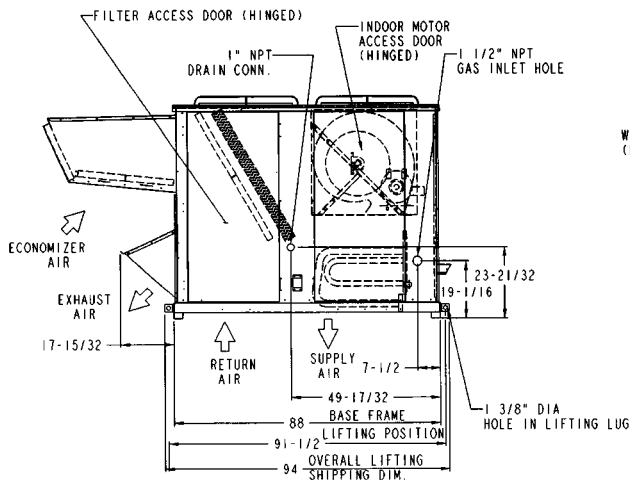
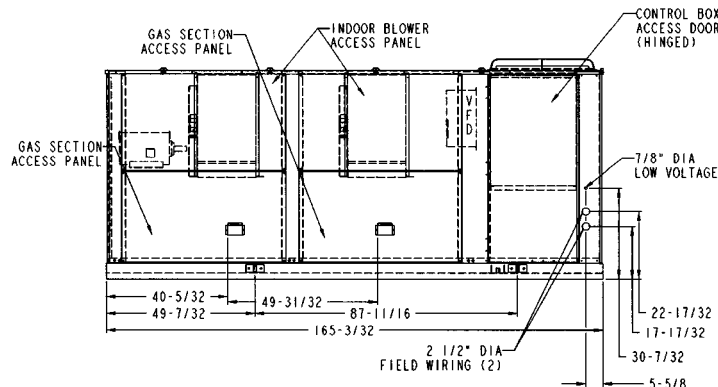
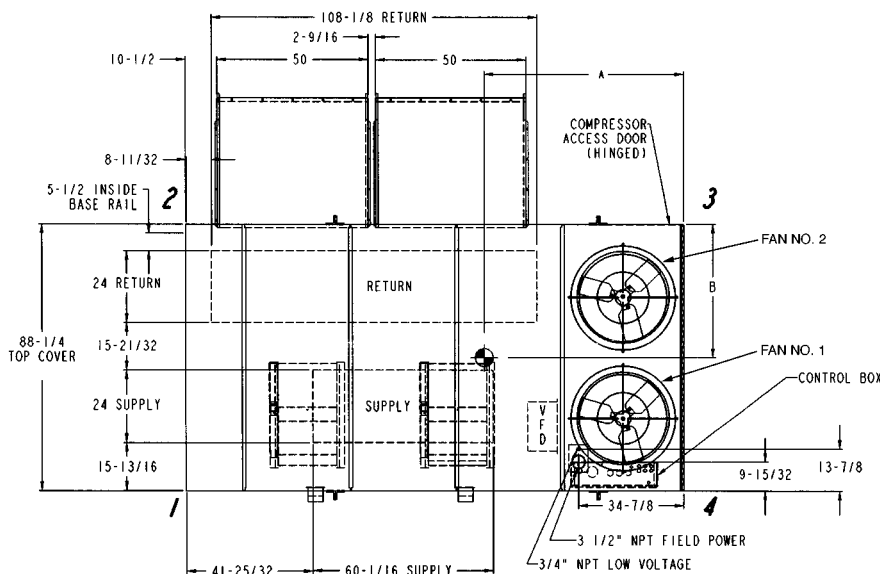
\*From edge of unit to horizontal.

**Fig. 2 — Roof Curb (Sizes 038-048)**

VFD — Variable Frequency Drive

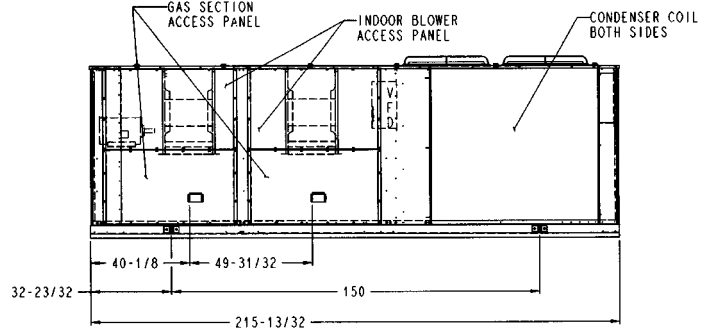
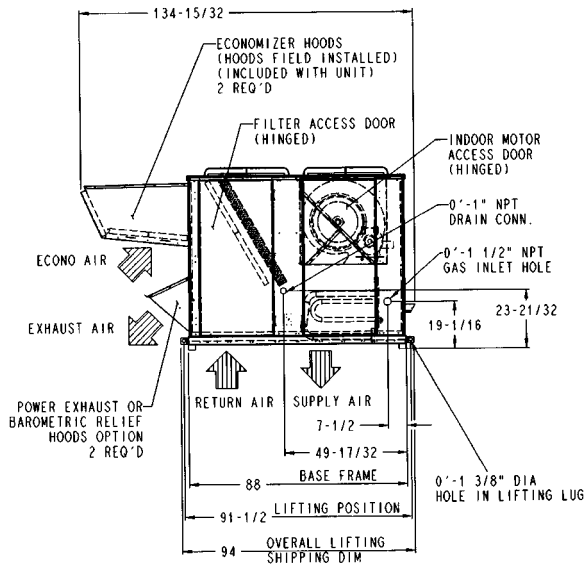
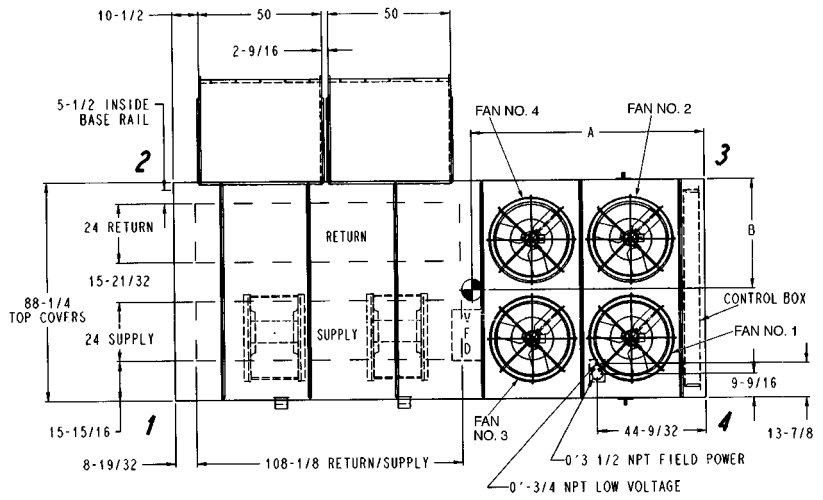
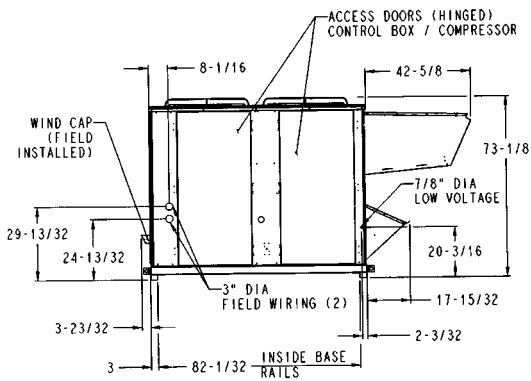
NOTES:

- Weights include economizer (STD).
- Center of gravity.
- Do not locate adjacent units with flue discharge facing economizer inlet. Minimum clearances to be:  
 Adjacent Units: 15'-0"  
 Top of Units: No overhang  
 Condenser Coil: 4'-0"  
 Economizer Side: 6'-0"  
 Gas Heat Side: 4'-0"  
 Filter Access Side: 10'-0" (For Removal of Evaporator Coil)
- For smaller service and operational clearances, contact Carrier Application Engineering department.
- Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on accessory roof curb.
- Dimensions are in inches.



UNIT SIZE	OPERATING WEIGHT lb	A ft-in.	B ft-in.	CORNER WEIGHT (lb)			
				1	2	3	4
48EJ,EKD024	4176	6- 0 <sup>3</sup> / <sub>8</sub>	3-6 <sup>3</sup> / <sub>8</sub>	879	954	1220	1124
48EJE024	4256	6- 1 <sup>5</sup> / <sub>16</sub>	3-6 <sup>1</sup> / <sub>16</sub>	917	973	1218	1148
48EJ,EKD028	4262	5- 9 <sup>5</sup> / <sub>8</sub>	3-8	899	899	1232	1232
48EJE028	4342	5-10 <sup>1</sup> / <sub>8</sub>	3-8 <sup>5</sup> / <sub>16</sub>	929	916	1240	1257
48EJ,EKD030	4262	5- 9 <sup>5</sup> / <sub>8</sub>	3-8	899	899	1232	1232
48EJE030	4342	5-10 <sup>1</sup> / <sub>8</sub>	3-8 <sup>5</sup> / <sub>16</sub>	929	916	1240	1257
48EJ,EKD034	4262	5- 9 <sup>5</sup> / <sub>8</sub>	3-8	899	899	1232	1232
48EJE034	4342	5-10 <sup>1</sup> / <sub>8</sub>	3-8 <sup>5</sup> / <sub>16</sub>	929	916	1240	1257

Fig. 3 — Base Unit Dimensions, 48EJ,EK024-034



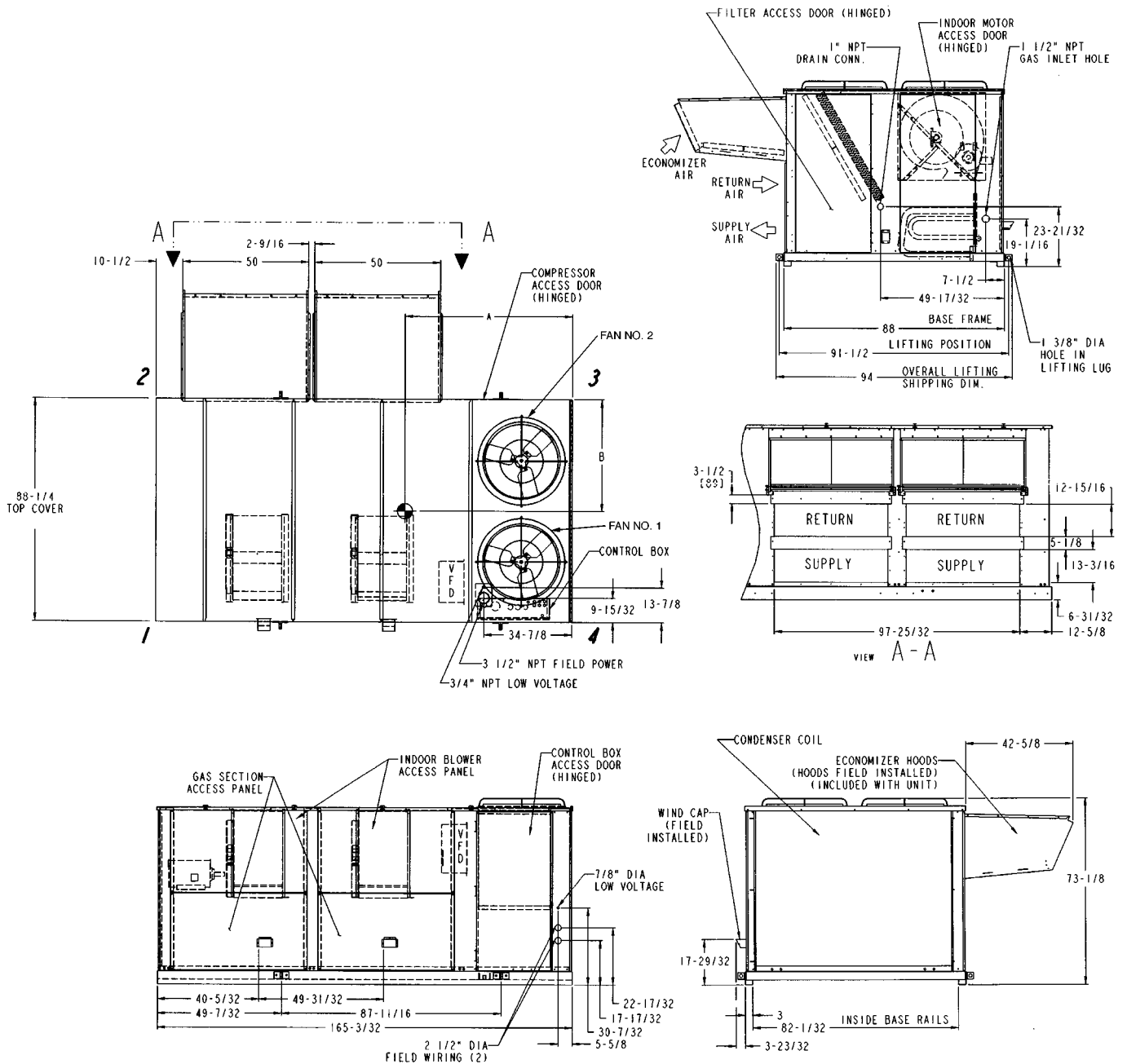
**VFD — Variable Frequency Drive**

**NOTES:**

1. Weights include economizer (STD).
2. Center of gravity.
3. Do not locate adjacent units with flue discharge facing economizer inlet. Minimum clearances to be:  
 Adjacent Units: 15'-0"  
 Top of Units: No overhang  
 Condenser Coil: 4'-0"  
 Economizer Side: 6'-0"  
 Gas Heat Side: 4'-0"  
 Filter Access Side: 10'-0" (For Removal of Evaporator Coil)
4. For smaller service and operational clearances, contact Carrier Application Engineering department.
5. Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on accessory roof curb.
6. Dimensions are in inches.

UNIT SIZE	OPERATING WEIGHT lb	CORNER WEIGHT (lb)	
		A ft-in.	B ft-in.
48EJ,EKD038	4442	7- 8 <sup>1</sup> / <sub>16</sub>	3-10 <sup>7</sup> / <sub>8</sub>
48EJE038	4602	7-10 <sup>1</sup> / <sub>8</sub>	3-11 <sup>3</sup> / <sub>16</sub>
48EJ,EKD044	4668	7- 5 <sup>5</sup> / <sub>16</sub>	3-10 <sup>7</sup> / <sub>8</sub>
48EJE044	4828	7- 6 <sup>13</sup> / <sub>16</sub>	3-11 <sup>3</sup> / <sub>16</sub>
48EJ,EKD048	4955	7- 3 <sup>11</sup> / <sub>16</sub>	3-10 <sup>1</sup> / <sub>2</sub>
48EJE048	5115	7- 5 <sup>3</sup> / <sub>16</sub>	3-10 <sup>13</sup> / <sub>16</sub>

**Fig. 4 — Base Unit Dimensions, 48EJ,EK038-048**



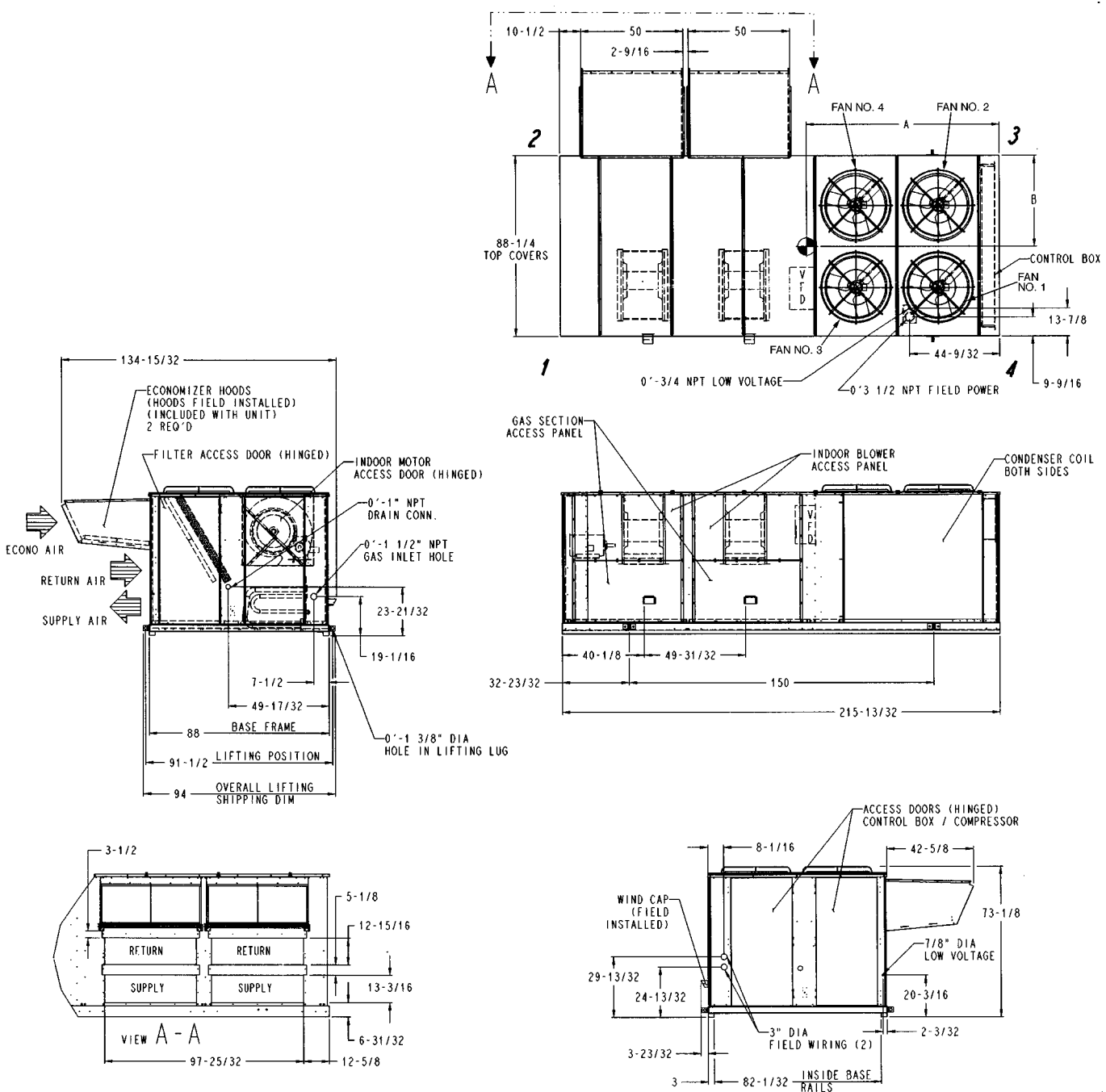
VFD — Variable Frequency Drive

NOTES:

1. Weights include economizer (STD).
2. Center of gravity.
3. Do not locate adjacent units with flue discharge facing economizer inlet.  
Minimum clearances to be:  
Adjacent Units: 15'-0"  
Top of Units: No overhang  
Condenser Coil: 4'-0"  
Economizer Side: 6'-0"  
Gas Heat Side: 4'-0"  
Filter Access Side: 10'-0" (For Removal of Evaporator Coil)
4. For smaller service and operational clearances, contact Carrier Application Engineering department.
5. Dimensions are in inches.
6. For side-supply/return applications, a single return and supply ductwork connection is recommended for covering both return and both supply openings.

UNIT SIZE	OPERATING WEIGHT lb	CORNER WEIGHT (lb)	
		A ft-in.	B ft-in.
48EW,EYD024	4176	6- 0 <sup>3</sup> / <sub>8</sub>	3-6 <sup>3</sup> / <sub>8</sub>
48EWE024	4256	6- 1 <sup>5</sup> / <sub>16</sub>	3-6 <sup>11</sup> / <sub>16</sub>
48EW,EYD028	4262	5- 9 <sup>5</sup> / <sub>8</sub>	3-8
48EWE028	4342	5-10 <sup>1</sup> / <sub>8</sub>	3-8 <sup>5</sup> / <sub>16</sub>
48EW,EYD030	4262	5- 9 <sup>5</sup> / <sub>8</sub>	3-8
48EWE030	4342	5-10 <sup>1</sup> / <sub>8</sub>	3-8 <sup>5</sup> / <sub>16</sub>
48EW,EYD034	4262	5- 9 <sup>5</sup> / <sub>8</sub>	3-8
48EWE034	4342	5-10 <sup>1</sup> / <sub>8</sub>	3-8 <sup>5</sup> / <sub>16</sub>

Fig. 5 — Base Unit Dimensions, 48EW,EY024-034



VFD — Variable Frequency Drive

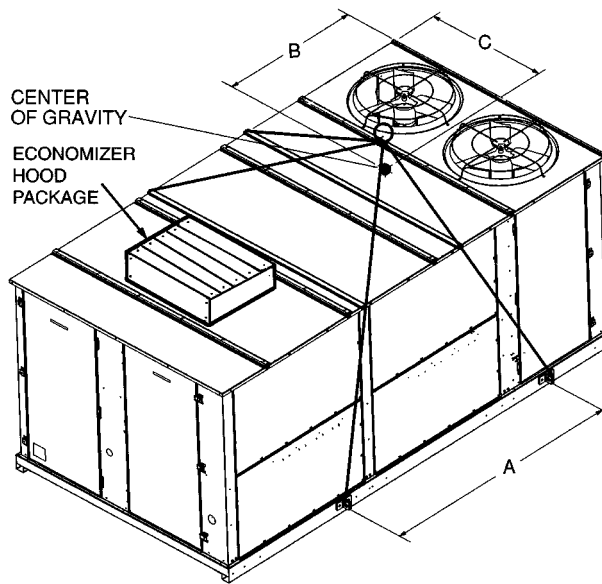
NOTES:

- Weights include economizer (STD).
- Center of gravity.
- Do not locate adjacent units with flue discharge facing economizer inlet. Minimum clearances to be:  
 Adjacent Units: 15'-0"  
 Top of Units: No overhang  
 Condenser Coil: 4'-0"  
 Economizer Side: 6'-0"  
 Gas Heat Side: 4'-0"  
 Filter Access Side: 10'-0" (For Removal of Evaporator Coil)
- For smaller service and operational clearances, contact Carrier Application Engineering department.
- Dimensions are in inches.
- For side-supply/return applications, a single return and supply duct-work connection is recommended for covering both return and both supply openings.

UNIT SIZE	OPERATING WEIGHT lb	A		CORNER WEIGHT (lb)			
		ft-in.	ft-in.	1	2	3	4
48EW,EYD038	4442	7- 8 <sup>11</sup> / <sub>16</sub>	3-10 <sup>7</sup> / <sub>8</sub>	1021	894	1180	1347
48EWE038	4602	7-10 <sup>1</sup> / <sub>8</sub>	3-11 <sup>3</sup> / <sub>16</sub>	1080	934	1200	1388
48EW,EYD044	4668	7- 5 <sup>5</sup> / <sub>16</sub>	3-10 <sup>7</sup> / <sub>8</sub>	1033	906	1275	1455
48EWE044	4828	7- 6 <sup>13</sup> / <sub>16</sub>	3-11 <sup>3</sup> / <sub>16</sub>	1094	945	1293	1496
48EW,EYD048	4955	7- 3 <sup>11</sup> / <sub>16</sub>	3-10 <sup>1</sup> / <sub>2</sub>	1068	953	1384	1550
48EWE048	5115	7- 5 <sup>5</sup> / <sub>16</sub>	3-10 <sup>13</sup> / <sub>16</sub>	1129	994	1401	1592

Fig. 6 — Base Unit Dimensions, 48EW,EY038-048





UNIT	WEIGHT		A		B		C	
	lb	kg	in.	mm	in.	mm	in.	mm
48EJ,EK,EW,EYD024	4176	1894	87.68	2227	72.4	1839	42.4	1072
48EJ,EWE024	4256	1930			73.3	1862	42.7	1085
48EJ,EK,EW,EYD028	4262	1933			69.6	1768	44.0	1118
48EJ,EK,EW,EYD030					70.1	1781	44.3	1125
48EJ,EK,EW,EYD034								
48EJ,EWE028								
48EJ,EWE030	4342	1969	150	3810	92.7	2355	46.9	1191
48EJ,EWE034	4442	2015			94.1	2390	47.2	1199
48EJ,EK,EW,EYD038					4668	2117	89.3	2268
48EJ,EWE038	4828	2190					90.8	2306
48EJ,EK,EW,EYD044	4955	2248			87.7	2228	46.5	1181
48EJ,EK,EW,EYD048	5115	2320			89.2	2266	46.8	1189
48EJ,EWE044								
48EJ,EWE048								

**⚠ CAUTION**

**NOTICE TO RIGGERS:  
ALL PANELS MUST BE IN PLACE  
WHEN RIGGING.**

NOTE: Rig with four cables and spread with two 92 in. (2337 mm) spreader bars. Maintain a distance of 74 in. (1880 mm) from top of unit to eyehook.

NOTE:

- Add 32 lb (14.5 kg) for domestic crating.
- Add 312 lb (142 kg) for export crating (024-034 units).
- Add 346 lb (157 kg) for export crating (038-048 units).
- Add 250 lb (113 kg) for power exhaust.
- Add 220 lb (100 kg) for copper condenser coil (024-034 units).
- Add 285 lb (129 kg) for copper condenser coil (038,044 units).
- Add 380 lb (172 kg) for copper condenser coil (048 unit).

**Fig. 7 — Rigging Label**

**Table 1 — Physical Data**

UNIT 48EJ,EK,EW,EY	024D/E			028D/E			030D/E			034D/E		
<b>NOMINAL CAPACITY (tons)</b>	20			25			27			30		
<b>OPERATING WEIGHT (lb)*</b> Unit	4176/4256			4262/4342			4262/4342			4262/4342		
AI/AI† (Lo Heat/Hi Heat)	4396/4476			4482/4562			4482/4562			4482/4562		
Roof Curb (14-in. curb)	365			365			365			365		
<b>COMPRESSOR</b>	06D328			06D328			06D537			06D537		
Type Ckt 1	06D818			06D328			06D328			06D537		
Ckt 2												
Number of Refrigerant Circuits	2			2			2			2		
Oil (oz) (Ckt 1, Ckt 2)	115, 88			115 ea.			115 ea.			115 ea.		
<b>REFRIGERANT TYPE</b>	R-22											
<b>Operating Charge (lb-oz)</b>	25-0			25-0			25-0			25-0		
Circuit 1**	31-0			25-0			25-0			25-0		
Circuit 2												
<b>CONDENSER COIL</b>	Cross-Hatched 3/8" Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins											
Quantity	1			1			1			1		
Rows...Fins/in.	4...15			4...15			4...15			4...15		
Total Face Area (sq ft)	33.3			33.3			33.3			33.3		
<b>CONDENSER FAN</b>	Propeller Type											
Nominal Cfm	13,420			13,420			13,420			13,420		
Quantity...Diameter (in.)	2...30			2...30			2...30			2...30		
Motor Hp (1075 Rpm)	1			1			1			1		
<b>EVAPORATOR COIL</b>	Cross-Hatched 3/8" Copper Tubes, Aluminum Plate Fins, Intertwined Circuits											
Rows...Fins/in.	4...15			4...15			4...15			4...15		
Total Face Area (sq ft)	31.7			31.7			31.7			31.7		
<b>EVAPORATOR FAN</b>	Centrifugal Type											
Quantity...Size (in.)	2...20x15			2...20x15			2...20x15			2...20x15		
Type Drive	Belt			Belt			Belt			Belt		
Nominal Cfm	8,000			10,000			11,000			12,000		
Motor Hp	5			7.5			10			10		
Motor Frame Size (Standard)	S184T			S215T			S215T			S215T		
(High Efficiency)	S215T			S215T			S256T			S256T		
Motor Bearing Type	Ball			Ball			Ball			Ball		
Maximum Allowable Rpm	1200			1200			1200			1200		
Motor Pulley Pitch Diameter	4.8			5.4			4.4			4.4		
Nominal Motor Shaft Diameter (in.)	1 1/8			1 3/8			1 3/8			1 3/8		
Fan Pulley Pitch Diameter (in.)	12.4			12.4			9.4			9.0		
Nominal Fan Shaft Diameter (in.)	1 15/16			1 15/16			1 15/16			1 15/16		
Belt, Quantity...Type	1...BX59			1...BX59			2...BX52			2...BX51		
Belt, Length (in.)	62			59			55			54		
Pulley Center Line Distance (in.)	16.0-18.7			15.6-18.4			15.6-18.4			15.6-18.4		
Factory Speed Setting (rpm)	717			962			1059			1187		
<b>FURNACE SECTION</b>	225			225			225			225		
Rollout Switch Cutout Temp (F)¶												
Burner Orifice Diameter (in. ...drill size)												
Natural Gas Std	.111...34			.111...34			.111...34			.111...34		
Liquid Propane Alt	.089...43			.089...43			.089...43			.089...43		
Thermostat Heat Anticipator Setting (amps)												
Stage 1	0.1			0.1			0.1			0.1		
Stage 2	0.1			0.1			0.1			0.1		
Gas Input (Btuh) Stage 1	262,500			262,500			262,500			262,500		
High	394,000			394,000			394,000			394,000		
Stage 2	350,000			350,000			350,000			350,000		
Low	525,000			525,000			525,000			525,000		
High												
Efficiency (Steady State) (%)	82			82			82			82		
Temperature Rise Range	15-45/35-65			15-45/35-65			15-45/35-65			15-45/35-65		
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		
Gas Valve Quantity	2			2			2			2		
Field Gas Connection Size (in.-FPT)	1.5			1.5			1.5			1.5		
<b>HIGH-PRESSURE SWITCH (psig)</b>	426			426			426			426		
Cutout	320			320			320			320		
Reset (Auto.)												
<b>LOW-PRESSURE SWITCH (psig)</b>	7			7			7			7		
Cutout	22			22			22			22		
Reset (Auto.)												
<b>OUTDOOR-AIR FILTERS</b>	8...16 x 25											
Quantity...Size (in.)	4...20 x 25											
<b>RETURN-AIR FILTERS</b>	10...20x24x2			10...20x24x2			10...20x24x2			10...20x24x2		
Quantity...Size (in.)												
<b>POWER EXHAUST</b>	Direct Drive, 3-Speed, Single-Phase Motor (Factory-Wired for High Speed) and Forward-Curved Fan											
Motor, Quantity...Hp	4...1			4...1			4...1			4...1		
Fan, Diameter... Width (in.)	11...10			11...10			11...10			11...10		

**LEGEND**

Al — Aluminum  
Cu — Copper

NOTE: High heat is for 48EJ,EW only.

VFD (Hp)	VFD WEIGHTS (lb)		
	208/230 v	460 v	575 v
5	20	22	60
7.5	51	37	64
10	51	61	64
15	61	63	109
20	63	111	109
25	105	112	174
30	172	118	180

\*Weight of unit does not include variable frequency drive (VFD) barometric relief, or power exhaust. If a VFD is installed, add the VFD weight in the table at right.

†Evaporator coil fin material/condenser coil fin material.

\*\*Sizes 024-034: Circuit 1 uses the lower portion of condenser coil, Circuit 2 uses the upper portion. Sizes 038-048: Circuit 1 uses the left condenser coil, Circuit 2 the right. All units have intertwined evaporator coils.

‡Motor and drive shown will deliver approximately 2.5 in. wg net external static. See Table 2 for more information.

¶Rollout switch is manual reset.

**Table 1 — Physical Data (cont)**

UNIT 48EJ,EK,EW,EY	038D/E			044D/E			048D/E		
<b>NOMINAL CAPACITY (tons)</b>	35			40			45		
<b>OPERATING WEIGHT (lb)*</b>									
Unit									
Al/AI† (Lo Heat/Hi Heat)	4442/4602			4668/4828			4955/5115		
Al/Cu† (Lo Heat/Hi Heat)	4727/4887			4953/5113			5335/5495		
Roof Curb (14-in. curb)	410			410			410		
<b>COMPRESSOR</b>									
Type Ckt 1	06D537			06EA250			06EA265		
Ckt 2	06D537			06EA250			06EA250		
Number of Refrigerant Circuits	2			2			2		
Oil (oz) (Ckt 1, Ckt 2)	115 ea.			224 ea.			304, 224		
<b>REFRIGERANT TYPE</b>				R-22					
Operating Charge (lb-oz)									
Circuit 1**	34-0			35-0			41-0		
Circuit 2	34-0			35-0			41-0		
<b>CONDENSER COIL</b>	Cross-Hatched 3/8" Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins								
Quantity	2			2			1		
Rows...Fins/in.	3...15			3...15			4...15		
Total Face Area (sq ft)	58.3			58.3			66.7		
<b>CONDENSER FAN</b>				Propeller Type					
Nominal Cfm	27,064			27,064			27,064		
Quantity...Diameter (in.)	4...30			4...30			4...30		
Motor Hp (1075 Rpm)	1			1			1		
<b>EVAPORATOR COIL</b>	Cross-Hatched 3/8" Copper Tubes, Aluminum Plate Fins, Intertwined Circuits								
Rows...Fins/in.	3...15			3...15			4...15		
Total Face Area (sq ft)	34.7			34.7			34.7		
<b>EVAPORATOR FAN</b>				Centrifugal Type					
Quantity...Size (in.)	2...20x15			2...20x15			2...20x15		
Type Drive	Belt			Belt			Belt		
Nominal Cfm	14,000			16,000			18,000		
Motor Hp	10			15			20		
Motor Frame Size (Standard)	S215T			D254T			S256T		
(High Efficiency)	S215T			S254T			S256T		
Motor Bearing Type	Ball			Ball			Ball		
Maximum Allowable Rpm	1200			1200			1200		
Motor Pulley Pitch Diameter	6.1			5.3			5.7		
Nominal Motor Shaft Diameter (in.)	1 3/8			1 1/8			1 1/8		
Fan Pulley Pitch Diameter (in.)	13.7			9.5			9.5		
Nominal Fan Shaft Diameter (in.)	1 15/16			1 15/16			1 15/16		
Belt, Quantity...Type	1...5VX650			2...5VX530			2...5VX550		
Belt, Length (in.)	65			53			55		
Pulley Center Line Distance (in.)	15.6-18.4			15.0-17.9			15.0-17.9		
Factory Speed Setting (rpm)	779			976			1050		
<b>FURNACE SECTION</b>									
Rollout Switch Cutout Temp (F)‡	225			225			225		
Burner Orifice Diameter (in. ...drill size)									
Natural Gas Std	.120...31			.120...31			.120...31		
Liquid Propane Alt	.096...41			.096...41			.096...41		
Thermostat Heat Anticipator Setting (amps)									
Stage 1	0.1			0.1			0.1		
Stage 2	0.1			0.1			0.1		
Gas Input (Btuh) Stage 1 Low	300,000			300,000			300,000		
High	600,000			600,000			600,000		
Stage 2 Low	400,000			400,000			400,000		
High	800,000			800,000			800,000		
Efficiency (Steady State) (%)	82			82			82		
Temperature Rise Range	10-40/30-60			10-40/30-60			10-40/30-60		
Manifold Pressure (in. wg)									
Natural Gas Std	3.5			3.5			3.5		
Liquid Propane Alt	3.5			3.5			3.5		
Gas Valve Quantity	2			2			2		
Field Gas Connection Size (in.-FPT)	1.5			1.5			1.5		
<b>HIGH-PRESSURE SWITCH (psig)</b>									
Cutout	426			426			426		
Reset (Auto.)	320			320			320		
<b>LOW-PRESSURE SWITCH (psig)</b>									
Cutout	7			7			7		
Reset (Auto.)	22			22			22		
<b>OUTDOOR-AIR FILTERS</b>				8...16 x 25					
Quantity...Size (in.)				4...20 x 25					
<b>RETURN-AIR FILTERS</b>									
Quantity...Size (in.)	10...20x24x2			10...20x24x2			10...20x24x2		
<b>POWER EXHAUST</b>	Direct Drive, 3-Speed, Single-Phase motor (Factory-Wired for High Speed) and Forward Curved Fan								
Motor, Quantity...Hp	4...1			4...1			4...1		
Fan, Diameter... Width (in.)	11...10			11...10			11...10		

**LEGEND**

Al — Aluminum  
Cu — Copper

\*Weight of unit does not include variable frequency drive (VFD) barometric relief, or power exhaust. If a VFD is installed, add the VFD weight in the table at right.

†Evaporator coil fin material/condenser coil fin material.

\*\*Sizes 024-034: Circuit 1 uses the lower portion of condenser coil, Circuit 2 uses the upper portion. Sizes 038-048: Circuit 1 uses the left condenser coil, Circuit 2 the right. All units have intertwined evaporator coils.

††Motor and drive shown will deliver approximately 2.5 in. wg net external static. See Table 2 for more information.

‡Rollout switch is manual reset.

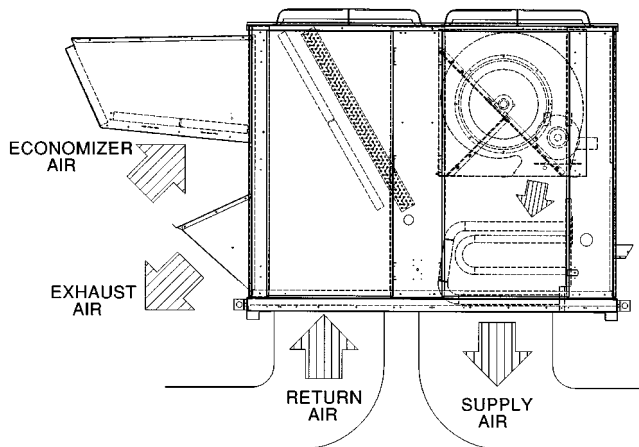
NOTE: High heat is for 48EJ,EW only.

VFD (Hp)	VFD WEIGHTS (lb)		
	208/230 v	460 v	575 v
5	20	22	60
7.5	51	37	64
10	51	61	64
15	61	63	109
20	63	111	109
25	105	112	174
30	172	118	180

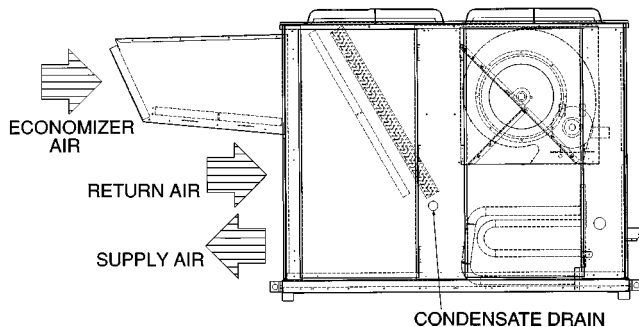
**Table 2 — Evaporator Fan Motor Data (Units with Starting Serial Numbers 4197 and Later)**

UNIT SIZE 48E	MOTOR HP	MOTOR SHAFT DIA. (in.)	FAN SHAFT SPEED (rpm)	MOTOR SHEAVE	MOTOR SHEAVE PITCH DIAMETER (in.)	BUSHING DIAMETER (in.)	FAN SHEAVE	FAN SHEAVE PITCH DIAMETER (in.)	BUSHING DIAMETER (in.)	BELT (QUANTITY)	OUTSIDE BELT LENGTH	BELT TENSION (Lb at .24 in.)
024	5	1.12	717	BK55	4.8	None-1.125	1B5V124	12.4	B-1.9375	BX59	62	5.10
	10	1.38	924	2BK50	4.4	None-1.375	2B5V86	8.6	B-1.9375	(2) BX51	54	5.21
	15	1.62	1096	2B5V56	5.7	B-1.625	2B5V90	9.1	B-1.9375	(2) 5VX530	53	6.00
028	7.5	1.38	773	BK60H	5.4	H-1.375	1B5V124	12.4	B-1.9375	BX59	62	6.48
	10	1.38	962	1B5V60	6.1	H-1.375	1B5V110	11.1	B-1.9375	5VX590	59	7.37
	15	1.62	1106	2B5V54	5.5	B-1.625	2B5V86	8.7	B-1.9375	(2) 5VX530	53	6.12
030	10	1.38	848	2BK50	4.4	None-1.375	2B5V94	9.4	B-1.9375	(2) BX52	55	5.27
	15	1.62	1059	2B5V48	4.9	B-1.625	2B5V80	8.1	B-1.9375	(2) 5VX500	50	6.63
	20	1.62	1187	2B5V58	5.9	B-1.625	2B5V86	8.7	B-1.9375	(2) 5VX530	53	7.31
034	10	1.38	884	2BK50	4.4	H-1.375	2B5V90	9.0	B-1.9375	(2) BX51	54	5.24
	15	1.62	1096	2B5V56	5.7	B-1.625	2B5V90	9.1	B-1.9375	(2) 5VX530	53	6.00
	20	1.62	1187	2B5V58	5.9	B-1.625	2B5V86	8.7	B-1.9375	(2) 5VX530	53	7.31
038	10	1.38	779	1B5V60	6.1	None-1.375	1B5V136	13.7	B-1.9375	5VX650	65	7.62
	15	1.62	976	2B5V52	5.3	B-1.625	2B5V94	9.5	B-1.9375	(2) 5VX530	53	6.37
	20	1.62	1050	2B5V56	5.7	B-1.625	2B5V94	9.5	B-1.9375	(2) 5VX530	55	7.60
044	15	1.62	976	2B5V52	5.3	B-1.625	2B5V94	9.5	B-1.9375	(2) 5VX530	53	6.37
	20	1.62	1050	2B5V56	5.7	B-1.625	2B5V94	9.5	B-1.9375	(2) 5VX550	55	7.60
	25	1.88	1182	2B5V74	7.5	B-1.875	2B5V110	11.1	B-1.9375	(2) 5VX590	59	7.60
048	20	1.62	993	2B5V62	6.3	B-1.625	2B5V110	11.1	B-1.9375	(2) 5VX570	57	7.22
	25	1.88	1134	2B5V80	5.9	B-1.875	2B5V124	12.5	B-1.9375	(2) 5VX630	63	7.36
	30	1.88	1182	2B5V74	7.5	B-1.875	2B5V110	11.1	B-1.9375	(2) 5VX590	59	9.07

NOTE: Motor shaft speed is 1750 rpm. The fan shaft diameter is 1<sup>5</sup>/<sub>16</sub> inches.



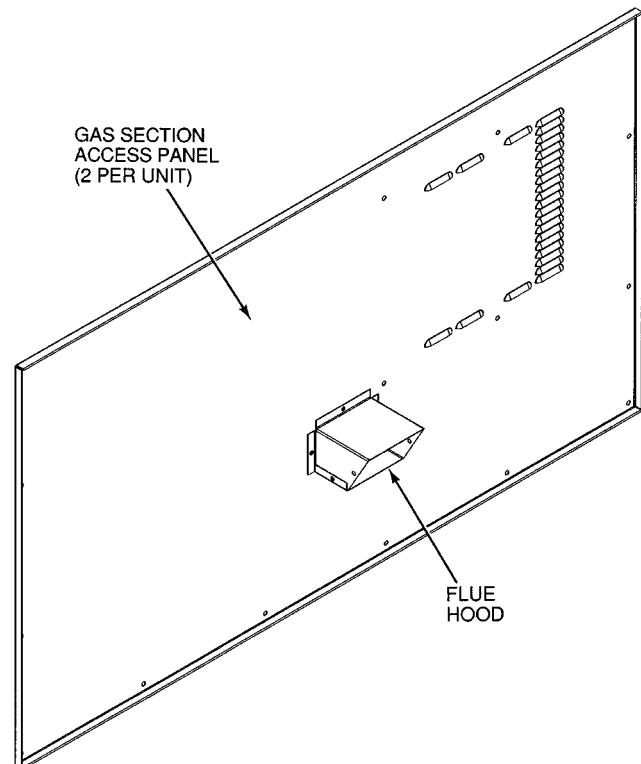
**Fig. 8 — Air Distribution — Thru-the-Bottom**



**Fig. 9 — Air Distribution — Thru-the-Side**

**Step 4 — Install Flue Hood** — Flue hood is shipped inside gas section of unit. To install, secure flue hood to access panel. See Fig. 10.

NOTE: When properly installed, flue hood will line up with combustion fan housing. See Fig. 11.



**Fig. 10 — Flue Hood Location**

**Step 5 — Trap Condensate Drain** — See Fig. 3-6 for drain location. Condensate drain is open to atmosphere and must be trapped. Install a trapped drain at the drain location. A trap at least 4-in. deep must be used. See Fig. 12. Trap must be installed to prevent freeze-up.

Condensate pans are sloped so that water will completely drain from the condensate pan to comply with indoor air quality guidelines. The condensate drain pan is fitted with a 1-in. FPT coupling.

**Step 6 — Install Gas Piping** — Unit is equipped for use with natural gas. Installation must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1.

Install manual gas shutoff valve with a 1/8-in. NPT pressure tap for test gage connection at unit. Field gas piping must include sediment trap and union. See Fig. 13. An 1/8-in. NPT is also located on the gas manifold adjacent to the gas valve.

**⚠ WARNING**

Do not pressure test gas supply while connected to unit. Always disconnect union before servicing.

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

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

**Step 7 — Controls Options** — The control options that the units can provide are based on the following parameters: CV (constant volume) or VAV (variable air volume) operation; stand-alone unit with field-supplied sensors installed (CV or VAV); as a system via Carrier Comfort System (TEMP or VVT®); optional electronic expansion board installed (CV or VAV); linked to the Carrier Comfort Network; and availability of a computer and software (ComfortWorks™ Building Supervisor, and Service Tool) or LID-2B accessory installed to access the base control board. See Table 3.

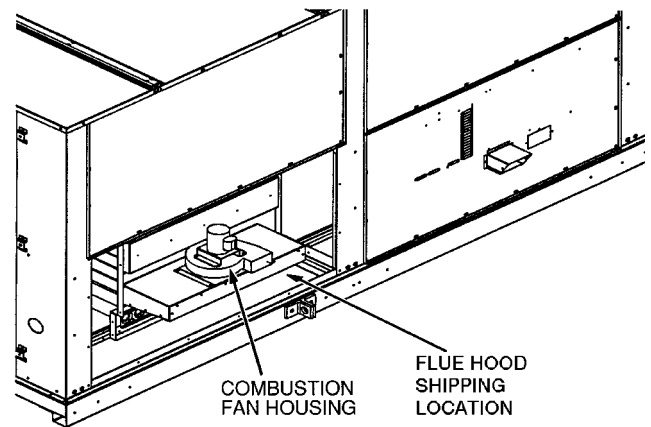
**NOTE:** Access to the base control board allows unit occupancy schedules, unit timeclock, and various set points to be changed from their factory-defined default settings.

All units are equipped with a supply air thermistor (SAT) located in the supply fan discharge and an outdoor air thermistor (OAT) located in the outdoor air hood. Variable air volume units are supplied with a return air thermistor (RAT) located on the return air damper support.

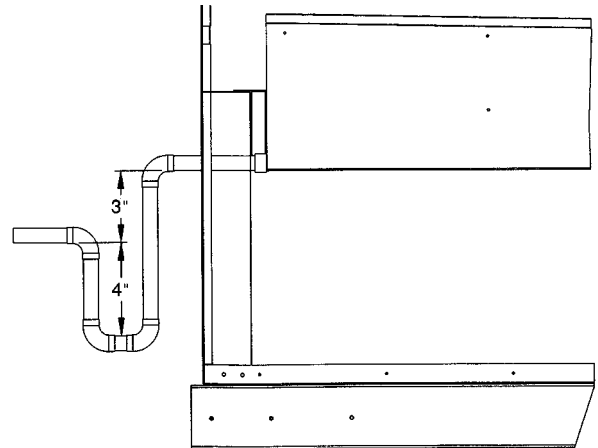
**CONSTANT VOLUME APPLICATIONS** — The units, as shipped, are operable as stand-alone units, using either a standard (mechanical or electronic) 2-stage heat, 2-stage cool thermostat, or with an electronic room sensor and a timeclock to establish unit start and stop times.

With a standard thermostat (programmable is optional), heating and cooling operation is set by space temperature.

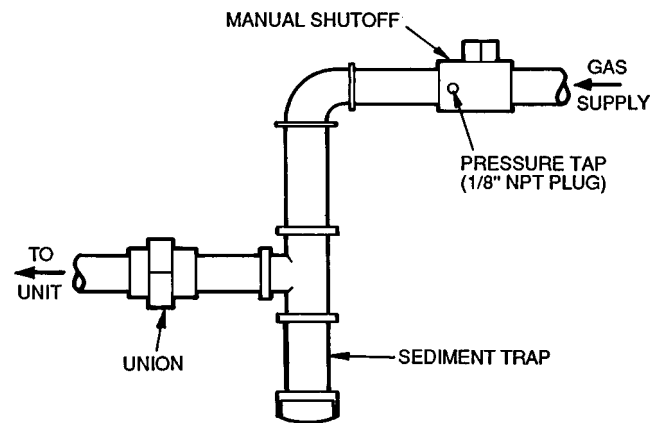
With a space sensor and timeclock, the machine will operate at default values unless they are changed using appropriate input devices. The space sensor senses space temperature and may be equipped with a timed override feature, which allows unit operation during unoccupied periods.



**Fig. 11 — Combustion Fan Housing Location**



**Fig. 12 — Condensate Drain Trap Piping Details (Typical Roof Curb or Slab Mount Shown)**



**Fig. 13 — Field Gas Piping**

The space sensors may be used in multiples of 4 or 9 to achieve space temperature averaging. The use of a space sensor also allows the unit to be turned on and off from a remote signal.

**Features with Thermostat Control of Unit**

- two-stage heating
- two-stage cooling
- control of unit using Y1, Y2, W1, W2, and G thermostat inputs
- control of the indoor fan
- outdoor-air temperature/supply-air temperature monitoring
- control of an outdoor air condenser fan based on outdoor-air temperature

**Table 3 — Controls Options and Configurations (Non-Thermostat Applications)**

UNIT CONFIGURATION	DEFAULT COOLING	DEFAULT HEATING
<b>CV or VAV Unit with SPT Sensor</b>	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — NA	Unoccupied Heating — 55 F (SPT) Occupied Heating — NA
<b>CV Unit with SPT Sensor and Remote Start/Stop Switch</b>	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — 78 F (SPT)	Unoccupied Heating — 55 F (SPT) Occupied Heating — 68 F (SPT)
<b>VAV Unit Remote Start/Stop Switch Only</b>	Unoccupied Cooling — 90 F (RAT) Occupied Cooling — 55 F (SAT)	Unoccupied Heating — 55 F (RAT) Occupied Heating — 68 F (RAT)*
<b>VAV Unit with SPT Sensor and Remote Start/Stop Switch</b>	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — 55 F (SAT)	Unoccupied Heating — 55 F (SPT) Occupied Heating — 68 F (RAT)*

**LEGEND**

- CV** — Constant Volume
- NA** — Not Available
- RAT** — Return-Air Temperature
- SAT** — Supply-Air Temperature
- SPT** — Space Temperature
- VAV** — Variable Air Volume

\*With DIP Switch No. 5 configured to OPEN (Occupied Heat Enabled).

NOTE: Space temperature sensor and remote start/stop switch are field-supplied.

- control of modulating economizer damper to provide free cooling when outdoor conditions are suitable, using supply-air temperature as a control point
- control of the economizer damper and indoor fan to obtain unoccupied free cooling
- provide power exhaust output to an external power exhaust controller
- support a field test for field checkout
- control of 2 stages of CV power exhaust
- compressor Time Guard® (power up, minimum off and on times)
- compressor lockout during low supply-air temperature

Additional features are provided by accessing the standard unit control board via software with a computer. These features are:

- electronic expansion board features (if installed)
- control board diagnostics
- ability to change supply air set point (economizer control)
- ability to change high outdoor temperature lockout set point (economizer control)
- ability to change power exhaust set points

NOTE: A CV unit without a thermostat requires a field-supplied sensor for operation.

Features with Sensor Control of Unit (Stand-Alone Applications) — Unit control is limited to CV unoccupied default set points, 90 F for cooling, 55 F for heating. There are 2 sensor options available:

- T-55 sensor will monitor room temperature and provide unoccupied override capability (1 hour)
- T-56 sensor will monitor room temperature, provide unoccupied override capability (1 hour), and provide a temperature offset of 5° F.

Standard features are:

- support of remote occupied/unoccupied input to start and stop the unit
- cooling capacity control of 3 stages using economizer and 2 compressors to maintain space temperature to an occupied or unoccupied set point
- enable heating or cooling during unoccupied periods as required to maintain space temperature within the unoccupied set points
- adjustment of space temperature set points of ±5° F when using a T-56 sensor

Additional features with sensor control of unit (with computer access) are:

- 365 day timeclock with backup (supports minute, hour, day of week, date, month, and year)
- daylight savings time function
- occupancy control with 8 periods for unit operation
- holiday table containing up to 18 holiday schedules

- ability to initiate timed override from T-55 or T-56 sensors for a timed period of 1 to 4 hours
- ability to use multiple space temperature sensors to average the space temperature
- temperature compensated start to calculate early start times before occupancy
- access to the Display, Maintenance, Configuration, Service, and Set Point data tables through network software

When the unit is equipped with a field-supplied space temperature sensor and a remote contact closure (remote start/stop) on the base control board, the occupied default set points will monitor unit operation. The occupied default set points are 78 F cooling and 68 F heating. See Fig. 14 for remote start/stop wiring.

NOTE: For units with a field-supplied space temperature sensor which have not had the base unit control board accessed via software to set an occupancy schedule, the remote start/stop closure will allow the unit to operate in the pre-configured occupied default set points (based on return-air temperature) of 78 F cooling and 68 F heating. Without this feature, the unit will control to the unoccupied default set points of 90 F cooling and 55 F heating.

An electronic expansion board may be field-installed to provide the following features:

- control of modulating economizer damper to maintain indoor air quality (IAQ) when outdoor conditions are suitable

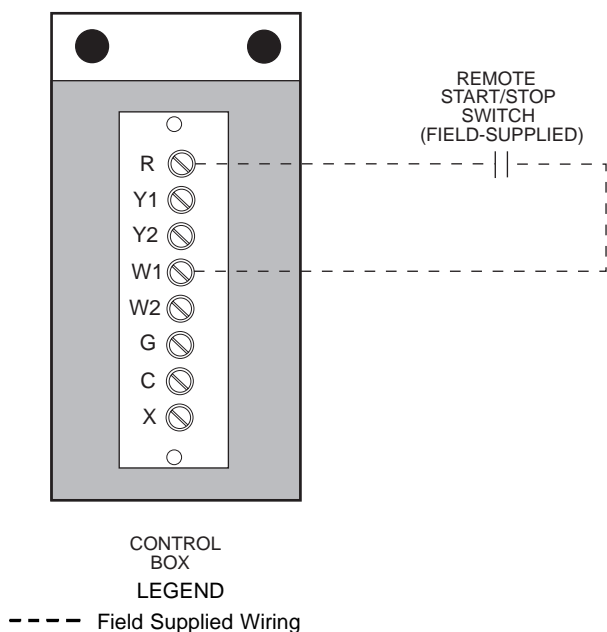
NOTE: The IAQ sensor must be set for current output (4 to 20 mA), not voltage output. Ensure the jumper on the sensor is in the upper position. See Fig. 15.

- provide discrete inputs for fan status, filter status, field-applied status, and demand limit
- provide an output for the external alarm light indicator
- provide power exhaust fire outputs for direct control of modulated power exhaust stages during fire or smoke modes
- control of smoke control modes including evacuation, smoke purge, pressurization, and fire shutdown (modulating power exhaust required)

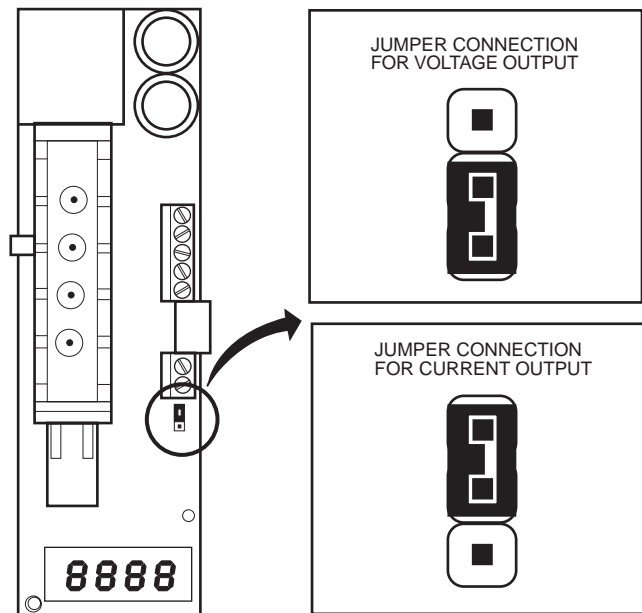
When the unit is connected to the CCN (Carrier Comfort Network), the following expansion board features can be utilized:

- perform Demand Limit functions based on CCN loadshed commands or the state of the discrete input
- alarm monitoring of all key parameters
- CCN protocol
- provides CCN IAQ participation

See Carrier TEMP or VVT® (Variable Volume and Temperature) literature for complete TEMP (single zone) or VVT (multi-zone) application information.



**Fig. 14 — Field Control Remote Start/Stop**



**Fig. 15 — Indoor Air Quality Sensor Configuration**

**Features with Sensor Control of Unit (Network Applications)** — The base control board provides, as standard, a connection for use with a Carrier VVT system and can also be integrated into a Carrier Comfort Network.

When the unit is accessed via a PC equipped with ComfortWorks™, Building Supervisor, or Service Tool software, or accessory LID-2B, the following features can be accessed:

- on-board timeclock can be programmed
- occupancy schedules can be programmed
- unit set points can be changed
- alarms can be monitored

This access is available on the base control board via a RJ-11 phone jack or a 3-wire connection to the communication bus. See Fig. 16. The timeclock has a 10-hour minimum back-up time to provide for unit power off for servicing unit or during unexpected power outages. For complete Carrier Comfort System (CCS) or Carrier Comfort Network (CCN) features and benefits, refer to the product literature.

## VARIABLE AIR VOLUME (VAV) APPLICATIONS

**Features with Stand-Alone Applications** — The units, as shipped, are operable as stand-alone units with the addition of a timeclock to establish unit start and stop times.

Heating and cooling in both on and off modes is controlled to default values by the base unit control. Set points may be changed with appropriate input devices.

The control has an on-board occupancy schedule which can be set using an input device and eliminates the need for an external timeclock.

During both the on and off periods, cooling operation is controlled to the supply air setting and heating is controlled to the return air setting (or to the optional space temperature sensor). During the on period, the supply fan runs continuously. During the off period, the supply fan will be activated if the return air sensor is outside of the set points and will run long enough to accurately sample the space temperature. The supply fan will then continue to run until any heating or cooling load is satisfied, at which point it will turn off.

The use of a space sensor will allow for supply air reset to conserve energy and maintain comfort. If equipped with an override feature, the sensor will allow operation during the off period for a fixed length of time.

Base unit control supports a Heat Interlock Relay (field supplied) to fully open the VAV terminal devices during heating operation.

Standard features of a VAV unit with a remote start/stop switch are:

- control board diagnostics
- control of an outdoor condenser fan based upon outdoor air temperature
- control of modulating economizer to provide free cooling when outdoor conditions are suitable, using supply-air temperature as a set point
- support of remote occupied/unoccupied input to start or stop the unit
- provide power exhaust output to an external power exhaust controller
- support supply-air temperature reset to offset supply air set point
- support a field test for field check out
- support linkage to DAV systems
- cooling capacity control of up to 6 stages plus economizer with compressors and unloaders to maintain supply air temperature set point during occupied periods
- control of one stage of heat to maintain return-air temperature at heating set point during occupied periods
- provide a variable frequency drive high voltage relay output to enable VFD
- control of heat interlock relay
- compressor Time Guard override (power up, minimum off and on times)

With the addition of a remote start/stop switch heating or cooling is enabled during unoccupied periods as required to maintain space temperature to within unoccupied set points.

Additional features may be provided with Electronic Access to Unit Control Board. These features are:

- additional control board diagnostics
- electronic expansion board features (if installed)
- control of the economizer damper and indoor fan to obtain unoccupied free cooling
- 365-day timeclock with backup (supports minute, hour, day, month, and year)
- holiday table containing up to 18 holiday schedules
- occupancy control with 8 periods for unit operation
- support a set of display, maintenance, configuration, service, and set point data tables for interface with Building Supervisor, ComfortWorks, or Service Tool software software or accessory LID-2B

When a VAV unit with a space temperature sensor is accessed via a computer, the following additional features are available:

- ability to initiate timed override from T-55 sensors
- temperature compensated start to calculate early start time before occupancy
- provide space temperature reset to reset the supply air set point upward when the temperature falls below the occupied cooling set point

An electronic expansion board may be field-installed to provide the following features:

- fan status
- filter status
- field-applied status
- demand limiting
- IAQ Sensor
- OAQ Sensor
- alarm light
- fire unit shutdown
- fire pressurization
- fire evacuation
- fire smoke purge

When the unit is connected to the CCN (Carrier Comfort Network), the following expansion board features can be utilized:

- CCN IAQ (indoor air quality) participation
- CCN OAQ (outdoor air quality) participation
- CCN demand limit participation
- modulated power exhaust override
- ability to use multiple space temperature sensors (multiples of 4 and 9 only) to average space temperature (DAV only)

A field-supplied T-55 space temperature sensor can be added to monitor room temperature and provide unoccupied override capability (1 hour).

When the unit is equipped with a field-supplied space temperature sensor and a remote contact closure (remote start/stop) the occupied default set points will monitor unit operation. The occupied default set points are 55 F (supply air) cooling and 68 F (return air temperature) heating. See Fig. 14 for remote start/stop wiring.

**NOTE:** For units without a space temperature sensor and which have not had the base unit control board accessed via software to set an occupancy schedule, the remote start/stop closure will allow the unit to operate in the pre-configured occupied default set points of 55 F (supply-air temperature) cooling and 68 F (return-air temperature) heating. Without an occupancy schedule, the unit will control to the unoccupied default set points of 90 F (return air) cooling and 55 F (return air) heating.

**Features with Network Applications** — The base control board provides, as standard, a connection for use with a Carrier Comfort System and can also be integrated into a Carrier Comfort Network. When the unit is accessed via a PC equipped with ComfortWorks™, Building Supervisor, or Service Tool software or LID-2B accessory, the following features can be accessed:

- on-board timeclock can be programmed
- occupancy schedules can be programmed
- unit set points can be changed
- alarms can be monitored

This access is available on the base control board via a RJ-11 phone jack or a 3-wire connection to the communication bus. See Fig. 16. The internal timeclock has a 10-hour minimum back-up time to provide for unit power off for servicing unit or during unexpected power outages. For complete Carrier Comfort System (CCS) or Carrier Comfort Network (CCN) features and benefits, refer to the product literature.

## Step 8 — Make Electrical Connections

**POWER WIRING** — Units are factory wired for the voltage shown on the unit nameplate.

When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (MOCP [maximum overcurrent protection] of unit is on the informative plate). All field wiring must comply with NEC and all local codes. Size wire based on MCA (minimum circuit amps) on the unit informative plate. See Fig. 17 for power wiring connections to the unit power terminal block and equipment ground.

The main power terminal block is suitable for use with aluminum or copper wire. See Fig. 17. Units have circuit breakers for compressors, fan motors, and control circuit. If required by local codes, provide an additional disconnect switch. Whenever external electrical sources are used, unit must be electrically grounded in accordance with local codes, or in absence of local codes, with NEC, ANSI C1-latest year.

All field wiring must comply with NEC and local code requirements.

**FIELD POWER SUPPLY** — Unit is factory wired for voltage shown on unit nameplate. See Table 4 for electrical data.

Field wiring can be brought into the unit from bottom (through basepan and roof curb) or through side of unit (corner post next to control box).

A 3½-in. NPT coupling for field power wiring and a ¾-in. NPT coupling for 24-v control wiring are provided in basepan. In the side post, there are two 2½-in. (024-034) or 3-in. (038-048) knockouts for the field power wiring. See Fig. 3-6. If control wiring is to be brought in through the side of unit, a ⅞-in. diameter hole is provided in the condenser side post next to the control box.

If disconnect box is mounted to corner post, be careful not to drill any screws into the condenser coil.

**Routing Through Bottom of Unit** — If wiring is brought in through bottom of unit, use field-supplied watertight conduit to run power wiring from basepan out through bottom 3½-in. hole to the disconnect box and back into unit to the main control box.

Use strain relief going into control box through 2½-in. diameter hole provided. After wires are in unit control box, connect to power terminal block (see Power Wiring section above).

Low-voltage wiring must be run in watertight conduit from the basepan to control box and through ⅞-in. diameter hole provided in bottom of unit control box. Field-supplied strain relief must be used going into the box. After wiring is in control box, make connections to proper terminals on terminal blocks (see Field Control Wiring section on page 21).

Install conduit connector in unit basepan as shown in Fig. 3-6. Route power and ground lines through connector to terminal connections in unit control box as shown on unit wiring diagram and Fig. 17.

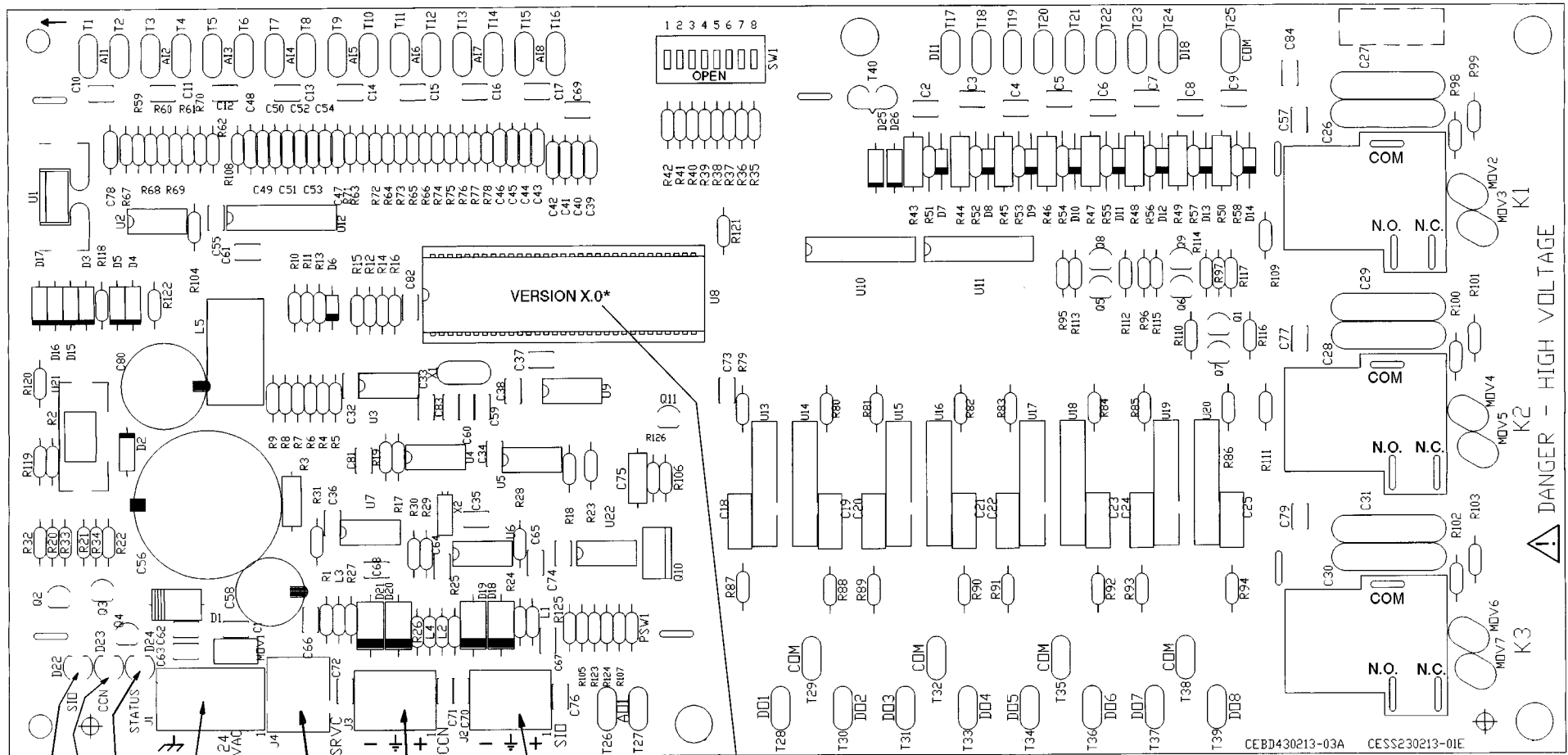
**Routing Through Side of Unit** — Route power wiring in field-supplied watertight conduit into unit through 2½-in. hole. See Fig. 17.

Use field-supplied strain relief going into control box through 2½-in. diameter hole provided. After wires are in unit control box, connect to power terminal block (see Power Wiring section on this page).

Bring low-voltage control wiring through factory-drilled ⅞-in. diameter hole in condenser side post. Use strain relief going into ⅞-in. diameter hole in bottom of unit control box.

After wiring is in control box, make connection to proper terminals on terminal blocks (see Field Control Wiring section on page 21).





GREEN LED  
RED LED  
YELLOW LED  
POWER CONNECTION TERMINAL  
REMOTE (RJ-11) CONNECTION  
CCN CONNECTION  
SIO CONNECTION TERMINAL (TO EXPANSION BOARD)

DETERMINE SOFTWARE VERSION HERE

LEGEND

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| <b>CCN</b> — Carrier Comfort Network | <b>N.O.</b> — Normally Open      |
| <b>COM</b> — Common                  | <b>R</b> — Relay                 |
| <b>D</b> — Diode                     | <b>SIO</b> — Serial Input/Output |
| <b>LED</b> — Light-Emitting Diode    | <b>SW</b> — Switch               |
| <b>N.C.</b> — Normally Closed        | <b>T</b> — Terminal              |

\*Where X is the unit control software version number.

Fig. 16 — Control Board Diagram

Table 4 — Electrical Data

UNIT SIZE 48E	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY	
				No. 1		No. 2											
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	FLA	MCA	MOCP*
024	208/230	187	254	39.1	228	25.6	160	2	1	5.3	5	16.7/ 15.2	—	—	0.96	101.8/100.3	125/125
												23.6	41.6	0.96	125.4/123.9	150/150	
											10	30.8/ 28.0	—	—	0.96	115.9/113.1	150/150
												23.6	41.6	0.96	139.5/136.7	175/175	
											15	46.2/ 42.0	—	—	0.96	131.3/127.1	150/150
												23.6	41.6	0.96	154.9/150.7	175/175	
	460	414	508	19.9	114	11.5	80	2	1	2.7	5	7.6	—	—	0.50	49.4	60
												12.6	23.6	0.50	62.0	80	
											10	14.0	—	—	0.50	55.8	70
												12.6	23.6	0.50	68.4	80	
											15	21.0	—	—	0.50	62.8	80
												12.6	23.6	0.50	75.4	90	
575	518	632	16.0	91	9.6	64	2	1	2.4	5	6.1	—	—	0.50	40.5	50	
											12.6	23.6	0.50	53.1	60		
										10	11.0	—	—	0.50	45.4	60	
											12.6	23.6	0.50	58.0	70		
										15	17.0	—	—	0.50	51.4	60	
											12.6	23.6	0.50	64.0	80		
028	208/230	187	254	39.1	228	39.1	228	2	1	5.3	7.5	24.2/ 22.0	—	—	0.96	122.8/120.6	150/150
												23.6	41.6	0.96	146.4/144.2	175/175	
											10	30.8/ 28.0	—	—	0.96	129.4/126.6	150/150
												23.6	41.6	0.96	153.0/150.2	175/175	
											15	46.2/ 42.0	—	—	0.96	144.8/140.6	175/175
												23.6	41.6	0.96	168.4/164.2	200/200	
	460	414	508	19.9	114	19.9	114	2	1	2.7	7.5	11.0	—	—	0.50	61.2	80
												12.6	23.6	0.50	73.8	90	
											10	14.0	—	—	0.50	64.2	80
												12.6	23.6	0.50	76.8	90	
											15	21.0	—	—	0.50	71.2	90
												12.6	23.6	0.50	83.8	100	
	575	518	632	16.0	91	16.0	91	2	1	2.4	7.5	9.0	—	—	0.50	49.8	60
												12.6	23.6	0.50	62.4	70	
											10	11.0	—	—	0.50	51.8	60
												12.6	23.6	0.50	64.4	80	
											15	17.0	—	—	0.50	57.8	70
												12.6	23.6	0.50	70.4	80	
030	208/230	187	254	57.1	266	39.1	228	2	1	5.3	10	30.8/ 28.0	—	—	0.96	151.9/149.1	200/200
												23.6	41.6	0.96	175.5/172.7	225/225	
											15	46.2/ 42.0	—	—	0.96	167.3/163.1	225/225
												23.6	41.6	0.96	190.9/186.7	225/225	
											20	59.4/ 54.0	—	—	0.96	180.5/175.1	225/225
												23.6	41.6	0.96	204.1/198.7	250/250	
	460	414	508	25.6	120	19.9	114	2	1	2.7	10	14.0	—	—	0.50	71.3	90
												12.6	23.6	0.50	83.9	100	
											15	21.0	—	—	0.50	78.3	100
												12.6	23.6	0.50	90.9	110	
											20	27.0	—	—	0.50	84.3	100
												12.6	23.6	0.50	96.9	110	
	575	518	632	20.5	96	16.0	91	2	1	2.4	10	11.0	—	—	0.50	57.4	70
												12.6	23.6	0.50	70.0	90	
											15	17.0	—	—	0.50	63.4	80
												12.6	23.6	0.50	76.0	90	
											20	22.0	—	—	0.50	68.4	80
												12.6	23.6	0.50	81.0	100	

See Legend and Notes on page 19.

Table 4 — Electrical Data (cont)

UNIT SIZE 48E	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM	POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY		
				No. 1		No. 2						FLA	LRA		FLA	LRA	MCA
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	FLA	MCA	MOCP*
034	208/230	187	254	57.1	266	57.1	266	2	1	5.3	10	30.8/28.0	—	—	0.96	169.9/167.1	225/200
												23.6	41.6	0.96	193.5/190.7	250/225	
		15	46.2/42.0	—	—	0.96	185.3/181.1	225/225									
			23.6	41.6	0.96	208.9/204.7	250/250										
		20	59.4/54.0	—	—	0.96	198.5/193.1	250/250									
			23.6	41.6	0.96	222.1/216.7	275/250										
	460	10	414	508	25.6	120	25.6	120	2	1	2.7	14.0	—	—	0.50	77.0	100
													12.6	23.6	0.50	89.6	110
		15	21.0	—	—	0.50	84.0	100									
									12.6	23.6	0.50	96.6	110				
		20	27.0	—	—	0.50	90.0	110									
									12.6	23.6	0.50	102.6	125				
575	10	518	632	20.5	96	20.5	96	2	1	2.4	11.0	—	—	0.50	61.9	80	
												12.6	23.6	0.50	74.5	90	
	15	17.0	—	—	0.50	67.9	80										
								12.6	23.6	0.50	80.5	100					
	20	22.0	—	—	0.50	72.9	90										
								12.6	23.6	0.50	85.5	100					
038	208/230	187	254	57.1	266	57.1	266	4	1	5.3	10	30.8/28.0	—	—	0.96	180.5/177.7	225/225
												23.6	41.6	0.96	204.1/201.3	250/250	
		15	46.2/42.0	—	—	0.96	195.9/191.7	250/225									
									23.6	41.6	0.96	219.5/215.3	275/250				
		20	59.4/54.0	—	—	0.96	209.1/203.7	250/250									
									23.6	41.6	0.96	232.7/227.3	275/275				
	460	10	414	508	25.6	120	25.6	120	4	1	2.7	14.0	—	—	0.50	82.4	100
													12.6	23.6	0.50	95.0	110
		15	21.0	—	—	0.50	89.4	110									
									12.6	23.6	0.50	102.0	125				
		20	27.0	—	—	0.50	95.4	110									
									12.6	23.6	0.50	108.0	125				
	575	10	518	632	20.5	96	20.5	96	4	1	2.4	11.0	—	—	0.50	66.7	80
													12.6	23.6	0.50	79.3	90
		15	17.0	—	—	0.50	72.7	90									
									12.6	23.6	0.50	85.3	100				
		20	22.0	—	—	0.50	77.7	90									
									12.6	23.6	0.50	90.3	110				

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

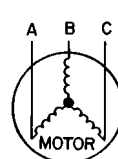
\*Fuse or HACR circuit breaker.



or



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

Maximum deviation is 7 v.

Determine percent voltage imbalance.

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

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

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

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. Canadian units may be fuse or circuit breaker.
2. **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 voltage imbalance.

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

Table 4 — Electrical Data (cont)

UNIT SIZE 48E	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY		
				No. 1		No. 2												
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	FLA	MCA	MOCP*	
044	208/230	187	254	69.2	345	69.2	345	4	1	5.3	15	46.2/ 42.0	—	—	0.96	223.1/218.9	275/275	
											20	59.4/ 54.0	23.6	41.6	0.96	246.7/242.5	300/300	
		25	74.8/ 68.0	23.6	41.6	0.96	259.9/254.5	300/300										
			23.6	41.6	0.96	275.3/268.5	300/300											
		460	414	508	28.8	173	28.8	173	4	1	2.7	15	21.0	—	—	0.50	96.6	125
												20	27.0	12.6	23.6	0.50	109.2	125
	25		34.0	—	—	0.50	109.6	125										
			12.6	23.6	0.50	122.2	150											
	575		518	632	26.7	120	26.7	120	4	1	2.4	15	17.0	—	—	0.50	86.7	110
												20	22.0	12.6	23.6	0.50	99.3	125
		25	27.0	—	—	0.50	91.7	110										
			12.6	23.6	0.50	104.3	125											
048		208/230	187	254	82.1	446	69.2	345	4	1	5.3	20	59.4/ 54.0	—	—	0.96	252.4/247.0	300/300
												25	74.8/ 68.0	23.6	41.6	0.96	276.0/270.6	300/300
	30		88.0/ 80.0	23.6	41.6	0.96	267.8/261.0	300/300										
			23.6	41.6	0.96	291.4/284.6	300/300											
	460		414	508	42.3	223	28.8	173	4	1	2.7	20	27.0	—	—	0.50	119.5	150
												25	34.0	12.6	23.6	0.50	132.1	150
		30	40.0	—	—	0.50	126.5	150										
			12.6	23.6	0.50	139.1	175											
		575	518	632	34.6	164	26.7	120	4	1	2.4	20	22.0	—	—	0.50	101.6	125
												25	27.0	12.6	23.6	0.50	114.2	125
	30		32.0	—	—	0.50	106.6	125										
			12.6	23.6	0.50	119.2	150											
30	32.0		—	—	0.50	111.6	125											
	12.6		23.6	0.50	124.2	150												

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

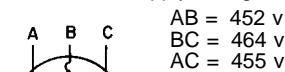
\*Fuse or HACR circuit breaker.



or



EXAMPLE: Supply voltage is 460-3-60.



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

Determine maximum deviation from average voltage.

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

Maximum deviation is 7 v.

Determine percent voltage imbalance.

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

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

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

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. Canadian units may be fuse or circuit breaker.

2. **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 voltage imbalance.

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

**IMPORTANT:** THE VAV (variable air volume) units use variable frequency drives, which generate, use and can radiate radio frequency energy. If units are not installed and used in accordance with these instructions, they may cause radio interference. They have been tested and found to comply with limits of a Class A computing device as defined by FCC (Federal Communications Commission) regulations, Subpart J of Part 15, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

**⚠ WARNING**

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

Affix crankcase heater sticker (located in the installers packet) to unit disconnect switch.

Voltage to compressor terminals during compressor operation must be within the voltage range indicated on the unit nameplate. On 3-phase units, phases must be balanced within 2%. Contact local power company for correction of improper voltage or phase imbalance. Unit failure due to operation of unit on improper line voltage or with excessive phase imbalance constitutes abuse and may cause damage to unit electrical components.

On 208/230-v units, transformer no. 1 is wired for 230-v. If 208/230-v unit is to be run with 208-v power supply, the transformer must be rewired as follows:

1. Remove cap from red (208 v) wire.
2. Remove cap from spliced orange (230 v) wire. Disconnect orange wire from black unit power wire.
3. Cap orange wire.
4. Splice red wire and black unit power wire. Cap wires.

**IMPORTANT:** BE CERTAIN UNUSED WIRES ARE CAPPED. Failure to do so may damage the transformers.

**FIELD CONTROL WIRING** — The unit can use either a Carrier-approved thermostat or a CCN (Carrier Comfort Network) compatible temperature sensor. Thermostats are used on CV (constant volume) units only. Control box diagrams are shown in Fig. 18 and 19.

**Thermostat Wiring (CV Only)** — Install a Carrier-approved accessory thermostat assembly (per current price pages) according to the installation instructions included with the accessory or these instructions. Locate the thermostat on a solid interior wall in the conditioned space to sense the average temperature.

Route the thermostat cable or equivalent single leads of colored wire from the subbase terminals to the low-voltage connection as shown on unit label wiring diagram and in Fig. 20.

**NOTE:** For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 50 to 75 ft, use no. 16 AWG insulated wire (35 C minimum). For over 75 ft, use no. 14 AWG insulated wire (35 C minimum). All wire larger than no. 18 AWG cannot be directly connected at the thermostat and will require a junction box and splice at the thermostat.

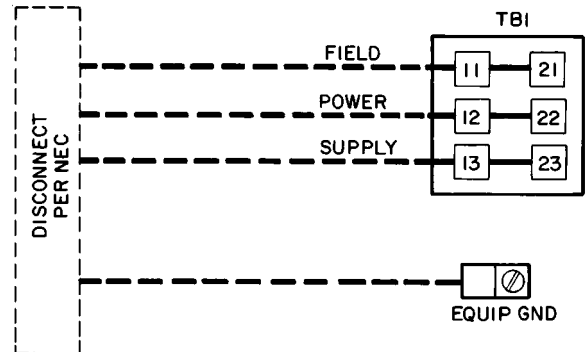
Set heat anticipators to 0.1 for all voltages.

**Sensor Wiring (CV or VAV)** — The temperature sensor is wired into the unit control board. See Fig. 21.

The unit is controlled with a T-55 or T-56 (CV only) zone sensor. Terminal TH (T-56) or T1 (T-55) on the sensor is connected to T1 of the base module board. Terminal COM (T-56) or T2 (T-55) on the sensor is connected to T2 on the base module board. If a T-56 set point override sensor is used, the override connection SW on the sensor is connected to T3 on the base module board.

If more than sensor is being used and averaged, sensors must be wired in multiples of 4 or 9. See Fig. 22.

**Heat Interlock Relay** — VAV units require a field-supplied heat interlock relay (HIR) to drive the air terminal wide open when in heat mode. Heat Interlock relay part number is HN61KK041.

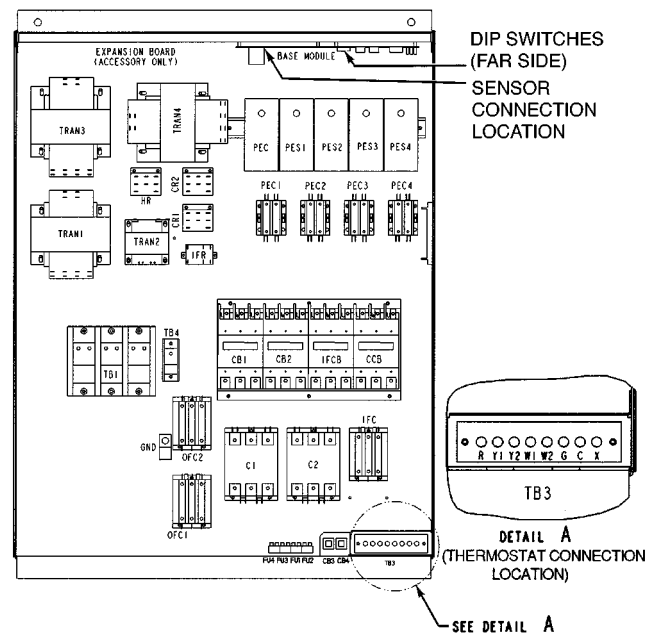


**LEGEND**

- GND** — Ground
- NEC** — National Electrical Code
- TB** — Terminal Block

**NOTE:** Maximum wire size for TB1 is 500 MCM.

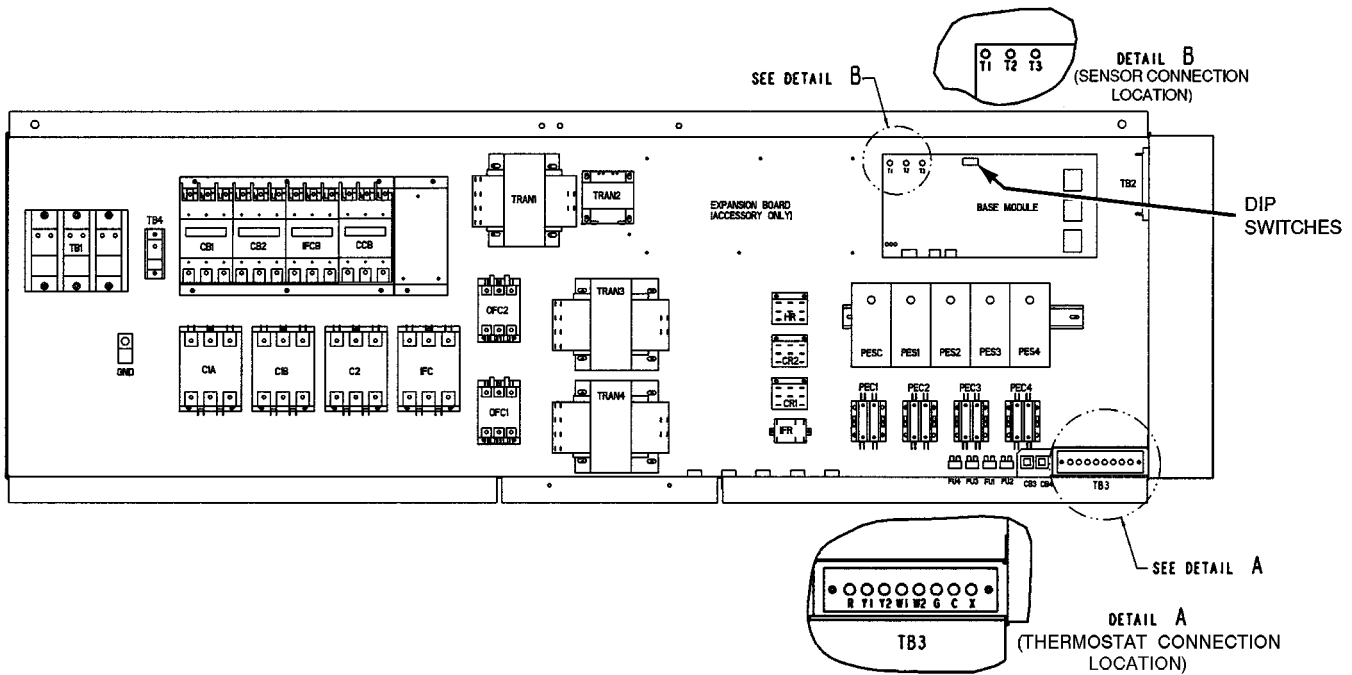
**Fig. 17 — Field Power Wiring Connections**



**LEGEND**

- C** — Compressor/Contactor
- CB** — Circuit Breaker
- DIP** — Dual In-Line Package
- FU** — Fuse
- HR** — Heater Relay
- IF** — Indoor Fan
- OF** — Outdoor Fan
- PEC** — Power Exhaust Controller
- TB** — Terminal Block
- TRAN** — Transformer

**Fig. 18 — Control Box Diagram (Sizes 024-034)**



- LEGEND**
- |                                   |                                       |
|-----------------------------------|---------------------------------------|
| <b>C</b> — Contactor/Compressor   | <b>IF</b> — Indoor Fan                |
| <b>CB</b> — Circuit Breaker       | <b>OF</b> — Outdoor Fan               |
| <b>DIP</b> — Dual In-Line Package | <b>PEC</b> — Power Exhaust Controller |
| <b>FU</b> — Fuse                  | <b>TB</b> — Terminal Block            |
| <b>HR</b> — Heater Relay          | <b>TRAN</b> — Transformer             |

Fig. 19 — Control Box Diagram (Sizes 038-048)

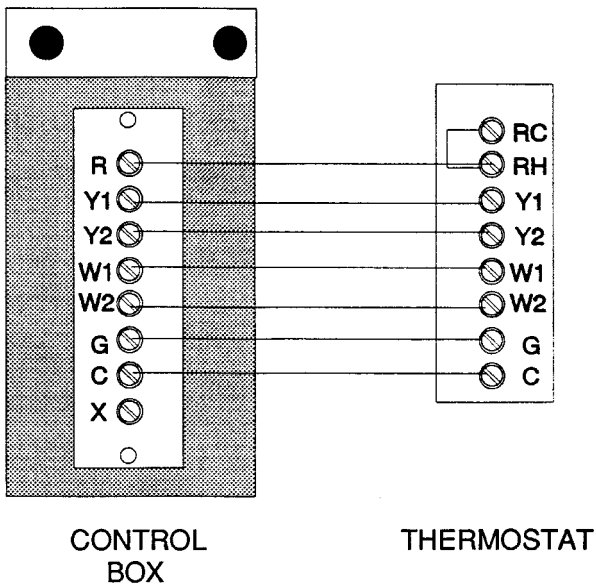
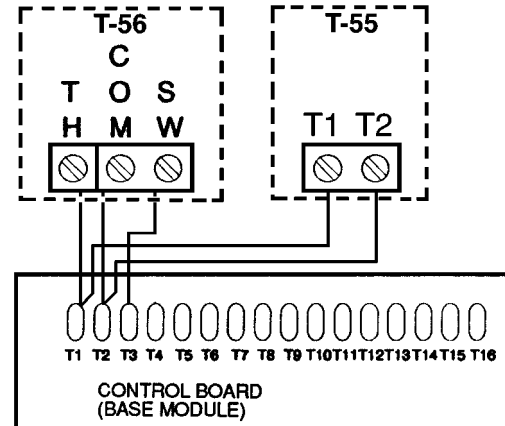


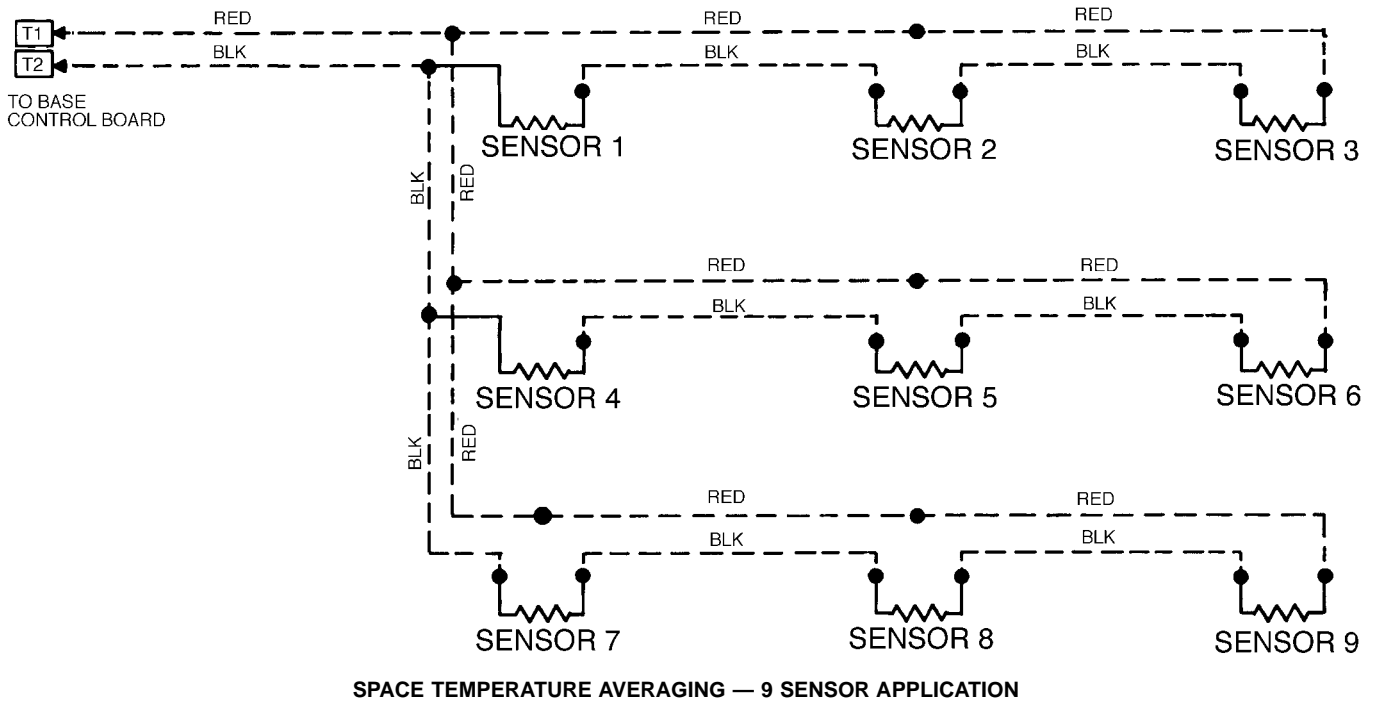
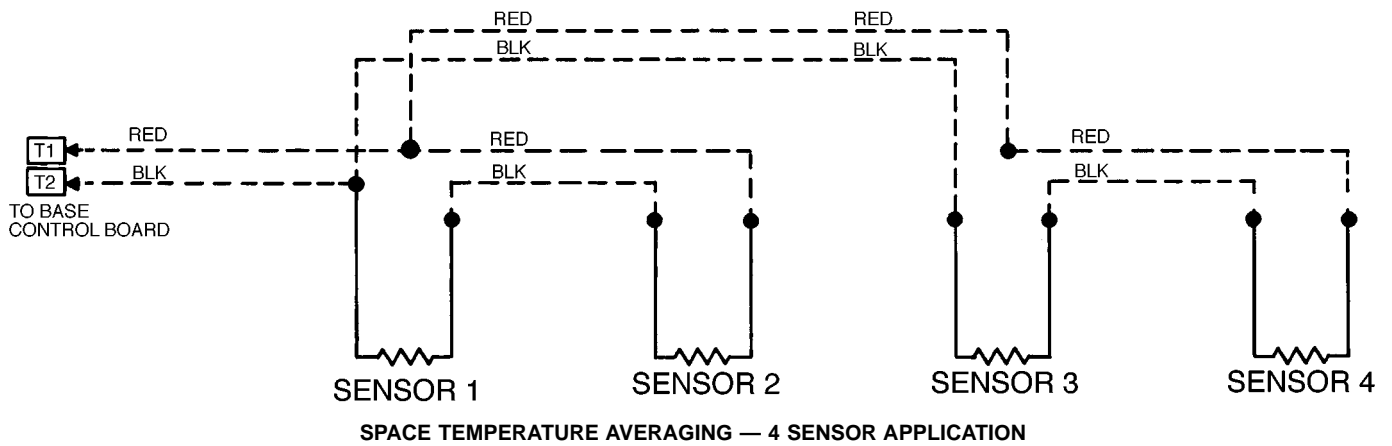
Fig. 20 — Field Control Thermostat Wiring



NOTE: Sensor part numbers are as follows:

- T-55 — CEC0121448-01
- T-56 — CEC0121503-01

Fig. 21 — Field Control Temperature Sensor Wiring (CV or VAV Units)



**Fig. 22 — Space Temperature Averaging Wiring**

**Remote Field Control** — A switch closure across terminals R and W1 on TB-3 will initiate the Occupied mode. This can be done manually as well as through a field-supplied timeclock.

**Service Tool, Building Supervisor, and ComfortWorks™ Software** — Access to the control board can be achieved through the terminal marked CCN via a 3-wire bus.

**IMPORTANT:** The default bus address is 0. The default element number is 1. Refer to CCN literature to change the default values, if needed.

**Carrier Comfort Network Interface** — The 48E units can be connected to the CCN. The communication bus wiring is supplied and installed in the field. Wiring consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it, the negative pins must be wired to the negative pins, and the

signal pins must be wired to signal ground pins. Wiring connections for CCN should be made at the 3-pin plug (CCN located at the base board). Consult CCN literature for further information.

Conductors and drain wire must be 20 AWG minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of -20 C to 60 C (-4 F to 140 F) is required. Table 5 lists cables that meet the requirements.

**Table 5 — CCN Connection Approved Shielded Cables**

MANUFACTURER	CABLE PART NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

**IMPORTANT:** When connecting the CCN communication bus to a system element, use a color coding system for the entire network to simplify installation and checkout. See Table 6.

**Table 6 — Color Code Recommendations**

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	CCN PLUG PIN NO.
Positive (+)	RED	1
Ground	WHITE	2
Negative (-)	BLACK	3

NOTE: If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of the communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground **at one point only**. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only).

To connect the unit to the network:

- Turn off power to the control box.
- Cut the CCN wire and strip the ends of the red (+), white (ground), and black (-) conductors. (If a different network color scheme is used, substitute appropriate colors.)
- Remove the 3-pin male plug from the base module in the main control box, and connect the wires as follows:
  - Insert and secure the red (+) wire to terminal 1 of the 3-pin plug.
  - Insert and secure the white (ground) wire to terminal 2 of the 3-pin plug.
  - Insert and secure the black (-) wire to terminal 3 of the 3-pin plug.
- Insert the plug into the existing 3-pin mating connector on the base module in the main control box.

## Step 9 — Make Outdoor-Air Inlet Adjustments

### ECONOMIZER

NOTE: If accessory power exhaust or barometric relief packages are being added to the unit, install power exhaust or barometric relief before installing economizer hoods.

**Economizer Hood Assembly** — The economizer hood is shipped in a package secured to the outside of the unit and must be field-assembled. There are 2 hoods on every unit. The 48EW/EY units are side supply and side return. The return duct limits access to economizer filters from below. Filter tracks (mounting angle without tabs) must be installed correctly to allow access to economizer filters from each side. Perform the following procedure to assemble the economizer hood:

NOTE: Before assembly of the economizer hood, check along the outer edges of the economizer assembly for any seal strip protruding past the flanges. Trim the excess seal strip so that it is flush with the economizer assembly flanges.

- Apply black seal strip (provided in package) to outside top-edge of hood sides. Wrap seal strip over edge to cover top flange (4 hood sides). Make sure seal strip covers screw holes. Allow strip to overhang 1/8-in. past the end opposite the mounting flange. See Fig. 23.

- Assemble hood sides, top, and cross member with gasketed screws provided. See Fig. 24.
- Attach 10 green speed clips (provided) to hood top.
- Apply black seal strip (provided) to mounting flanges of hood sides being sure to cover mounting holes. See Fig. 25.

NOTE: Each hood assembly has a slotted side that should be adjacent to the other hood when mounted to the unit.

- Apply black seal strip (provided) to hood top mounting flange. Seal strip of hood top mounting flange must press tightly against seal strip of hood side mounting flanges. See Fig. 26.
- Add gray foam strip (provided in package) to cross members on bottom tray. See Fig. 27.
- Place gray foam strip (provided) on inside of slotted hood side between filter and cross member opposite the mounting end. See Fig. 28.
- Attach gray foam strip (provided) to block-off baffle on outer face of flange. See Fig. 29.
- Remove the screws on each end and along top of damper assembly of unit. Remove top 2 screws on each side of filter panel under damper assembly. Set hood assembly in place and attach to unit using these screws.
- Attach accessory enthalpy bracket on hood side furthest from control box end. Locate bracket on inside upper right-hand corner of economizer hood using hood mounting holes. Mount outdoor-air thermistor to enthalpy bracket (if purchased). Attach and wire enthalpy assembly. Place quick connects on enthalpy wires.
- Remove screws along bottom of damper assembly. Locate and mount blockoff baffle using these screws.
- Assemble 2 filter tracks side-by-side with the assembled ends together.
- Attach mounting angle (without tabs) to the assembled end of the filter track. See Fig. 30.
- Attach 6 green speed clips (provided) to mounting angles. Engagement section of clip faces inside of rack.
- Attach remaining mounting angle (with tabs) to other end of the filter track with no. 10 screws provided. See Fig. 31.
- Place filter track assembly in bottom of hood by placing tabbed end into slotted side (with tab on bottom) and attaching opposite end to hood with speed clips and gasketed screws provided. Tabs can be hand bent after they have been inserted into the side.

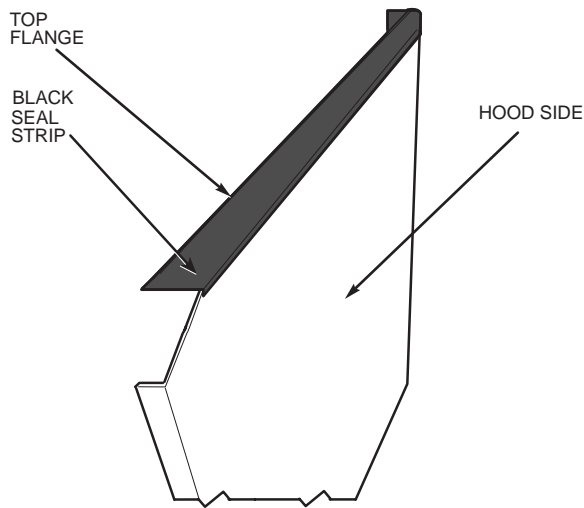
NOTE: The filter track assembly end with screws should face away from the other hood when mounted on the unit.

NOTE: Tabs from both filter tracks will be in the same space. After one filter track has been inserted into hood side, bend the tabs so they will not interfere with installation of the second hood.

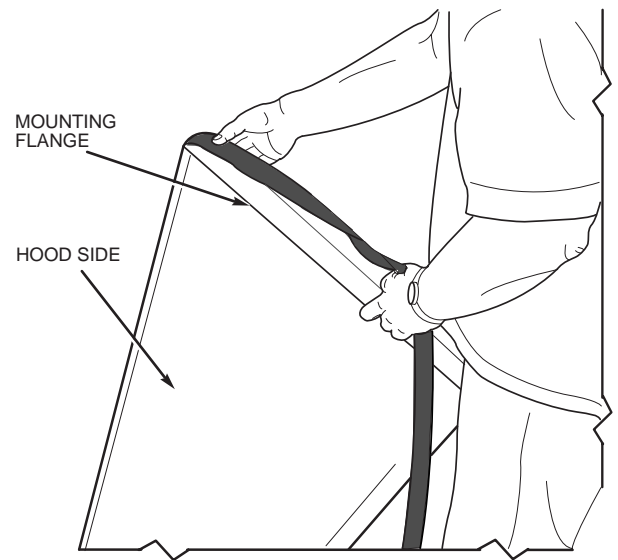
- Attach black seal strip (provided) to filter cover. Seal strip should be applied to the center of the large flange making sure to cover holes. See Fig. 32.
- Slide two 20 x 25-in. filters into cross members of hood assembly. Attach filter cover over filters with screws and speed clips provided.

**Minimum Damper Position Setting** — Setting of the outdoor air damper position is performed in conjunction with a shortened version of the field run test. This is performed by first opening DIP (Dual In-line Package) switch no. 4 then no. 6. See Fig. 18 and 19 and Direct Digital Controls DIP Switch Configuration section on page 33.

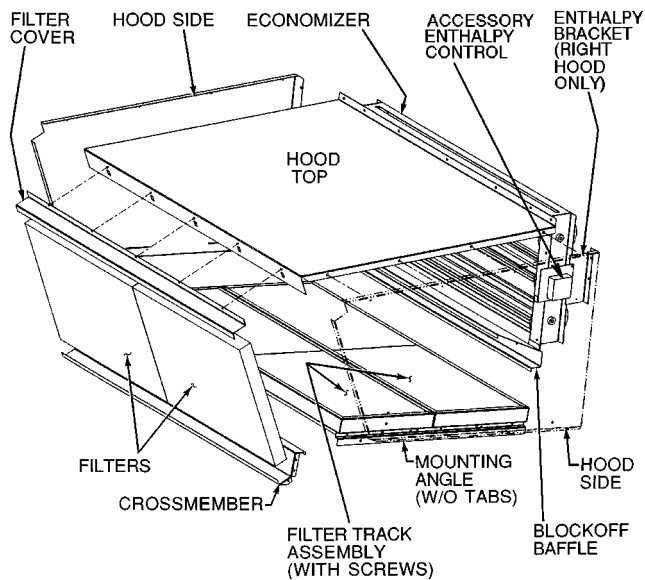




**Fig. 23 — Adding Seal Strip to Top of Hood Sides**

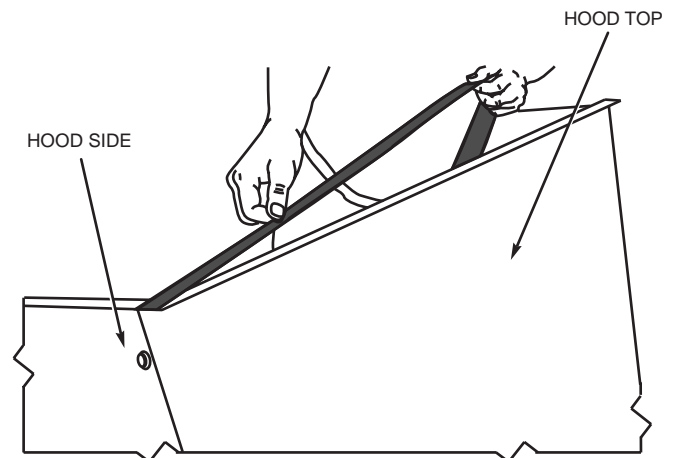


**Fig. 25 — Adding Seal Strip to Mounting Flange of Hood Sides**

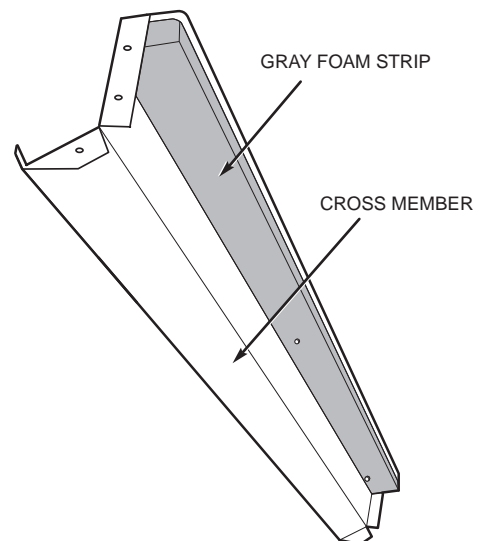


NOTE: Left side economizer hood has mounting angle without tabs and filter track assembled end on the opposite side.

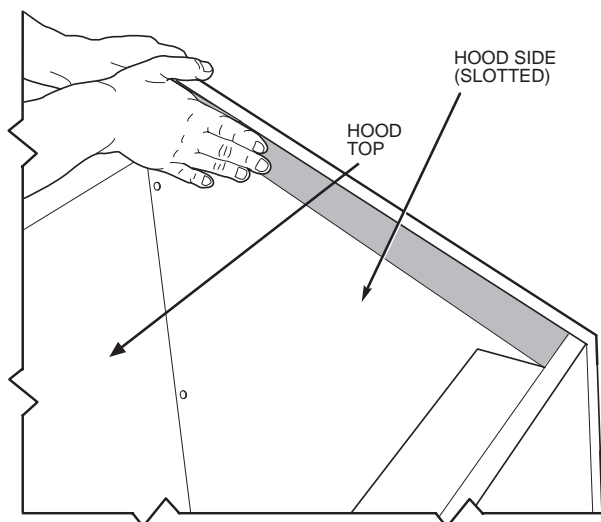
**Fig. 24 — Economizer Hood Assembly (Right Side Economizer Hood Shown)**



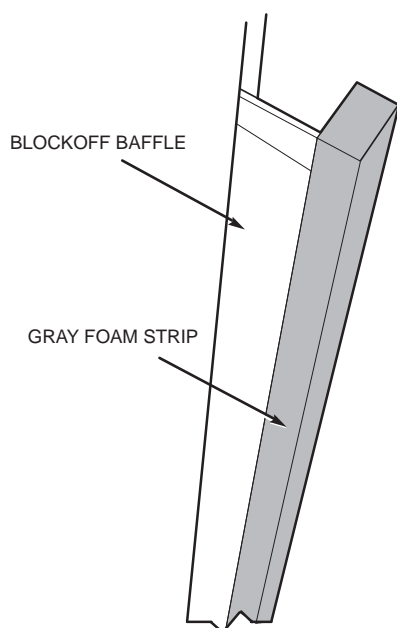
**Fig. 26 — Adding Seal Strip to Hood Top Mounting Flange**



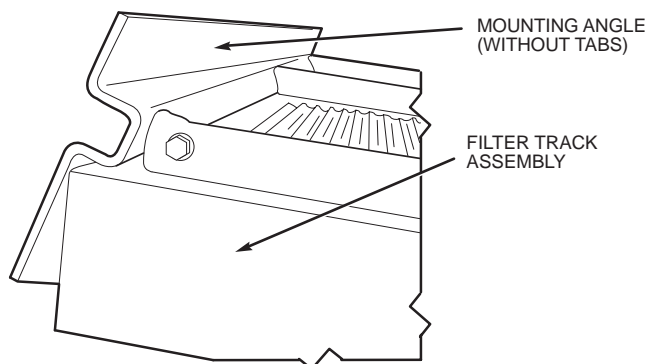
**Fig. 27 — Adding Foam Strip to Cross Member**



**Fig. 28 — Adding Foam Strip to Hood Side**



**Fig. 29 — Adding Foam Strip to Blockoff Baffle**



**Fig. 30 — Mounting Angle (Without Tabs) Attached to Filter Track Assembly**

The outdoor-air damper closes. The control allows 90 seconds for the damper to close in case it is in the full open position. Next, the indoor-fan contactor will energize. The outdoor-air damper will remain at 0% for 30 seconds. It will then move to the 10% position for another 30 seconds. This will be repeated at every 10% increment for 30 seconds until the damper reaches 100% open. Close DIP switch no. 4 during the 30 seconds immediately after the desired outdoor air minimum damper position. The 30-second time period is to allow time where DIP switch no. 4 can be closed. The default value of the minimum outdoor air damper position is 20%. If the desired minimum position is 30%, allows the damper position to go to 10% for 30 seconds, then 20% for 30 seconds, and when it reaches 30% close DIP switch no. 4 during the 30-second period following the 30% position.

The minimum outdoor air damper position is now set. Close DIP switch no. 6.

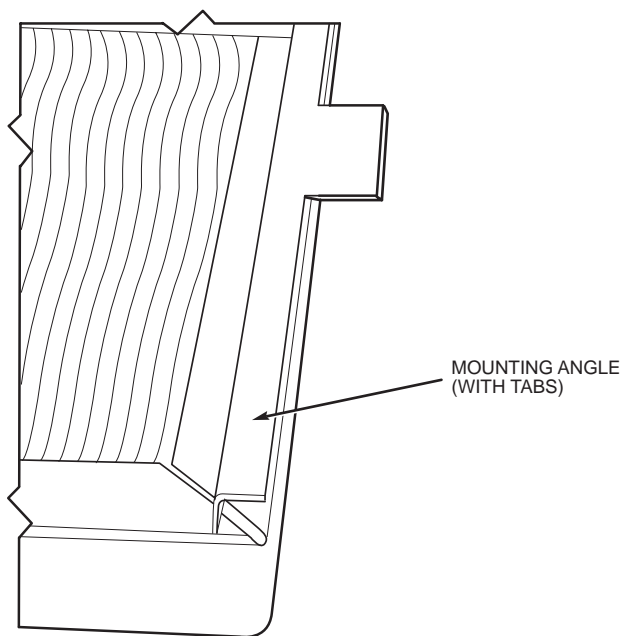
### ECONOMIZER SETTINGS

**Accessory Enthalpy Control (Fig. 33)** — The control (HH57AC077) is mounted in the economizer hood. See Fig. 24. The enthalpy setting adjustment is on the enthalpy control. For maximum benefit of outdoor air, set enthalpy control to A. See Fig. 34 and 35.

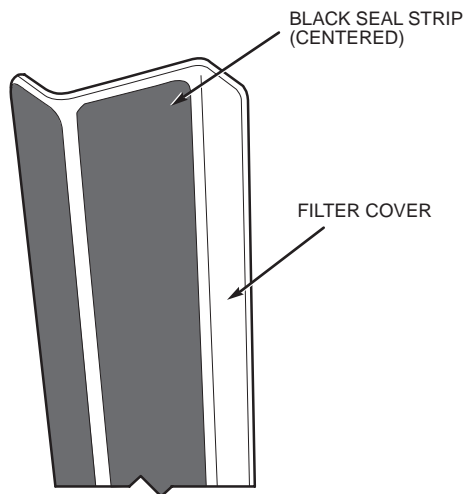
**Enthalpy Control Installation** — The outdoor air enthalpy control is installed on the inside panel of the outdoor air hood. The enthalpy control should be mounted when the outdoor air hoods are assembled. To install the control, perform the following procedure:

1. Turn off all power. Ensure disconnect is locked out.
2. Remove the economizer inlet filters from the bottom of the right hand economizer hood. See Fig. 24. See Fig. 36 for economizer details.
3. Mount the outdoor air enthalpy sensor inside the right economizer hood on the right side panel of the hood, adjacent to the outdoor-air thermistor.
4. Locate the red, violet, and brown wires near the outdoor air thermistor. Remove the splice from the red and violet wires. Remove the cap from the brown wire.
5. Install a 1/4-in. push on terminal (field-supplied) on the violet and brown wires.
6. Connect a 1/4-in. push on terminal (field provided) to one end of a 18-gage, 6-in. jumper wire (field-provided). Connect the other end to the red wire and attach a 1/4-in. push on connector (field provided).
7. Connect the red wire with the jumper to terminal TR1. Connect the jumper to terminal 2. Connect the brown wire to terminal TR. Connect the violet wire to terminal 3. All connections are on the enthalpy control.
8. Replace the economizer filters.
9. Return power to unit.

**Accessory Differential Enthalpy Control (Fig. 33)** — The control (HH57AC077), in conjunction with the accessory enthalpy sensor (HH57AC078), controls economizer operation according to the differential enthalpy. The control is mounted in the economizer hood. The sensor is mounted in the return duct (48EJ/EK) or return air plenum (48EW/EY).



**Fig. 31 — Mounting Angle (With Tabs) Attached to Filter Track Assembly**



**Fig. 32 — Attaching Seal Strip to Filter Cover**

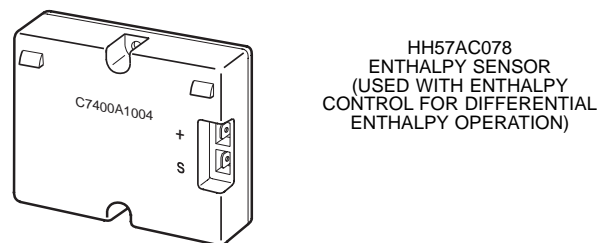
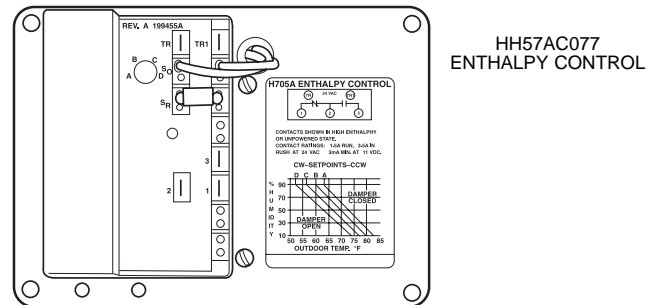
**Differential Enthalpy Sensor Installation** — To install the control, perform the following procedure:

1. Turn off all power. Ensure disconnect is locked out.
2. Remove the economizer inlet filters from the bottom of the right hand economizer hood. See Fig. 24.
3. Remove the factory-installed, 620-ohm jumper between terminals SR and + on the enthalpy control located inside the outdoor air hood.
4. Connect the violet wire from the enthalpy sensor kit to the + terminal on the enthalpy control. Connect the blue wire from the enthalpy sensor kit to the SR terminal on the enthalpy control.

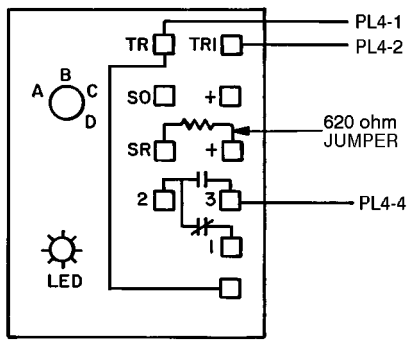
5. Turn the enthalpy control set point potentiometer clockwise past the “D” setting on the enthalpy control to configure the control to operate on differential enthalpy. See Fig. 34.
6. Remove the return-air enthalpy sensor from the accessory package. Using the screws provided, mount the sensor inside the return duct near the unit. Do not locate the control too far from the unit, or the wires will not reach from the sensor to the control. On 48EW/EY units, the enthalpy sensor can be installed in the return air section of the unit, under the return air dampers.
7. Route the wires from the enthalpy sensor to the return air enthalpy control through the holes on the inside of the hinged filter access panel. The holes are blocked by plug buttons which should be removed.
8. Use field-supplied wire ties to attach the violet wire to the + terminal and the blue wire to the SR terminal.
9. Replace economizer filters.
10. Return power to unit.

**Disable Economizer** — For applications where the economizer will not be used (areas of high humidity), the economizer should be disabled. To disable the economizer, perform the following:

1. Turn off power. Lock out disconnect.
2. Locate the OAT (Outdoor Air Thermostat) in the right hand outdoor air damper area.
3. Locate the splice connecting the violet wire coming from T24 on the base module board to the red wire coming from T29 on the base module board. Remove the wire nut and break the red to violet wire splice.
4. Cap off both wires. When the connection is broken the base module is fooled into thinking that the enthalpy is not acceptable and economizer operation is disabled.

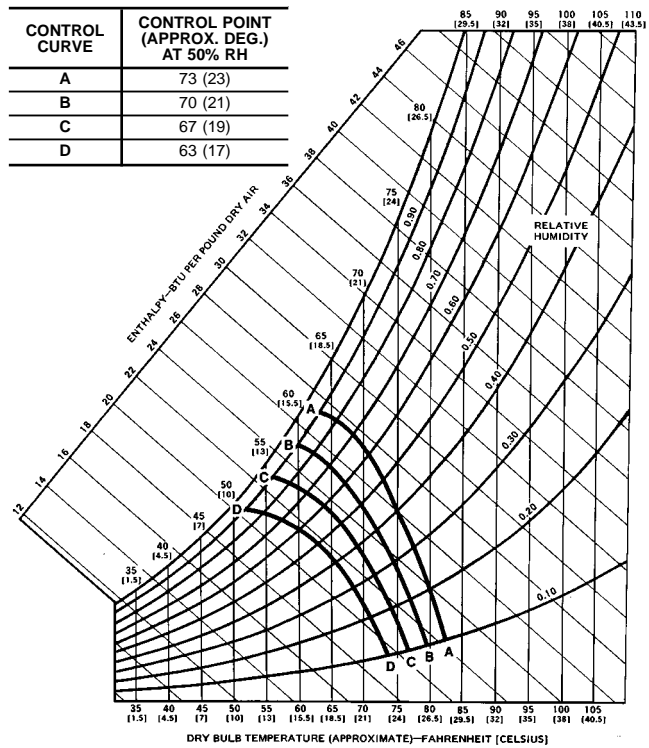


**Fig. 33 — Differential Enthalpy Control and Sensor**



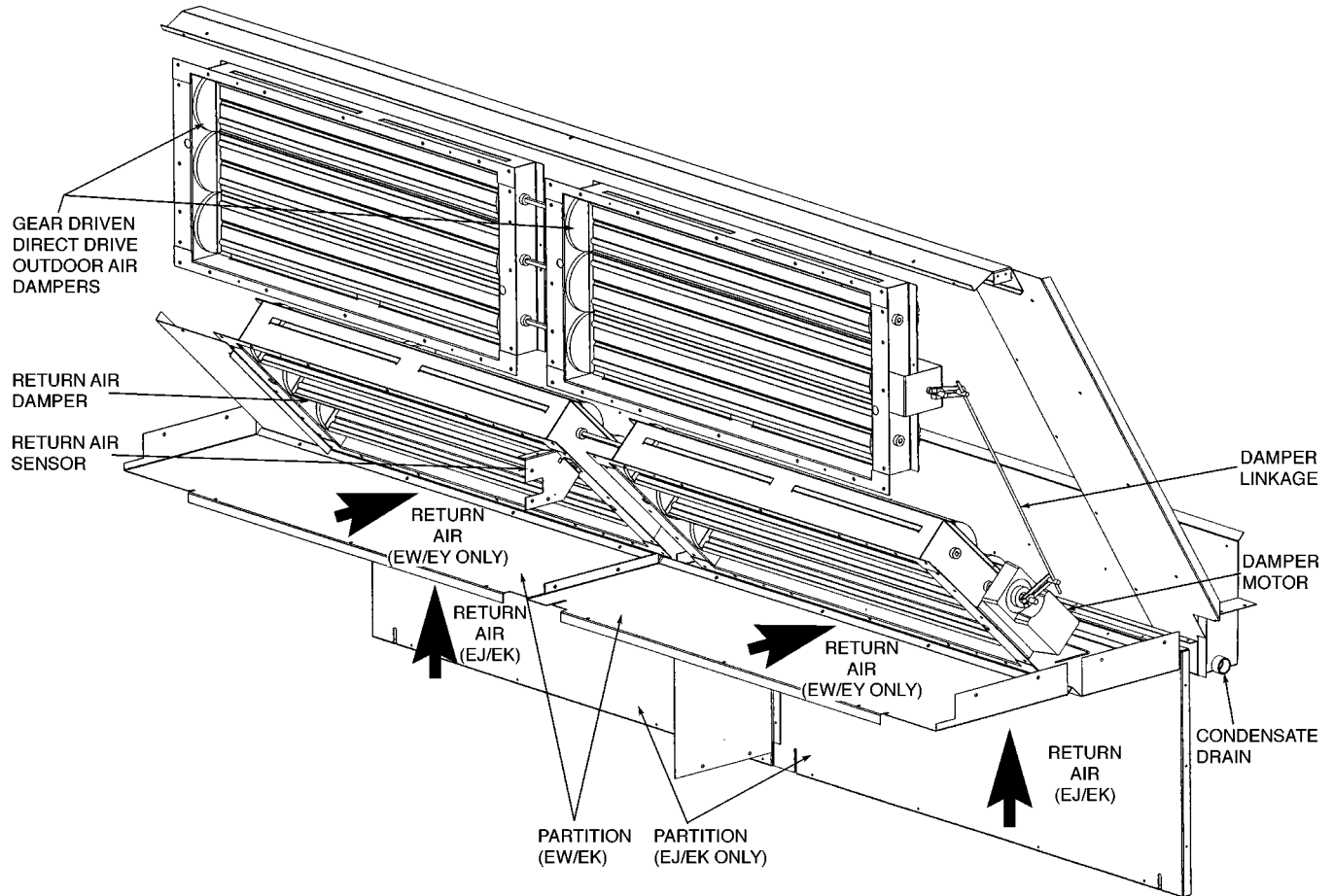
NOTE: Switches shown in high enthalpy state. Terminals 2 and 3 close on enthalpy decrease.

**Fig. 34 — Wiring Connections for Solid-State Enthalpy Control (HH57AC077)**



RH — Relative Humidity

**Fig. 35 — Psychrometric Chart for Enthalpy Control**



NOTE: Partitions shown indicate both side supply (EW/EY) and vertical supply (EJ/EK) units.

**Fig. 36 — Economizer Details**

### Step 10 — Position Power Exhaust/Barometric Relief Damper Hood

All electrical connections have been made and adjusted at the factory. The power exhaust blowers and barometric relief dampers are shipped assembled and tilted back into the unit for shipping. Brackets and extra screws are shipped in shrink wrap around the dampers. If ordered, each unit will have 4 power exhaust blowers and motors or 4 barometric relief dampers.

1. Remove 9 screws holding each damper assembly in place. See Fig. 37. Each damper assembly is secured with 3 screws on each side and 3 screws along the bottom. Save screws.

#### ⚠ CAUTION

Be careful when tilting blower assembly. Hoods and blowers are heavy and can cause injury if dropped.

2. Pivot each damper assembly outward until edges of damper assembly rest against inside wall of unit.
3. Secure each damper assembly to unit with 6 screws across top (3 screws provided) and bottom (3 screws from Step 1) of damper.
4. With screws saved from Step 1, install brackets on each side of damper assembly.
5. Remove tape from damper blades.

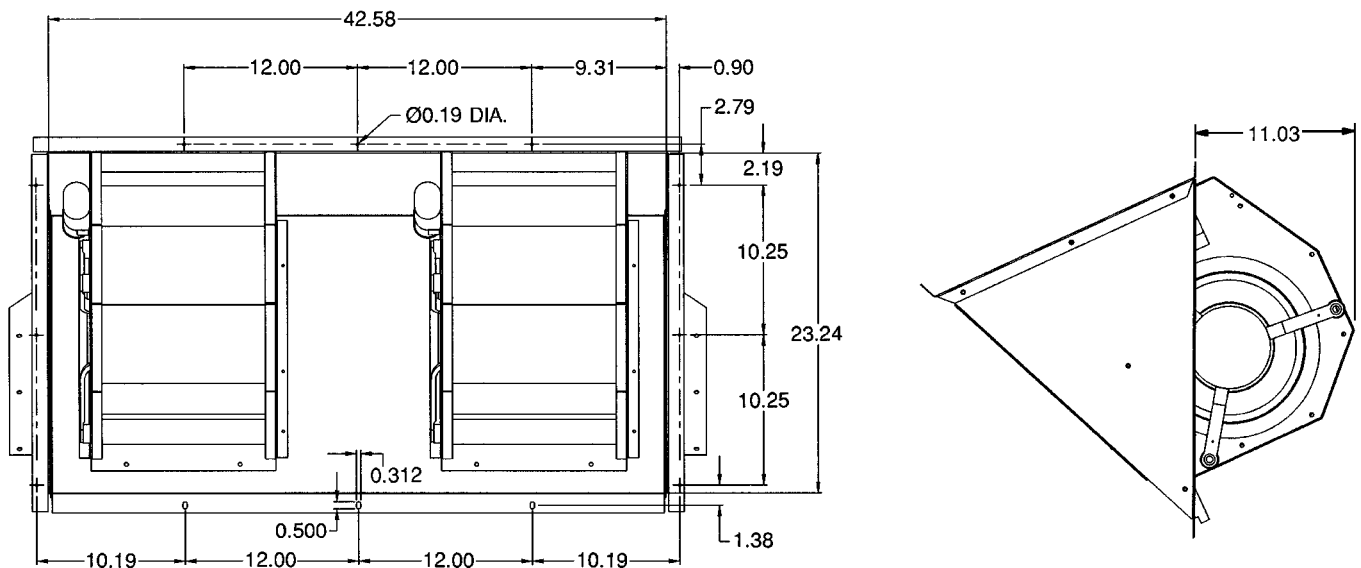
**VAV DUCT PRESSURE TRANSDUCER** — The VAV duct pressure transducer (VAV inverter pressure transducer) is located behind the filter access door on the lower inner panel.

See Fig. 38. A section of field-supplied ¼-in. plastic tubing must be run from the high pressure tap on the differential pressure switch and connected to a field-supplied tap in the supply-air duct. The tap is usually located ⅔ of the way out on the main supply duct. Remove plug button in panel to route tubing.

The low pressure tap is factory-routed to the atmosphere. For a positive-pressure building, route the high tap to building air and low tap to atmosphere. For a negative-pressure building, route the high tap to atmosphere and the low tap to building air.

**VAV BUILDING PRESSURE TRANSDUCER** — The VAV building pressure transducer (modulating power exhaust pressure transducer) is located behind the filter access door on the lower inner panel. See Fig. 38. A section of field-supplied ¼-in. plastic tubing must be run from the high pressure tap on the differential pressure switch to the conditioned space. The pressure tube must be terminated in the conditioned space where a constant pressure is required. This location is usually in an entrance lobby so that the building exterior doors will open and close properly. Remove plug button in panel to route tubing.

The low pressure tap is factory-routed to the atmosphere. For a positive-pressure building, route the high tap to building air and low tap to atmosphere. For a negative-pressure building, route the high tap to atmosphere and the low tap to building air.



#### NOTES:

1. Unless otherwise specified, all dimensions are to outside of part.
2. Dimensions are in inches.
3. On 48EW,EY units, accessory barometric relief or power exhaust must be mounted in the field-supplied return ductwork.

**Fig. 37 — Barometric Relief Damper and Power Exhaust Mounting Details**

**Step 11 — Install All Accessories** — After all the factory-installed options have been adjusted, install all field-installed accessories. Refer to the accessory installation instructions included with each accessory.

**MOTORMASTER® III INSTALLATION**

**Install Field-Fabricated Wind Baffles** — Wind baffles must be field-fabricated for all units to ensure proper cooling cycle operation at low-ambient temperatures. See Fig. 39 for baffle details. Use 20-gage, galvanized sheet metal, or similar corrosion-resistant metal for baffles. Use field-supplied screws to attach baffles to unit. Screws should be 1/4-in. diameter and 5/8-in. long. Holes for wind baffles are pre-punched in the unit sheet metal.

**⚠ CAUTION**

To avoid damage to the refrigerant coils and electrical components, use recommended screw sizes only.

On 48EJ,EK,EW,EY024-034 units, the wind baffles attach to flanges formed on the outer sheet metal of the unit where the condenser coil tube sheets attach.

On 48EJ,EK,EW,EY038-048 units, the wind baffles attach to flanges formed on the outer sheet metal of the unit corner post. The other end of the baffle is attached to the center panel between the condenser coil and the indoor section. Two baffles are required for 48EJ,EK,EW,EY038-048 units.

**Install Motormaster III Controls** — Only one Motormaster III control is required per unit.

**Motor** — The circuit no. 1 (lead compressor) outdoor-fan motor (OFM) will need to be changed out in the field to accommodate the Motormaster III accessory. The replacement motor part no. is HD52AK652.

On 48EJ,EK,EW,EY038-048 units, only one OFM will need to be changed out. The no. 1 compressor is located at the left side of the unit looking from the compressor end. The circuit no. 2 OFMs are controlled to shut off at 55 F and turn on at 65 F outdoor-air temperature.

**Sensor** — Install the sensor for thermistor input control in the location shown in Fig. 40A-C. Connect sensor leads to the violet and gray control signal leads on the Motormaster III control.

**Signal Selection Switch** — Remove the cover of the Motormaster III control. Set the switch to accept the thermistor sensor input signal. Set the frequency to match the unit power supply (60 Hz).

**Motormaster III Control** — The recommended mounting location is in the indoor fan section, mounted on the panel that separates the indoor and outdoor sections. On VAV units, this location is next to the VFD.

Do not route the Motormaster III wiring next to the VFD on VAV units. Use a separate connector through the partition when wiring to the OFM.

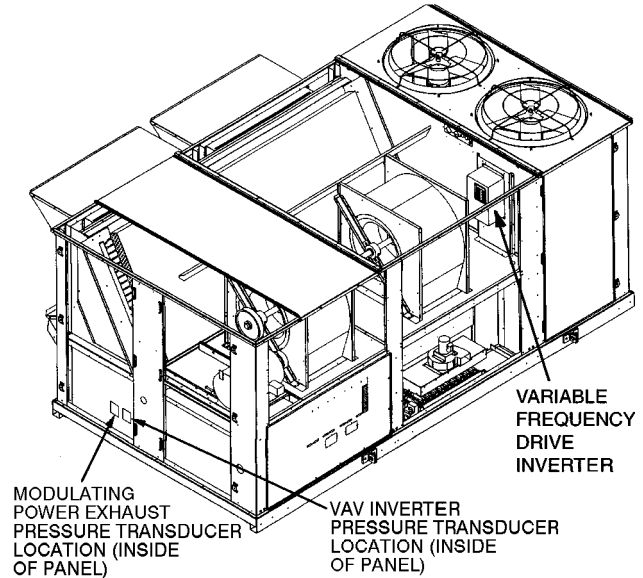
**Electrical Connections**

**⚠ WARNING**

To avoid possibility of electrical shock and personal injury, turn off all power to unit before making electrical connections.

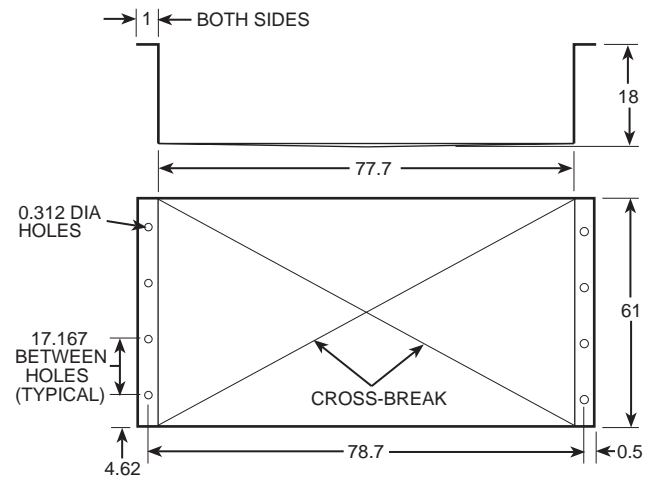
When replacing the OFM, reconnect the black, yellow, and blue wires from the outdoor fan contactor to the black, yellow, and blue wires of the Motormaster III control. Run new wires from the red, orange, and brown wires to the leads of the new OFM. Connect the green wire from the control to ground.

**NOTE:** On all 575-v units, 2 transformers (part no. HT01AH851) must be used for each Motormaster III control to lower the supply voltage to the control to 460-v. Transformers can be mounted anywhere outside the control box.



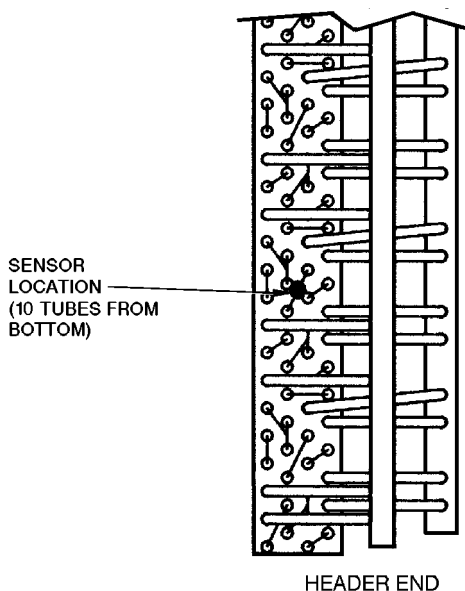
VAV — Variable Air Volume

**Fig. 38 — Pressure Transducer Locations**

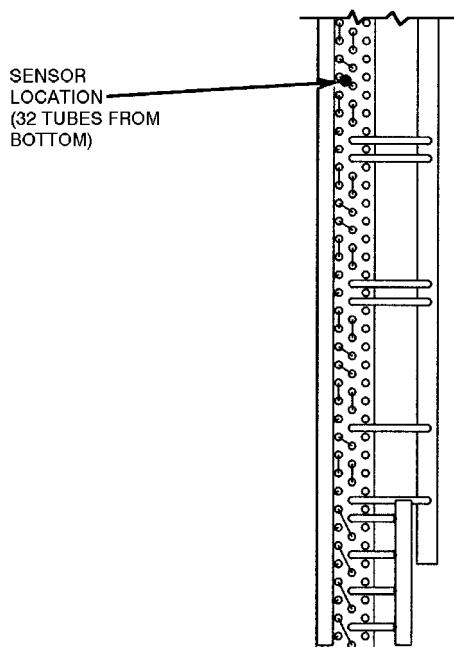


**NOTE:** All dimensions are in inches. Material: 20 gage galvanized steel or other non-corrosive material.

**Fig. 39 — Motormaster III Baffle Details**



**Fig. 40A — Motormaster III Sensor Location (Sizes 024-034)**



**Fig. 40B — Motormaster® III Sensor Location (Sizes 038 and 044)**

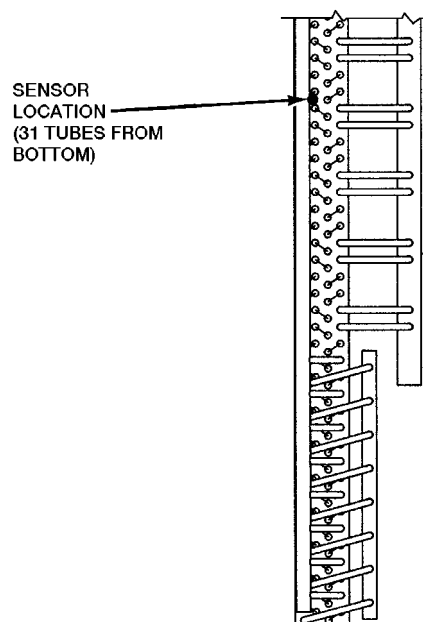
### START-UP

Use the following information and Start-Up Checklist on page CL-1 to check out unit PRIOR to start-up.

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

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

**Service Valves** — Ensure that the suction, discharge, and liquid line service valves are open. Damage to the compressor could result if they are left closed.



**Fig. 40C — Motormaster III Sensor Location (Size 048)**

LEFT HAND CONDENSER COIL VIEWED FROM ACCESS PANEL

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

**Refrigerant Service Ports** — Each refrigerant system has one suction port located in the top of the compressor motor casing. All units also have one service port on the liquid line valve and one on the compressor discharge valve. Be sure that caps on the ports are tight.

**Crankcase Heaters** — Crankcase heaters are energized as long as there is power to the unit, except when the compressors are operating.

**IMPORTANT:** Unit power must be on for 24 hours prior to start-up. Otherwise, damage to compressor may result.

**Variable Frequency Drive (VFD)** — The variable frequency drives are factory set. These settings include factory-installed jumpers and software configurations. The only field configured set point is duct static pressure. An Operation Manual is shipped with each VAV unit. This manual should be used if the drive needs to be customized for a particular application.

**NOTE:** The VFD will always provide the proper phase sequence to the indoor-fan motor. The indoor-fan motor operates in proper rotation regardless of the phase sequence to the unit. If, upon start-up, the outdoor fans operate backwards but the indoor fan operates in the correct direction, reverse any two leads to the main terminal block. All fans will then operate in the correct direction.

To set the duct static pressure, perform the following steps. The factory setting is zero. The duct transducer has a range from 0 to 5 in. wg. The transducer output is 4 to 20 mA, therefore, 0 to 5 in. wg is proportional to the 4 to 20 mA and must be expressed to the VFD in terms of percentage of the frequency range. Refer to Table 7. The set point value is a percentage of the maximum output frequency. Locate the duct static pressure closest to that desired and use the corresponding set point value. If necessary, interpolation between duct static pressures is permissible.

To set the VFD, the VFD must be powered up; however, since it is located near the indoor air fan, operation of the fan is not desirable. To disable the fan, perform the following procedure:

1. Open the indoor fan circuit breaker.
2. Remove the jumper between CC and ST on the terminal strip of the VFD (see Fig. 41).
3. Close the indoor fan circuit breaker. The VFD now is powered but the fan will not operate.
4. On the front of the VFD is a keypad and display which will be used to enter the set point. To access this field, press the "PRG" key until the display reads "S.PrG" (Speed Group Parameters). Press the arrow key until "Sr1" is displayed. This is the VFD set point listed in Table 7.
5. Press the "READ/WRITE" key. The set point value will be displayed. Use the up-arrow or down-arrow key to adjust the set point value to the value desired.
6. Press the "READ/WRITE" key again to enter the new value.
7. Check the factory default values.

**IMPORTANT:** The Carrier factory default values for the VFD may be different than the default values of the manufacturer. Refer to the Carrier literature when checking default values. The following default values have been changed from the manufacturer settings to more closely match the VFD operation to a Carrier VAV unit.

SETUP PARAMETERS (Item 6, Point 1, Output Frequency) — The default value should be 20.

JUMP FREQUENCY GROUP (Item 7, PID Set Point Control Select) — The default value is 1.

JUMP FREQUENCY GROUP (Item 8, Proportional Gain) — The default value is 100.

JUMP FREQUENCY GROUP (Item 9, Integral Gain) — The default value is 50.

SPEED GROUP PARAMETERS (Item 2, Multi-Speed Run Frequency No. 1) — The factory setting is 30.

SPEED GROUP PARAMETERS (Item 2, Fire Speed Override Frequency) — The factory setting is 60.

8. Open the indoor fan circuit breaker.
9. Replace the jumper between CC and ST on the terminal strip of the VFD.
10. Close the indoor fan circuit breaker; the VFD now is powered and the fan will operate.

NOTE: Any field measurement of supply fan amps must be taken with an RMS meter between the fan circuit breaker and fan contactor (upstream of VFD).

**Power Exhaust** — The optional non-modulating power exhaust (CV only) is a two-stage design where the operation of the exhaust fans is linked to economizer position. When the supply fan is running and the economizer is 25% open,

the base module closes contacts, activating two exhaust fans. When the economizer position reaches 75% open, the base module activates the other two exhaust fans. The fans will turn off when the economizer closes below the same points. The economizer position set points that trigger the exhaust fans can be modified, but only through use of the Service Tool, Comfort Works, or Building Supervisor software. If single-stage operation is desired, adjust the economizer set points to identical values at the desired point to activate all exhaust fans.

The optional modulating power exhaust (VAV standard, CV optional) is controlled by a modular electronic sequencer system. This system consists of a model R353 signal input module and 4 model S353 staging modules. The signal input module receives a 0 to 10 vdc signal from the building pressure transducer, which is mounted adjacent to the supply static transducer behind the filter access panel. The modules are mounted just below the unit control board. The left module is the R353, and the 4 modules on the right are S353 modules for stages 1 through 4. On the unit wiring label, the R353 is designated PES3, and the S353 modules are designated PES1 through PES4.

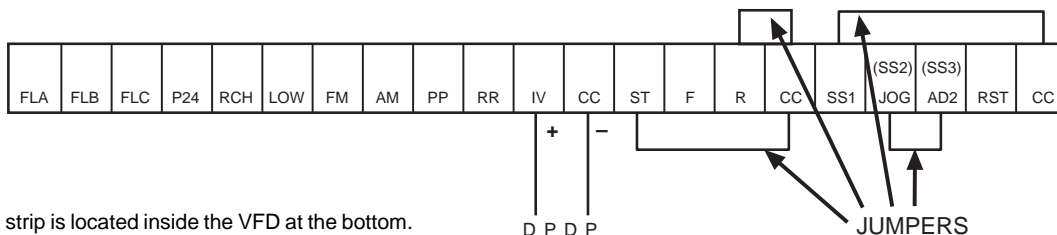
The building pressure transducer range is -0.5 to +0.5 in. wg. It is powered by a 0 to 10 vdc signal. A factory-installed hose at the "Lo" connection leads to atmosphere, and a field-supplied hose must be connected to the "Hi" connection and led into the building to a point where building pressure is to be controlled (positive-pressure building). There is a plug button in the bulkhead just above the transducers, for use in leading the hoses into the building via the return air ductwork.

There are 3 adjustments at the R353 module, all of which have been factory set. In the center of the circuit board is a set of 4 pins with a jumper, labeled J2. This determines the mode of operation. The bottom two pins must be jumpered for direct operation. Direct operation means that the staging modules are activated in sequence as the input signal increases.

**Table 7 — VFD Supply Air Pressure Set Point**

PRESSURE (in. wg)	CONTROL (mA)	VFD SET POINT
0	4.0	0
0.25	4.8	3
0.50	5.6	6
0.75	6.4	9
1.00	7.2	12
1.25	8.0	15
1.50	8.8	18
1.75	9.6	21
2.00	10.4	24
2.25	11.2	27
2.50	12.0	30
2.75	12.8	33
3.00	13.6	36
3.25	14.4	39
3.50	15.2	42

VFD — Variable Frequency Drive



NOTE: Terminal strip is located inside the VFD at the bottom.

**Fig. 41 — VFD Factory-Installed Jumpers**



At the upper right corner of the board is a set of 5 pins and jumper, which determines the time constant for the control. The time constant is the delay in response built into the controls. The jumper should be on the middle or bottom two pins, for the maximum time constant. The delay can be decreased, if desired, by moving the jumper progressively upward, always jumpering adjacent pins.

At the lower left corner of the board below the terminal strip is a resistor marked R27. This must be removed in order to obtain the 0 to 10 vdc signal output. There will not be a resistor on a factory-supplied module, but a resistor may be present on a replacement module and must be removed.

The R353 module has a terminal block with 7 connections available for wiring. The 2 right-hand terminals are for the 24 vac and common connections. The next 2 terminals are for the 0 to 10 vdc signal. Consult the wiring label for wire identification if replacing the module. The 3 left-hand terminals are not used for this application.

The S353 module has an LED (light-emitting diode), a set of 4 jumper pins, and 2 potentiometers. The LED will light whenever the module is activated, providing a visual indication of the number of exhaust fans running. The jumper pins are arranged in a square format. Two jumpers are used to determine the mode of operation (direct or reverse). The 2 jumpers must be arranged horizontally for direct action (factory set).

At the top of the module are two potentiometers. The left potentiometer adjusts the **offset**. The right potentiometer adjusts the **differential**. The potentiometers are factory set for a nominal 0 in. wg building pressure.

The **offset** set point is defined as the point at which a module turns off a fan, and is measured in terms of percent of the input signal. For control purposes, 0 offset is at an arbitrary "floor" which is established at 10% of the input signal, or 1 vdc. In this example, the first stage will turn off at 30% (3 vdc), and the offset potentiometer will be set at 20%. The second stage will turn off at 50% signal (5 vdc), and the offset potentiometer will be set at 40%. The fourth stage is at the maximum 75% offset, which equates to 85% signal or 8.5 vdc. The offset potentiometer is calibrated in 10% increments.

Table 8 relates building pressure to signal level.

**Table 8 — Potentiometer Signal Levels**

BUILDING PRESSURE (in. wg)	SIGNAL LEVEL (vdc)
-0.50	2
-0.25	4
0.00	6
0.25	8
0.50	10

If the building pressure is controlled at 0 in. wg, offset of the first stage should be set at 50%, which equates to 60% of the input signal, or 6 vdc. The other stages can then be set as desired between 50% and 75%.

The default offset set points for modulating power exhaust are shown in Table 9.

The **differential** set point is the difference between the turn off point and the turn on point for each module. It also is calibrated in terms of percent of input signal, and has a range of 1% to 7%. The differential potentiometer is cali-

brated in 1% increments, and is factory set at approximately 3%. It is recommended to leave the set point at 3%, to minimize cycling of the fans.

The offset and differential potentiometers have been factory set for atmospheric pressure. Do not change these settings until there is some experience with the building. In most cases the factory settings will be satisfactory. However, if the building pressure is not being maintained as desired, then some minor adjusting on a trial and error basis can be made.

### Direct Digital Controls DIP Switch Configuration

The Direct Digital Control (DDC) board must be configured for each application. The DDC board is configured through the DIP switches located on the board. There are 8 DIP switches which configure 8 different applications of the DDC. See Table 10. DIP switch 1 is on the left of the block. DIP switch 8 is on the right of the block. To open a DIP switch, push the switch up with suitable tool (small-blade screwdriver). To close a DIP switch, push the switch down. Factory settings are shown in Table 11.

The DIP switch configurations are as follows:

- DIP switch 1 configures the unit to operate as a VAV or CV unit
- DIP switch 2 configures the unit to use a space sensor (VAV units) or a thermostat (CV units)
- DIP switch 3 configures the DDC for use with an electronic expansion board
- DIP switch 4 is used to field test the unit
- DIP switch 5 is used to enable occupied heating (VAV units) or specify the type of power exhaust (CV units)
- DIP switch 6 configures the Time Guard® override and, when used with the field test function, sets the minimum damper position
- DIP switch 7 configures the unit for gas heat or electric heat
- DIP switch 8 configures the unit for heat pump or air conditioner operation.

**Crankcase Heater** — Units are equipped with crankcase heaters. Crankcase heaters are energized as long as there is power supplied to unit. Crankcase heaters deenergize while compressors are running.

**IMPORTANT:** To prevent damage to compressors, crankcase heater should be energized 24-hours prior to start-up.

**Evaporator Fan** — Fan belt and fixed pulleys are factory-installed. See Tables 12-16 for fan performance and motor limitations data. Remove tape from fan pulley, and be sure that fans rotate in the proper direction. See Table 17 for air quantity limits. Static pressure drop for power exhaust is negligible. To alter fan performance, see Evaporator Fan Performance Adjustment section on page 46.

**Condenser Fans and Motors** — Condenser fans and motors are factory set. Refer to Condenser-Fan Adjustment section on page 47 as required. Be sure that fans rotate in the proper direction. Fan no. 2 (sizes 024-034) and fans no. 3 and 4 (sizes 038-048) are cycled on the outdoor-air temperature.

**Table 9 — Power Exhaust Default Set Points**

STAGE	OFFSET	DIFFERENTIAL	OFF VOLTAGE	ON VOLTAGE	OFF STATIC PRESSURE (in. wg)
1	50%	3%	6.0	6.3	0.00
2	55%	3%	6.5	6.8	0.06
3	60%	3%	7.0	7.3	0.12
4	64%	3%	7.4	7.7	0.18

**Table 10 — DIP Switch Configuration**

SETTING	1	2	3	4	5	6	7	8
OPEN	VAV	VAV — Space Sensor Installed	Expansion Board	Field Test ON	VAV — Occupied Heat Enabled	Time Guard® Override ON	Gas Heat	Heat Pump Operation
		CV — CCN or Sensors Used			CV — Modulated Power Exhaust			
CLOSED	CV	VAV — No Space Sensor	Base Control Board Only	Field Test OFF	VAV — Occupied Heat Disabled	Time Guard Override OFF	Electric Heat	Air Conditioner Operation
		CV — Thermostat			CV — Constant Volume Power Exhaust			

LEGEND

CCN — Carrier Comfort Network  
 CV — Constant Volume  
 VAV — Variable Air Volume

NOTES:

1. The OPEN side of the DIP switch is marked "OPEN." When the rocker switch is on the "OPEN" side of the switch, the switch is OPEN.
2. The configuration of DIP switches 2 and 5 are dependent on DIP switch 1. If DIP switch 1 is set to OPEN (VAV operation), then DIP switches 2 and 5 will configure VAV functions.
3. When the unit is field-tested (DIP switch 4 to OPEN), the function of DIP switch 6 changes and it is used to set the minimum damper position.

**Table 11 — DIP Switch Factory Settings**

UNIT	1	2	3	4	5	6	7	8
48EJ,EW	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed
48EK,EY	Open	Closed	Closed	Closed	Closed	Closed	Open	Closed

**Table 12 — Fan Performance, 48EJ/EK024-034 — Vertical Discharge Units**  
**(For EW/EY units, reduce net available external static pressure by 0.3 in. wg)**

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
4,000	340	0.83	416	1.17	480	1.52	537	1.90	588	2.29	635	2.69	679	3.11	720	3.53
5,000	384	1.25	453	1.61	513	1.99	566	2.39	615	2.79	660	3.21	703	3.64	742	4.08
6,000	432	1.79	495	2.19	550	2.59	600	3.01	647	3.43	690	3.87	730	4.31	769	4.77
7,000	483	2.48	540	2.91	591	3.33	638	3.77	682	4.22	723	4.67	762	5.14	799	5.61
8,000	536	3.33	588	3.78	635	4.23	679	4.69	720	5.16	759	5.64	797	6.12	832	6.61
8,250	549	3.57	600	4.02	646	4.48	690	4.95	730	5.42	769	5.90	806	6.39	841	6.88
9,000	590	4.34	637	4.82	681	5.30	722	5.78	762	6.27	799	6.77	834	7.27	868	7.77
10,000	645	5.54	689	6.04	729	6.54	768	7.04	805	7.56	840	8.07	874	8.59	906	9.12
11,000	701	6.92	741	7.44	779	7.96	816	8.49	850	9.03	884	9.56	916	10.10	947	10.65
12,000	757	8.49	795	9.04	830	9.59	865	10.14	898	10.69	929	11.25	960	11.81	990	12.37
12,500	786	9.36	822	9.92	856	10.47	890	11.03	922	11.60	953	12.16	983	12.73	1012	13.31
13,000	814	10.28	849	10.84	883	11.41	915	11.98	946	12.56	976	13.13	1006	13.71	1034	14.30
13,750	857	11.75	890	12.34	922	12.92	953	13.51	983	14.10	1012	14.69	1041	15.28	1068	15.88
14,000	871	12.27	904	12.86	936	13.45	966	14.05	996	14.64	1025	15.23	1053	15.83	1080	16.43
15,000	929	14.50	960	15.10	990	15.71	1019	16.33	1047	16.94	1074	17.55	1101	18.17	1127	18.79

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
4,000	759	3.97	796	4.42	831	4.87	865	5.34	897	5.81	929	6.30	959	6.79	988	7.28
5,000	780	4.53	816	4.99	851	5.45	884	5.93	916	6.41	946	6.90	976	7.40	1005	7.91
6,000	805	5.23	840	5.70	874	6.18	906	6.67	937	7.16	968	7.66	997	8.17	1025	8.69
7,000	834	6.09	868	6.57	901	7.07	932	7.56	962	8.07	992	8.58	1020	9.10	1048	9.63
8,000	866	7.10	899	7.60	930	8.11	961	8.62	990	9.14	1019	9.67	1047	10.20	1074	10.74
8,250	874	7.38	907	7.89	938	8.40	968	8.92	998	9.44	1026	9.97	1054	10.50	1081	11.04
9,000	901	8.29	932	8.80	963	9.33	992	9.86	1021	10.39	1049	10.93	1076	11.48	1102	12.03
10,000	938	9.65	968	10.18	997	10.72	1026	11.27	1054	11.82	1081	12.37	1107	12.93	1133	13.49
11,000	977	11.19	1006	11.75	1035	12.30	1062	12.87	1089	13.43	1115	14.00	1141	14.57	1166	15.15
12,000	1019	12.94	1047	13.51	1074	14.08	1100	14.66	1126	15.24	1152	15.83	1177	16.42	1201	17.01
12,500	1040	13.88	1067	14.46	1094	15.05	1120	15.63	1146	16.22	1171	16.82	1195	17.41	—	—
13,000	1062	14.88	1089	15.47	1115	16.06	1140	16.66	1166	17.25	1190	17.86	—	—	—	—
13,750	1095	16.48	1121	17.08	1147	17.68	1172	18.29	1196	18.90	—	—	—	—	—	—
14,000	1106	17.04	1132	17.64	1157	18.25	1182	18.86	—	—	—	—	—	—	—	—
15,000	1152	19.41	1177	20.04	1200	20.66	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
4,000	1017	7.79	1045	8.30	1072	8.82
5,000	1033	8.42	1061	8.94	1087	9.46
6,000	1053	9.21	1080	9.73	1106	10.27
7,000	1075	10.16	1102	10.69	1127	11.24
8,000	1100	11.28	1126	11.83	1151	12.38
8,250	1107	11.59	1133	12.14	1158	12.69
9,000	1128	12.58	1153	13.14	1178	13.70
10,000	1158	14.06	1183	14.63	—	—
11,000	1190	15.74	—	—	—	—
12,000	—	—	—	—	—	—
12,500	—	—	—	—	—	—
13,000	—	—	—	—	—	—
13,750	—	—	—	—	—	—
14,000	—	—	—	—	—	—
15,000	—	—	—	—	—	—

LEGEND

**Bhp** — Brake Horsepower

NOTES:

- Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.
- Conversion — Bhp to watts:  

$$\text{Watts} = \frac{\text{Bhp} \times 746}{\text{Motor efficiency}}$$
- Variable Air Volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb (entering dry bulb) and ewb (entering wet bulb) conditions.

**Table 13 — Fan Performance, 48EJ,EK038,044 — Vertical Discharge Units**  
**(For EW/EY units, reduce net available external static pressure by 0.5 in. wg)**

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	429	1.70	484	2.40	536	2.70	584	3.10	630	3.50	674	3.90	716	4.30	756	4.80
8,000	475	2.36	525	3.09	571	3.49	616	3.90	658	4.31	699	4.74	738	5.17	776	5.61
9,000	523	3.11	567	3.97	610	4.39	651	4.82	690	5.26	728	5.71	765	6.16	801	6.62
10,000	571	4.00	612	5.01	651	5.46	689	5.91	725	6.37	761	6.84	795	7.31	829	7.79
11,000	620	5.04	658	6.22	694	6.69	729	7.17	763	7.65	796	8.14	829	8.64	860	9.14
12,000	670	6.24	705	7.61	738	8.10	771	8.60	803	9.11	834	9.62	865	10.13	894	10.65
13,000	720	7.61	752	9.19	784	9.70	814	10.23	844	10.75	874	11.29	902	11.82	931	12.36
14,000	771	9.15	801	10.97	830	11.51	859	12.05	887	12.60	915	13.15	942	13.71	969	14.27
15,000	822	10.88	850	12.95	877	13.52	904	14.08	931	14.65	957	15.22	983	15.80	1008	16.38
16,000	873	12.80	899	15.16	925	15.74	951	16.33	976	16.92	1001	17.51	1025	18.11	1049	18.71
17,000	924	14.91	949	17.59	974	18.20	998	18.80	1022	19.41	1045	20.03	1069	20.64	1092	21.26
18,000	976	17.24	999	20.26	1023	20.88	1046	21.51	1068	22.14	1091	22.77	1113	23.41	1135	24.05
19,000	1027	19.77	1050	23.17	1072	23.82	1094	24.46	1115	25.11	1137	25.76	1158	26.42	1179	27.07
20,000	1079	22.53	1100	26.33	1122	27.00	1142	27.66	1163	28.33	1183	29.00	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	794	5.20	832	5.62	868	6.06	903	6.52	937	6.98	971	7.44	1003	7.92	1035	8.40
8,000	813	6.06	848	6.52	883	6.98	916	7.45	949	7.92	981	8.40	1012	8.89	1042	9.38
9,000	835	7.09	869	7.56	902	8.04	934	8.53	965	9.02	995	9.52	1025	10.02	1054	10.53
10,000	862	8.28	893	8.77	925	9.27	955	9.77	985	10.28	1014	10.79	1043	11.31	1071	11.84
11,000	891	9.64	921	10.15	951	10.67	980	11.19	1008	11.71	1036	12.24	1064	12.78	1090	13.32
12,000	924	11.18	952	11.71	980	12.24	1008	12.78	1035	13.32	1062	13.87	1088	14.42	1114	14.98
13,000	958	12.91	986	13.45	1012	14.01	1039	14.56	1064	15.13	1090	15.69	1115	16.26	1140	16.83
14,000	995	14.83	1021	15.40	1046	15.97	1071	16.55	1096	17.13	1120	17.71	1144	18.29	1168	18.89
15,000	1033	16.96	1058	17.55	1082	18.14	1106	18.73	1130	19.33	1153	19.93	1176	20.54	1199	21.14
16,000	1073	19.31	1097	19.92	1120	20.52	1143	21.14	1165	21.75	1188	22.37	—	—	—	—
17,000	1114	21.88	1137	22.51	1159	23.13	1181	23.76	—	—	—	—	—	—	—	—
18,000	1156	24.69	1178	25.33	1199	25.98	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	1066	8.88	1096	9.38	1125	9.88
8,000	1072	9.88	1101	10.39	1130	10.90
9,000	1083	11.04	1111	11.56	1139	12.08
10,000	1098	12.37	1125	12.90	1152	13.44
11,000	1117	13.86	1143	14.41	1169	14.96
12,000	1139	15.54	1164	16.11	1189	16.68
13,000	1164	17.41	1188	17.99	—	—
14,000	1191	19.48	—	—	—	—
15,000	—	—	—	—	—	—
16,000	—	—	—	—	—	—
17,000	—	—	—	—	—	—
18,000	—	—	—	—	—	—
19,000	—	—	—	—	—	—
20,000	—	—	—	—	—	—

**LEGEND**

**Bhp** — Brake Horsepower

**NOTES:**

- Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.
- Conversion — Bhp to watts:  

$$\text{Watts} = \frac{\text{Bhp} \times 746}{\text{Motor efficiency}}$$
- Variable Air Volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb (entering dry bulb) and ewb (entering wet bulb) conditions.

**Table 14 — Fan Performance, 48EJ,EK048 — Vertical Discharge Units**  
**(For EW/EY units, reduce net available external static pressure by 0.5 in. wg)**

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	528	3.20	572	4.00	615	4.40	656	4.90	695	5.30	733	5.80	769	6.20	805	6.70
10,000	577	4.10	617	5.10	657	5.50	694	6.00	731	6.40	766	6.90	801	7.40	834	7.90
11,000	627	5.10	664	6.30	700	6.80	735	7.30	769	7.70	802	8.20	835	8.70	866	9.20
12,000	677	6.30	711	7.70	745	8.20	778	8.70	809	9.20	841	9.70	871	10.20	901	10.80
13,000	728	7.71	760	9.31	791	9.83	822	10.35	851	10.88	881	11.42	909	11.95	938	12.50
14,000	779	9.28	809	11.11	838	11.65	867	12.20	895	12.75	923	13.31	950	13.87	976	14.43
15,000	830	11.03	858	13.13	886	13.69	913	14.26	939	14.83	966	15.41	991	15.99	1017	16.57
16,000	882	12.97	908	15.36	934	15.95	960	16.54	985	17.13	1010	17.73	1034	18.33	1058	18.93
17,000	934	15.12	959	17.83	983	18.44	1008	19.05	1031	19.66	1055	20.28	1078	20.89	1101	21.52
18,000	986	17.47	1010	20.53	1033	21.16	1056	21.79	1078	22.42	1101	23.06	1123	23.70	1145	24.34
19,000	1038	20.05	1061	23.49	1083	24.13	1105	24.78	1126	25.44	1147	26.09	1169	26.75	1190	27.41
20,000	1091	22.84	1112	26.69	1133	27.36	1154	28.03	1174	28.70	1195	29.37	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	839	7.10	873	7.62	905	8.10	937	8.59	968	9.08	999	9.57	1028	10.08	1057	10.58
10,000	866	8.40	898	8.85	929	9.34	959	9.85	989	10.36	1018	10.87	1047	11.39	1075	11.91
11,000	897	9.70	927	10.24	956	10.76	985	11.28	1013	11.81	1041	12.34	1068	12.87	1095	13.41
12,000	930	11.30	958	11.82	986	12.36	1014	12.90	1041	13.44	1067	13.99	1093	14.54	1119	15.10
13,000	965	13.04	992	13.59	1019	14.15	1045	14.71	1071	15.27	1096	15.84	1121	16.41	1146	16.98
14,000	1002	14.99	1028	15.56	1054	16.14	1079	16.71	1103	17.30	1127	17.88	1151	18.47	1175	19.06
15,000	1041	17.15	1066	17.74	1090	18.34	1114	18.93	1138	19.53	1161	20.13	1184	20.74	—	—
16,000	1082	19.52	1105	20.14	1128	20.75	1151	21.37	1174	21.99	1196	22.61	—	—	—	—
17,000	1124	22.14	1146	22.77	1168	23.40	1190	24.03	—	—	—	—	—	—	—	—
18,000	1166	24.98	1188	25.63	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	1086	11.10	1114	11.61	1141	12.14
10,000	1102	12.44	1129	12.97	1155	13.51
11,000	1122	13.96	1147	14.51	1173	15.06
12,000	1144	15.66	1169	16.23	1194	16.80
13,000	1170	17.56	1194	18.14	—	—
14,000	1198	19.66	—	—	—	—
15,000	—	—	—	—	—	—
16,000	—	—	—	—	—	—
17,000	—	—	—	—	—	—
18,000	—	—	—	—	—	—
19,000	—	—	—	—	—	—
20,000	—	—	—	—	—	—

**LEGEND**

**Bhp** — Brake Horsepower

**NOTES:**

- Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.
- Conversion — Bhp to watts:  

$$\text{Watts} = \frac{\text{Bhp} \times 746}{\text{Motor efficiency}}$$
- Variable Air Volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

**Table 15 — Fan Performance — Power Exhaust**

48EJ,EK,EW,EY024-048 (20 THRU 45 TONS)																		
Airflow (Cfm)	Low Speed						Medium Speed						High Speed					
	208 v			230, 460, 575 v			208 v			230, 460, 575 v			208 v			230, 460, 575 v		
	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts
6,500	0.32	2.82	3160	0.70	2.98	3340	—	—	—	—	—	—	—	—	—	—	—	—
6,700	0.23	2.87	3220	0.63	3.03	3400	0.60	3.01	3380	0.82	3.23	3620	—	—	—	—	—	—
6,900	0.17	2.92	3270	0.59	3.09	3460	0.55	3.07	3440	0.78	3.28	3680	—	—	—	—	—	—
7,100	0.13	2.93	3290	0.56	3.11	3490	0.49	3.12	3500	0.73	3.34	3740	—	—	—	—	—	—
7,300	0.09	2.97	3330	0.53	3.15	3530	0.43	3.18	3560	0.68	3.39	3800	—	—	—	—	—	—
7,500	—	—	—	0.51	3.19	3580	0.39	3.24	3630	0.64	3.44	3860	—	—	—	—	—	—
7,700	—	—	—	0.48	3.23	3620	0.33	3.27	3670	0.59	3.48	3900	0.60	3.69	4140	0.73	3.98	4460
7,900	—	—	—	0.45	3.27	3670	0.27	3.32	3720	0.54	3.52	3950	0.56	3.74	4190	0.69	4.02	4510
8,100	—	—	—	0.40	3.33	3730	0.22	3.36	3770	0.49	3.57	4000	0.51	3.78	4240	0.65	4.07	4560
8,500	—	—	—	—	—	—	0.17	3.47	3890	0.40	3.67	4120	0.41	3.83	4290	0.56	4.12	4620
8,900	—	—	—	—	—	—	0.00	3.58	4010	0.30	3.77	4230	0.31	3.93	4410	0.47	4.23	4740
9,300	—	—	—	—	—	—	—	—	—	0.22	3.87	4340	0.20	4.07	4560	0.37	4.37	4900
9,700	—	—	—	—	—	—	—	—	—	0.16	3.95	4430	0.11	4.17	4670	0.30	4.47	5010
10,100	—	—	—	—	—	—	—	—	—	0.12	4.03	4520	0.04	4.25	4770	0.23	4.56	5110
10,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.17	4.66	5220
10,900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.12	4.75	5330
11,300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.07	4.80	5380
11,700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04	4.83	5420

**LEGEND**

- Bhp** — Brake Horsepower
- ESP** — External Static Pressure (in. wg)
- Watts** — Input Watts to Motor

**Table 16 — Motor Limitations**

STANDARD EFFICIENCY MOTORS						
Nominal Hp	Maximum Bhp	Maximum Amps			Maximum Watts	Motor Efficiency
		230	460	575		
5	5.9	14.6	—	—	5,030	87.5
	5.9	—	7.9	6.0	5,030	87.5
7.5	8.7	22.0	—	—	7,334	88.5
	9.5	—	12.0	10.0	8,008	88.5
10	10.2	28.0	—	—	8,502	89.5
	11.8	—	14.6	12.0	9,836	89.5
15	15.3	43.8	—	—	12,543	91.0
	18.0	—	21.9	19.0	14,756	91.0
20	22.4	62.0	—	—	18,363	91.0
	23.4	—	28.7	23.0	19,183	91.0
25	28.9	72.0	—	—	23,511	91.7
	29.4	—	37.4	31.0	23,918	91.7
30	35.6	95.0	—	—	28,742	92.4
	34.7	—	48.0	47.0	28,015	92.4

HIGH EFFICIENCY MOTORS						
Nominal Hp	Maximum Bhp	Maximum Amps		Maximum Watts	Motor Efficiency	
		230	460			
5	5.9	15.8	—	4,918	89.5	
	5.9	—	7.9	4,918	89.5	
7.5	8.7	22.0	—	7,078	91.7	
	9.5	—	12.0	7,728	91.7	
10	10.2	28.0	—	8,298	91.7	
	11.8	—	15.0	9,600	91.7	
15	15.3	43.8	—	12,273	93.0	
	18.0	—	21.9	14,439	93.0	
20	22.4	58.2	—	17,853	93.6	
	23.4	—	28.7	18,650	93.6	
25	28.9	73.0	—	23,034	93.6	
	29.4	—	36.3	23,432	93.6	
30	35.6	82.6	—	28,374	93.6	
	34.7	—	41.7	27,656	93.6	

**BHP** — Brake Horsepower

NOTE: Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the horsepower ratings shown on the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

Table 17 — Air Quantity Limits

UNIT 48EJ,EK,EW,EY	MINIMUM HEATING AIRFLOW (Low Heat)	MINIMUM HEATING AIRFLOW (High Heat)	MINIMUM COOLING AIRFLOW (VAV) AT FULL LOAD OPERATION	MINIMUM COOLING AIRFLOW (CV)	MAXIMUM AIRFLOW
024	5730	5950	2000	6,000	10,000
028	5730	5950	2500	7,500	12,500
030	5730	5950	2750	8,250	13,750
034	5730	5950	3000	9,000	15,000
038	7360	9820	3500	10,500	17,500
044	7360	9820	4000	12,000	20,000
048	7360	9820	4500	13,500	22,500

LEGEND

CV — Constant Volume  
VAV — Variable Air Volume

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

**Filter Replacement** — To replace filters, open filter access door (marked with label). Remove inner access panel. Remove plastic filter retainer in between filter tracks by sliding and pulling outward. Remove first filter by sliding it out of the opening in filter track. Locate filter removal tool, which is shipped next to the return air dampers. Use the filter removal tool to remove the rest of the filters.

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

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

Economizer operation and adjustment are described in Sequence of Operation section on this page; and Minimum Damper Position Setting section on page 24.

**Gas Heat** — Verify gas pressures before turning on heat as follows:

1. Turn off field-supplied manual gas stop, located external to unit.
2. Connect pressure gage to supply gas tap, located on field-supplied manual shutoff valve (see Fig. 13 on page 13).
3. Connect pressure gage to manifold pressure tap on unit gas valve.
4. Supply gas pressure must not exceed 13.5 in. wg. Check pressure at field-supplied shut-off valve.
5. Turn on manual gas stop and initiate a heating demand. Jumper R to W1 in the control box to initiate heat. On VAV units, the RAT (Return-Air Temperature) must be less than or equal to 68 F for heating to be energized. Use the field test procedure to verify heat operation. After the unit has run for several minutes, verify that incoming pressure is 5.0 in. wg or greater, and that the manifold pressure is 3.5 in. wg. If manifold pressure must be adjusted, refer to Gas Valve Adjustment section on page 47.

**Sequence of Operation**

NOTE: Unit is shipped with default values that can be changed through Service Tool, Building Supervisor, or Comfort-Works™ software. See Table 18 for default values.

COOLING, CONSTANT VOLUME (CV) UNITS — On power up, the control module will activate the initialization software of the control board. The initialization software then reads DIP switch no. 1 position to determine CV or VAV operation. Next, DIP switch no. 2 is read to determine if the control is thermostat or sensor type operation. If switch 2 is

open, then sensors are employed. If switch no. 2 is closed, thermostat is employed. Initialization clears all alarms and alerts, remaps the input/output database for CV operation, sets maximum heat stages to 2, and sets maximum cool stages to 3. The control reads DIP switch no. 3 and if open, then it sets the internal flag for expansion mode operation.

The first time power is sent to the control board after a power outage, power up takes 5 minutes plus a random 1 to 63 seconds.

The TSTAT function performs a thermostat based control by monitoring Y1, Y2, W1, W2, and G inputs. These functions control stages cool1, cool2, heat1, heat2, and indoor fan, respectively. If TSTAT function is NOT selected, the control determines the occupancy state on the Time Schedules or with remote occupied/unoccupied input. If temperature compensated start is active, the unit will be controlled as in the Occupied mode. User-defined set points are shown in Table 18.

The occupied or unoccupied comfort set points must be selected and the space temperature offset input will be used, if present. The Occupied Heat set point default value is 68 F. The Occupied Cool set point default value is 78 F. The Unoccupied Heat set point default value is 55 F. The Unoccupied Cool set point value is 90 F. The control board will set appropriate operating mode and fan control. The control board will turn on indoor fan, if in Occupied mode, or determine if unit is in Unoccupied mode and the space temperature is outside of the unoccupied comfort set points, (Unoccupied Heat or Unoccupied Cool).

The control board will then monitor space temperature against comfort set points and control heating or cooling stages as required. If system is in the Occupied mode, the economizer will operate as required. If the system is in Unoccupied mode, the system will perform nighttime free cool and IAQ (indoor air quality) pre-occupancy purge as required (when functions are enabled via software). Whenever the DX (di-rect expansion) cooling is requested, the outdoor fan will operate.

The control board will operate economizer, run diagnostics to monitor alarms/alerts at all times, and respond to CCN communications to perform any configured network POC (product outboard control) functions such as time and outdoor-air temperature broadcast and Global occupancy broadcast. When the optional expansion I/O board is employed, it will: perform periodic scan and maintain database of expanded I/O points, perform Fire/Smoke control (power exhaust required); and if in Occupied mode perform IAQ control and monitor fan, filter, demand limit, and field-applied status (with accessories).

If thermostats are used to energize the G input, the control will turn on indoor fan without delay and open economizer dampers to minimum position.

**Table 18 — User Defined Set Points**

SET POINT NAME	FORMAT	DESCRIPTION	LIMITS	DEFAULT
<b>OHSP</b>	xx.xF	Occupied Heat Set Point	55 to 80 F	68 F
<b>OCSP</b>	xx.xF	Occupied Cool Set Point	55 to 80 F	78 F
<b>UHSP</b>	xx.xF	Unoccupied Heat Set Point	40 to 80 F	55 F
<b>UCSP</b>	xx.xF	Unoccupied Cool Set Point	75 to 95 F	90 F
<b>SASP</b>	xx.xF	Supply Air Set Point	45 to 70 F	55 F
<b>OATL</b>	xx.xF	Hi OAT Lockout Temperature	55 to 75 F	65 F
<b>NTLO</b>	xx.xF	Unoccupied OAT Lockout Temperature	40 to 70 F	50 F
<b>RTIO</b>	xx.x	Reset Ratio	0 to 10	3
<b>LIMT</b>	xx.xF	Reset Limit	0 to 20° F	10%
<b>MDP</b>	xxx%	Minimum Damper Position	0 to 100%	20%
<b>LOWMDP</b>	xxx%	Low Temperature Minimum Damper Position Override	0 to 100%	100%
<b>IAQS</b>	xxxx	IAQ Set Point	1 to 5000 PPM	650 PPM
<b>UHDB</b>	xx.xF	Unoccupied Heating Deadband	0 to 10° F	1° F
<b>UCDB</b>	xx.xF	Unoccupied Cooling Deadband	0 to 10° F	1° F
<b>LTMP</b>	xxx%	Low Temp. Min. Position	0 to 100%	10%
<b>HTMP</b>	xxx%	High Temp. Min. Position	0 to 100%	35%
<b>PES1</b>	xxx%	CV Power Exhaust Stage 1 Point	0 to 100%	25%
<b>PES2</b>	xxx%	CV Power Exhaust Stage 2 Point	0 to 100%	75%

**LEGEND**

- CV** — Constant Volume
- IAQ** — Indoor Air Quality
- OAT** — Outdoor-Air Temperature

If thermostats are used to deenergize the G input, the control board will turn off indoor fan without any delay and close economizer dampers.

When cooling, G must be energized before cooling can operate. The control board determines if outdoor conditions are suitable for economizer cooling using the standard outdoor air thermistor. For economizer to function for free cooling, the enthalpy must be low, the outdoor air must equal to or less than the High Outdoor Air Temperature Lockout (default is 65 F), the SAT (supply-air temperature) thermistor is NOT in alarm, and outdoor air reading is available. When these conditions are satisfied, the control board will use economizer as the first stage of cooling.

When Y1 input is energized, the economizer will be modulated to maintain SAT at the defined set point. The default is 55 F. When SAT is above the set point, the economizer will be 100% open. When SAT is below the set point, the economizer will modulate between minimum and 100% open position. When Y2 is energized, the control will turn on compressor no. 1 and continue to modulate economizer as described above. If the Y2 remains energized and the SAT reading remains above the set point for 15 minutes, compressor no. 2 will turn on. If Y2 is deenergized at any time, only the last stage of compression that was energized will be turned off. If outdoor conditions are not suitable for economizer cooling, the economizer will go to minimum position and cycle compressor no. 1 and 2 based on demand from Y1 and Y2 respectively. The compressors will be locked out when the SAT temperature is too low (less than 40 F for compressor no. 1 and less than 45 F for compressor no. 2.) After a compressor is locked out, it can restart after normal time guard period.

The Time Guard® function maintains a minimum off time of 5 minutes, a minimum ON time of 10 seconds, and a minimum delay before starting the second compressor of 10 seconds.

When heating, the heat stages respond to the demand from W1 and W2 of the thermostat input. Heating and cooling will be mutually locked out on demand on a first call basis. The heating and the cooling functions cannot be operating simultaneously.

**COOLING, VARIABLE VOLUME UNITS** — On power up, the control module will activate the initialization software

of the control board. The initialization software then reads DIP switch no. 1 position to determine CV or VAV operation. Initialization clears all alarms and alerts, re-maps the input/output database for VAV operation, sets maximum heat stages to 1 and sets maximum cool stages to 6. The control reads DIP switch no. 3 and if open, then it sets the internal flag for expansion mode operation.

The control board will determine if an interface (linkage) is active and if the unit will operate in a Digital Air Volume (DAV) mode. In a DAV system, the room terminals are equipped with microprocessor controls that give commands to the base unit module. If an interface is active, the control will replace local comfort set points, space and return air temperatures and occupancy status with the linkage data supplied.

The control board will determine occupancy status from Time Schedules (if programmed), Remote Occupied/Unoccupied input, global occupancy, or DAV. If temperature compensated start is active, the unit will be controlled as in the Occupied mode.

**NOTE:** The temperature compensated start is a period of time calculated to bring the unit on while unoccupied to reach the occupied set point when occupancy occurs.

The control board will set the appropriate operating mode and fan control. The control board will turn VFD on if Occupied mode is evident.

For units equipped with a start/stop switch only (no space temperature sensor), if unoccupied and valid return-air temperature reading is available (either from a sensor or DAV), the control will monitor return-air temperature against Unoccupied Heat and Cool set points.

For units with a start-stop switch and a space temperature sensor, the control board will start the VFD whenever SPT is outside of the set points (Unoccupied Heat or Unoccupied Cool). The VFD may also be started by nighttime thermostat via remote Occupied/Unoccupied input or by a temperature compensated start algorithm. When VFD is running in a normal mode, the control will start heating or cooling as required to maintain supply-air temperature at the supply air set point plus the reset (when enabled). The reset value is determined by SAT (supply-air temperature) reset and/or space temperature reset algorithms. The space temperature reset is only available when enabled through software.



When cooling, the control will energize the power exhaust enable output to the external power exhaust controller, when power exhaust is used.

If occupied, the control will perform economizer control (economizer control same as described above for CV units). If unoccupied, the control will perform nighttime free cool and IAQ pre-occupancy purge as required (when enabled through software). When DX (direct expansion) cooling is called, the outdoor fans will always operate.

The control will run continuous diagnostics for alarms/alerts; respond to CCN communications and perform any configured network POC (product outboard controls) functions such as time and outdoor-air temperature broadcast and global broadcast; and perform Fire/Smoke control if equipped with power exhaust.

**GAS HEATING, CONSTANT VOLUME (CV) UNITS** — The gas heat units incorporate 2 separate systems to provide gas heat. Each system incorporates its own induced-draft motor, Integrated Gas Control (IGC) board, 2 stage gas valve, manifold, etc. The systems are operated in parallel; for example, when there is a call for first stage heat, both induced-draft motors operate, both gas valves are energized, and both IGC boards initiate spark.

All of the gas heating control is performed through the IGC boards (located in the heating section). The base module board serves only to initiate and terminate heating operation.

The base module board is powered by 24 vac. When the thermostat or room sensor calls for heating, power is sent from the base module board to W on each of the IGC boards. An LED on the IGC board will be on during normal operation. A check is made to ensure that the rollout switches and limit switches are closed and the induced-draft motors are not running. The induced-draft motors are then energized, and when speed is proven with the hall effect sensor on the motor, the ignition activation period begins. The burners will ignite within 5 seconds.

When ignition occurs the IGC board will continue to monitor the condition of the rollout and limit switches, the hall effect sensor, as well as the flame sensor. If the unit is controlled through a room thermostat set for fan auto., 45 seconds after ignition occurs, the indoor-fan motor will be energized and the outdoor-air dampers will open to their minimum position. If for some reason the overtemperature limit opens prior to the start of the indoor fan blower, on the next attempt, the 45-second delay will be shortened to 5 seconds less than the time from initiation of heat to when the limit tripped. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan on delay will not change back to 45 seconds unless power is reset to the control. If the unit is controlled through a room sensor, the indoor fan will be operating in the Occupied mode and the outdoor-air dampers will be in the minimum position.

If the unit is controlled with a room sensor in the Unoccupied mode, the indoor fan will be energized through the IGC board with a 45-second delay and the outside-air dampers will move to the IAQ position (generally closed in the Unoccupied mode). If IAQ is not enabled, dampers will move to the minimum position.

When additional heat is required, W2 closes and initiates power to the second stage of the main gas valves. When the thermostat is satisfied, W1 and W2 open and the gas valves close interrupting the flow of gas to the main burners. If the call for W1 lasted less than 1 minute, the heating cycle will not terminate until 1 minute after W1 became active. If the unit is controlled through a room thermostat set for fan auto., the indoor-fan motor will continue to operate for an additional 45 seconds then stop and the outdoor-air dampers will

close. If the overtemperature limit opens after the indoor motor is stopped within 10 minutes of W1 becoming inactive, on the next cycle the time will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified, the fan off delay will not change back to 45 seconds unless power is reset to the control. If the unit is controlled through a room sensor, the indoor fan will be operating in the Occupied mode and turned off after 45 seconds in the Unoccupied mode.

**GAS HEATING, VARIABLE AIR VOLUME (VAV) UNITS** — All of the gas heating control is performed through the integrated gas control (IGC) board. The base module board serves only to initiate and terminate heating operation.

**NOTE:** The unit is factory-configured for disabled occupied heating. DIP switch 5 is used to enable occupied heating (DIP switch 5 set to OPEN).

The base module board is powered by 24 vac. When there is a call for heating (either Morning Warm-Up, Unoccupied, or Occupied modes), power is sent from the base module board to W on each of the IGC boards and W2 of the main gas valve. When heating, the control board will energize a field-supplied heat interlock relay output to drive the VAV terminal boxes wide open. The HIR is not required on a DAV system. See Fig. 42. In the Occupied mode the indoor-fan motor will be operating and the outdoor-air dampers will be in the minimum position. In the Unoccupied mode the indoor-fan motor will be off, but will energize 45 seconds after the call for heat and the outdoor-air dampers will move to the IAQ Unoccupied position (generally set to closed in the Unoccupied mode). The duct pressure sensor will signal to the variable frequency drive to operate at full speed since all terminals have been driven open. An LED on the IGC board will be on during normal operation. A check is made to ensure that the rollout switches and limit switches are closed and the induced-draft motors are not running. The induced-draft motors are then energized and when speed is proven with the hall effect sensor on the motor, the ignition activation period begins. The burners will ignite within 5 seconds.

When ignition occurs the IGC board will continue to monitor the condition of the rollout and limit switches, the hall effect sensor, and the flame sensor.

If the call for heat lasted less than 1 minute, the heating cycle will not terminate until 1 minute after heat became active. When heating is satisfied, the power will be interrupted to the IGC board and W1 and W2 of the main gas valve. If the unit is controlled through a room sensor, the indoor fan will be operating in the Occupied mode and turned off after 45 seconds in the Unoccupied mode.

**MORNING WARM-UP (VAV only) (PC Accessed/CCN Operation)** — Morning warm-up occurs when the control has been programmed to turn on heat prior to the Occupied mode to be ready for occupancy mode. Morning warm-up is a condition in VAV systems that occurs when the Temperature Compensated Start algorithm calculates a biased occupied start time and the unit has a demand for heating. The warm-up will continue into the occupied period as long as there is a need for heat. During warm-up, the unit can continue heating into the occupied period, even if occupied heating is disabled. When the heating demand is satisfied, the warm-up condition will terminate. To increase or decrease the heating demand, use Service Tool software to change the Occupied Heating set point.

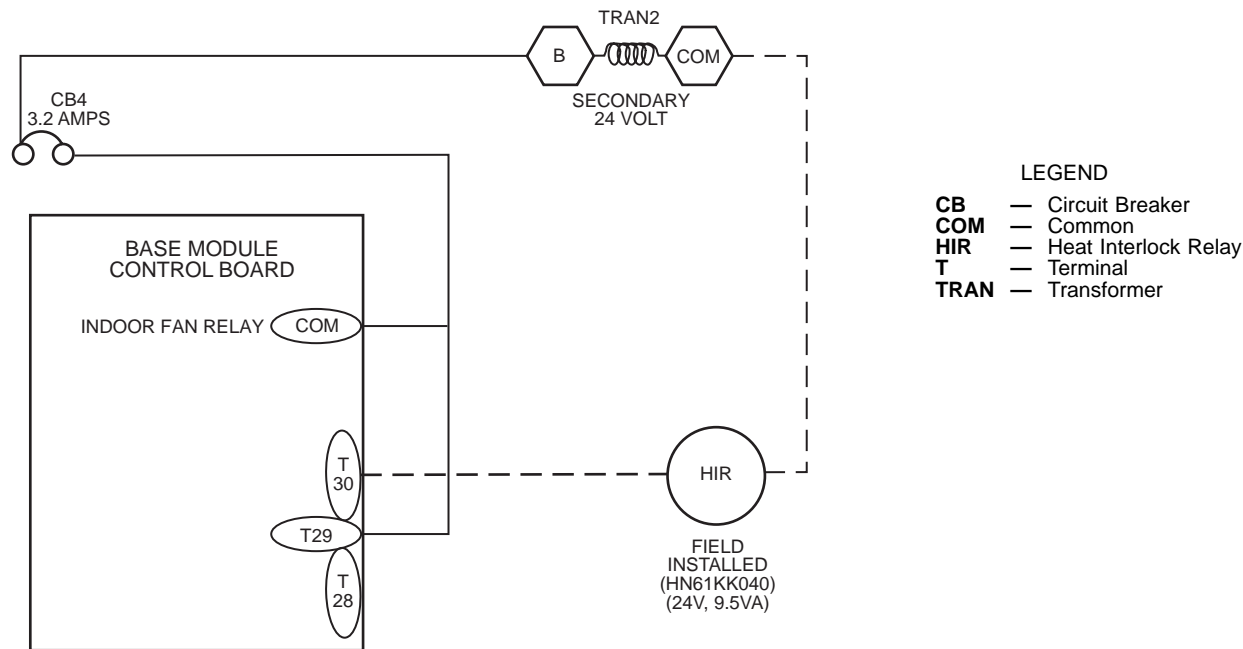
**NOTE:** To utilize Morning Warm-Up mode, the unit occupancy schedule must be accessed via Service Tool, Building Supervisor, or ComfortWorks™ software or accessory LID-2B. The PC can access the base control board via the 3-wire communication bus or via an RJ-11 connection to the CCN terminal on the base control board. See Fig. 16.

**MORNING WARM-UP (VAV Only) (Stand-Alone Operation)** — When the unit operates in stand-alone mode, morning warm-up occurs when the unit is energized in Occupied mode and return-air temperature (RAT) is below 68 F. Warm-up will not terminate until the RAT reaches 68 F. The heat interlock relay output is energized during morning warm-up. (A field-installed 24-vdc heat interlock relay is required.) The output will be energized until the morning warm-up cycle is complete. Refer to Fig. 42 for heat interlock relay wiring.

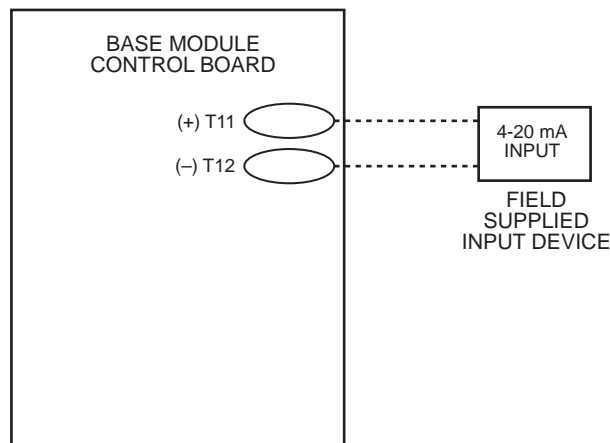
**SPACE TEMPERATURE RESET SENSOR (VAV Only)** — An accessory space temperature sensor wired to terminals T1 and T2 on the control module is required. Space temperature reset is used to reset the supply-air temperature set point of a VAV system higher, as the space temperature falls below the Occupied Cool set point. As the space temperature falls below the Occupied Cool set point, the supply-air temperature will be reset upward as a function of the reset ratio. (Default is 3.) Reset ratio is expressed in degrees change

in supply-air temperature per degree of space temperature change. A reset limit will exist which will limit the maximum number of degrees the supply-air temperature may be raised. (Default is 10 F.) Both the reset ratio and the reset limit are user definable. The sequence of operation is as follows:

1. The on/off status of the unit supply fan is determined.
2. If the fan is “on,” the sequence will check if the system is occupied.
3. If the system is occupied, the sequence will determine if the reset option is enabled.
4. If the reset option is enabled, the sequence will read the space temperature and compare it to the Occupied Cool set point. If the temperature is below the Occupied Cool set point, the algorithm will compute the reset value and compare this value against the reset limit. If it is greater than the reset limit, the sequence will use the reset limit as the reset value.



**Fig. 42 — Heat Interlock Relay Wiring**



**LEGEND**  
**T** — Terminal

**NOTE:** The 4 to 20 mA input is a field-supplied non-Carrier EMS (Energy Management System) device.

mA INPUT	DEG. F RESET
4	0.00
5	1.25
6	2.50
7	3.75
8	5.00
9	6.25
10	7.50
11	8.75
12	10.00
13	11.25
14	12.50
15	13.75
16	15.00
17	16.25
18	17.50
19	18.75
20	20.00

**Fig. 43 — Space Temperature Reset Wiring**

**Space Temperature Reset Example** — The occupied cooling set point is set to 73 F. The Reset Ratio is set to 5. The Reset Limit is set to 20° F. The Reset Ratio determines how many degrees F the temperature is reset. At 72 F, the supply temperature will be reset 5 degrees higher. At 71 F, the supply temperature will be reset 10 degrees higher. At 70 F, the supply temperature will be reset 15 degrees higher and the Reset Limit will have been reached.

**SUPPLY AIR TEMPERATURE RESET** — Supply air temperature reset is used to reset the supply air temperature utility. A 4 to 20 mA signal (field-supplied) is required. The reset option does not require enabling.

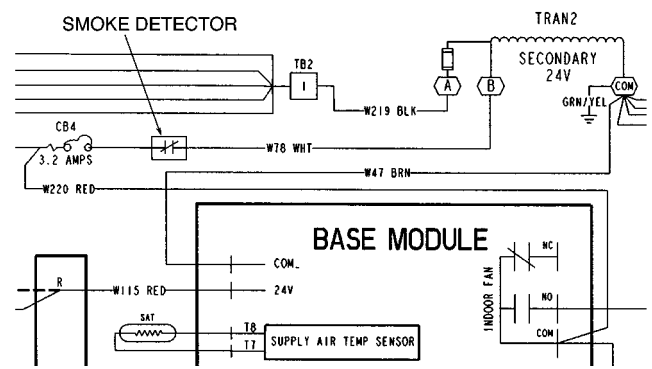
**POWER EXHAUST OPERATION** — The optional power exhaust packages are factory- or field-installed with vertical units and optionally installed in the return air ductwork for horizontal applications. The standard (offered with constant volume or variable air volume units) and the modulating power exhaust (offered on VAV units) are the two packages offered. The modulating power exhaust package is equipped with a field-adjustable static pressure controller to stage up to 4 power exhaust stages which will maintain a building static pressure. The blue controller located in the control box below the control board can be adjusted, by removing the covers and adjusting the set point dial to the desired building pressure. The blue controller monitors the 4 individual sequencers which activate the 4 individual power exhaust motors. The standard power exhaust package controls up to 2 stages of power exhaust to maintain building pressure. The power exhaust package can be configured to deliver positive or negative building pressure. These power exhaust stages are staged according to a percentage of the economizer dampers position. Default values are 25% for Stage 1 and 75% for Stage 2. This package has set points that are adjustable through software (Service Tool, Building Supervisor, or ComfortWorks™).

**SMOKE CONTROL MODES** — The 48EJ,EK,EW,EY units with an optional expansion board perform fire and smoke control modes. The expansion board provides 4 modes which can be used to control smoke within the conditioned area. The modes of operation are fire shutdown, pressurization, evacuation, and smoke purge. See Table 19.

**SMOKE DETECTOR** — A smoke detector can be used to initiate fire shutdown. This can be accomplished by a set of normally closed pilot relay contacts which will interrupt power from the 24-v transformer, secondary “B” terminal to the control circuit breaker (CB4). See Fig. 44. The wire that connects these two points is white and labeled “W78.”

**NOTE:** On standard gas models, the indoor fan will continue to run 45 seconds after the call for heat has been terminated. If fire shutdown is initiated the fan will stop immediately. No 45-second delay will occur.

The smoke detector may be mounted in the return air duct or the supply duct. Carrier does not make recommendations



**Fig. 44 — Field-Supplied Smoke Detector Wiring**

as to specific smoke detector location due to liability considerations.

**INDOOR AIR QUALITY CONTROL** — The accessory expansion board and accessory IAQ sensor are required for IAQ control. The Carrier sensors operate with a 4 to 20 mA signal. The 4 to 20 mA signal is connected to T11 (+) and T12 (-) on the expansion board for the IAQ sensor, and T13 (+) and T14 (-) on the expansion board for the OAQ (Outdoor Air Quality) sensor. The sensor is field-mounted and wired to the expansion board installed in the unit main control box. The IAQ sensor must be powered by a field-supplied 24-v power supply (ungrounded). Do not use the unit 24-v power supply to power the sensor.

Once installed, the sensor must be enabled. The sensor is configured with default values which may be changed through network access software. To work properly, the IAQ sensor high and low reference points for the sensor that is used must match the configured values. The expansion board reacts to a 4 to 20 mA signal from the IAQ sensor. The low reference (4 mA output) must be configured to the minimum IAQ sensor reading. The high reference (20 mA output) must be configured to the maximum IAQ sensor reading.

The IAQ sensor can be configured to either low or high priority. The priority value can be changed by the user. The default is low.

**Low priority** — When the priority is set to low, the initial control is to the IAQ set point, but the outside air damper position will change to its minimum position when the following conditions occur:

- CV units with sensor — when the space temperature is greater than the occupied cooling set point plus 2° F or when the space temperature is less than the occupied heating set point minus 2° F.
- VAV units and CV units with thermostat — when the supply-air temperature is less than the supply-air temperature set point minus 8° F or when the supply-air temperature is greater than the supply air temperature set point plus 5° F for 4 minutes.

**Table 19 — Smoke Control Modes**

DEVICE	PRESSURIZATION	SMOKE PURGE	EVACUATION	FIRE SHUTDOWN
<b>Economizer</b>	100%	100%	100%	0%
<b>Indoor Fan/VFD</b>	ON	ON	OFF	OFF
<b>Power Exhaust (all outputs)</b>	OFF	ON	ON	OFF
<b>Heat Stages</b>	OFF	OFF	OFF	OFF
<b>HIR</b>	ON	ON	OFF	OFF

**LEGEND**

- HIR** — Heat Interlock Relay
- VFD** — Variable Frequency Drive

- When the outdoor air quality is greater than the outdoor air quality set point (ppm)

**High priority** — When the priority is set to high, the IAQ set point controls the outside air damper exclusively, with no regard to comfort conditioning.

**TIME GUARD® CIRCUIT** — The Time Guard function (built into the rooftop control board) maintains a minimum off time of 5 minutes, a minimum on time of 10 seconds, and a 10-second delay between compressor starts.

**CRANKCASE HEATER** — Unit main power supply must remain on to provide crankcase heater operation. The crankcase heater in each compressor keeps oil free of refrigerant while compressor is off.

**HEAD PRESSURE CONTROL** — Each unit has a fan cycling, outdoor thermostat to shut off the outdoor-fan motor(s) at 55 F (one outdoor-fan motor on 024-034 units and two outdoor fan motors on 038-048 units). The head pressure control permits unit to operate with correct condensing temperatures down to 35 F outdoor-air temperature.

**MOTORMASTER® III CONTROL** — The Motormaster III Solid-State Head Pressure Control is a field-installed accessory fan speed control device actuated by a temperature sensor. It is specifically designed for use on Carrier equipment and controls the condenser-fan motor speed in response to the saturated condensing temperature. For outdoor temperatures down to -20 F, it maintains condensing temperature at 100 F. Refer to the accessory Motormaster installation instructions for more information.

**CAPACITY CONTROL, COOLING** — The cooling capacity staging tables are shown in Tables 20 and 21.

**Table 20 — Cooling Capacity Staging Table, CV Units with 2 Compressors**

	Stages			
	0	1 Economizer	2	3
<b>Compressor 1</b>	off	off	on	on
<b>Compressor 2</b>	off	off	off	on

NOTE: On CV units that require additional unloading, add suction pressure unloaders to Compressor 1 only.

**Table 21 — Cooling Capacity Staging Table VAV Units with 2 Compressors and 2 Unloaders\***

	Stages						
	0	1	2	3	4	5	6
<b>Compressor 1</b>	off	on	on	on	on	on	on
<b>Unloader 1</b>	off	on	on	off	on	on	off
<b>Unloader 2</b>	off	on	off	off	on	off	off
<b>Compressor 2</b>	off	off	off	off	on	on	on

\*40 ton units have only one unloader.

**FIELD TEST** — The field test program is initiated by moving up DIP switch no. 4 to the OPEN position. The outdoor-air damper will close. The control allows 90 seconds for the damper to close in case it was in the full open position. Next, the indoor-fan contactor will be energized, and the outside-air damper will begin to open to its default value of 20% and stay at that position for a short period of time. The outdoor-air damper will then open to its full open position and stay at that position for a short period of time. The outdoor-air damper will then close.

If the unit is equipped with power exhaust, stage 1 will be energized for 5 seconds. If the unit is configured for stage 2 of power exhaust, stage 2 will be energized for 5 seconds after the first stage is deenergized.

The first stage of heat will be energized for 30 seconds, after which the second stage heat will be energized for an additional 30 seconds. Heat is then deenergized.

The last step is the Cooling mode. Outdoor-fan contactor no. 1 is energized. This is followed by each stage of cooling energized with a 10-second delay between stages. After this is complete, outdoor-fan contactor no. 2 is energized for 10 seconds.

The compressors will now deenergize, followed by the outdoor-fan contactors and indoor-fan contactors. If the unit is equipped with the Integrated Gas Control (IGC) board, the indoor fan will continue to operate for an additional 30 seconds after deenergizing the circuit.

The field test is then complete.

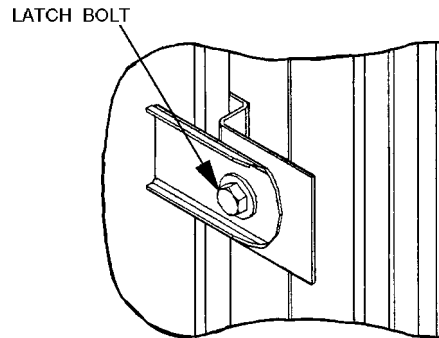
## SERVICE

### ⚠ WARNING

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

**Service Access** — All unit components can be reached through clearly labelled hinged access doors. These doors are not equipped with tiebacks, so if heavy duty servicing is needed, either remove them or prop them open to prevent accidental closure.

Each door is held closed with 3 latches. The latches are secured to the unit with a single ¼-in. - 20 x ½-in. long bolt. See Fig. 45.



**Fig. 45 — Door Latch**

To open, loosen the latch bolt using a 7/16-in. wrench. Pivot the latch so it is not in contact with the door. Open the door. To shut, reverse the above procedure.

NOTE: Disassembly of the top cover may be required under special service circumstances. It is very important that the orientation and position of the top cover be marked on the unit prior to disassembly. This will allow proper replacement of the top cover onto the unit and prevent rainwater from leaking into the unit.

**IMPORTANT:** After servicing is completed, make sure door is closed and relatched properly, and that the latches are tight. Failure to do so can result in water leakage into the evaporator section of the unit.

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

**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. Check spark gap. See Fig. 46. Refer to Main Burners section on page 48.

**FLUE GAS PASSAGEWAYS** — The flue collector box and heat exchanger cells may be inspected by removing gas section access panel (Fig. 3-6), flue box cover, collector box, and main burner assembly (Fig. 47 and 48). Refer to Main Burners section on page 48 for burner removal sequence. If cleaning is required, clean all parts with a wire brush. Re-assemble using new cerafelt high-temperature insulation for sealing.

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

To inspect blower wheel, remove heat exchanger access panel. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel assembly by removing screws holding motor mounting plate to top of combustion fan housing (Fig. 47 and 48). The motor, scroll, and wheel assembly can be removed from the unit. Remove scroll from plate. Remove the blower wheel from the motor shaft and clean with a detergent or solvent. Replace motor and wheel assembly.

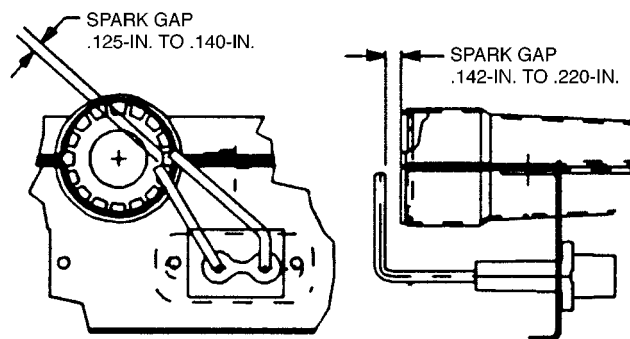


Fig. 46 — Spark Gap Adjustment

**EVAPORATOR COIL** — Remove access panels and clean as required with commercial coil cleaner.

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

**CONDENSATE DRAIN** — Check and clean each year at start of cooling season. In winter, keep drains and traps dry.

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

NOTE: The unit requires industrial grade throwaway filters capable of withstanding face velocities up to 625 fpm.

**OUTDOOR-AIR INLET SCREENS** — Clean screens with steam or hot water and a mild detergent. Do not use disposable filters in place of screens. See Fig. 24 for location of screens (filter track assembly).

### Lubrication

**COMPRESSORS** — Each compressor is charged with the correct amount of oil at the factory. The correct oil charge is shown in Table 1. If oil is visible in the compressor sight glass, check unit for operating readiness as described in Start-Up section, then start the unit. Observe oil level and add oil, if required, to bring oil level in compressor crankcase up to between 1/4 and 1/3 of sight glass during steady operation.

If oil charge is above 1/3 sight glass, do not remove any oil until the compressor crankcase heater has been energized for at least 24 hours with compressor off.

When additional oil or a complete charge is required, use only Carrier-approved compressor oil:

Petroleum Specialties, Inc. . . . .	Cryol 150
Texaco, Inc. . . . .	Capella WF-32
Witco Chemical Corp. . . . .	Suniso 3GS

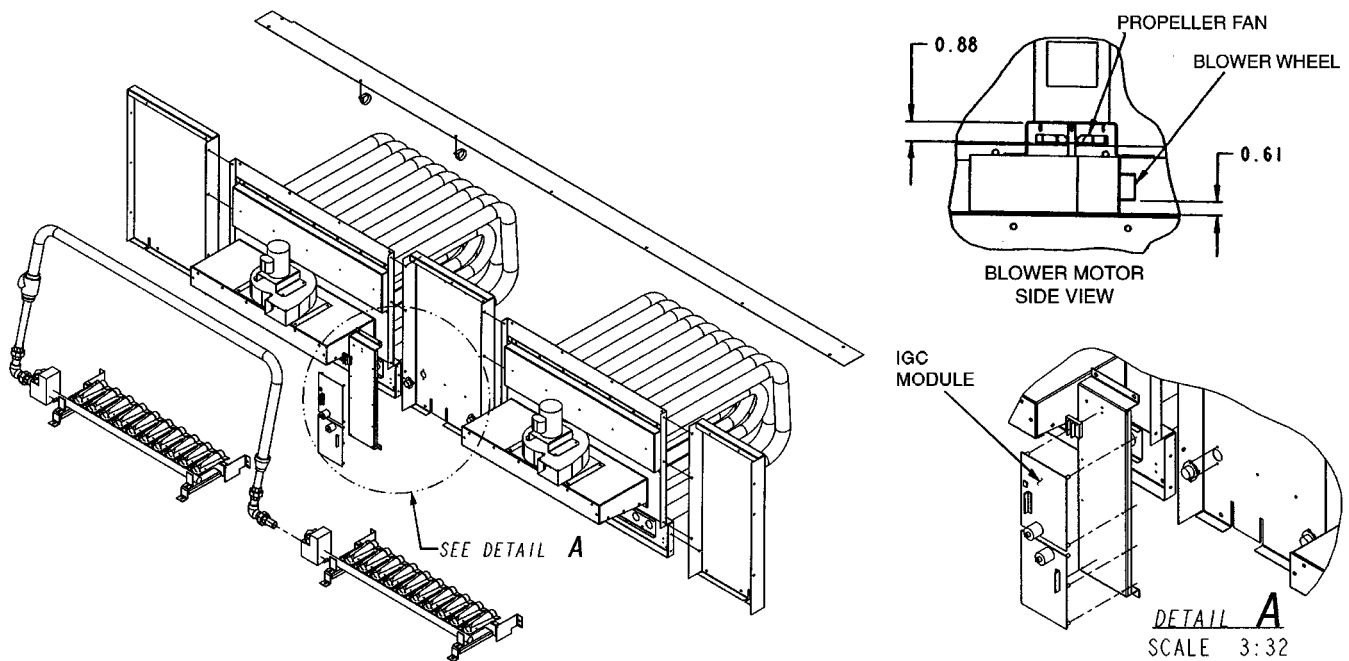
**IMPORTANT:** Do not use reclaimed oil or oil that has been exposed to the atmosphere. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants section, for procedures to add or remove oil.

**FAN SHAFT BEARINGS** — Lubricate bearings at least every 6 months with suitable bearing grease. Do not over grease. Typical lubricants are given below:

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

\*Preferred lubricant because it contains rust and oxidation inhibitors.

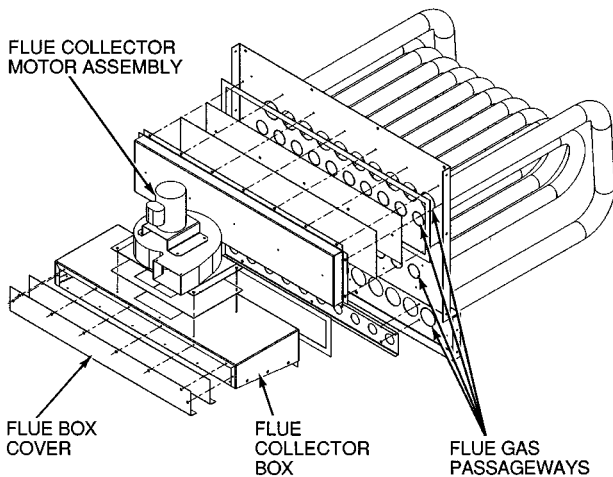
**CONDENSER- AND EVAPORATOR-FAN MOTOR BEARINGS** — The condenser- and evaporator-fan motors have permanently-sealed bearings, so no field lubrication is necessary.



**NOTES:**

1. Torque set screws on blower wheel to 70 in. lbs ± 2 in. lbs.
2. Torque set screw on propeller fan to 15 in. lbs ± 2 in. lbs.
3. Dimensions are in inches.

**Fig. 47 — Typical Gas Heating Section**



**Fig. 48 — Gas Heat Section Details**

**Evaporator Fan Performance Adjustment (Fig. 49)** — Fan motor pulleys are designed for speed shown in Table 1 (factory speed setting).

**IMPORTANT:** Check to ensure that the unit drive matches the duct static pressure using Tables 12-14.

To change fan speeds, change pulleys.

To align fan and motor pulleys:

1. Shut off unit power supply.
2. Loosen fan shaft pulley bushing.

3. Slide fan pulley along fan shaft.
4. Make angular alignment by loosening motor from mounting plate.
5. Retighten pulley.

**Evaporator Fan Service and Replacement**

1. Shut off unit power supply.
2. Remove supply-air section panels.
3. Remove belt and blower pulley.
4. Loosen setscrews in blower wheels.
5. Remove locking collars from bearings.
6. Remove shaft.
7. Remove venturi on opposite side of bearing.
8. Lift out wheel.
9. Reverse above procedure to reinstall fan.
10. Check and adjust belt tension as necessary.

**Belt Tension Adjustment** — To adjust belt tension:

1. Shut off unit power supply.
2. Loosen motor mounting nuts and bolts. See Fig. 50.
3. Loosen fan motor nuts.
4. Turn motor jacking bolts to move motor mounting plate left or right for proper belt tension. A slight bow should be present in the belt on the slack side of the drive while running under full load.
5. Tighten nuts.
6. Adjust bolts and nut on mounting plate to secure motor in fixed position. Recheck belt tension after 24 hours of operation. Adjust as necessary.

## Evaporator-Fan Motor Replacement

1. Shut off unit power supply.
2. Remove upper outside panel and open hinged door to gain access to motor.
3. Fully retract motor plate adjusting bolts.
4. Loosen the two rear (nearest the evaporator coil) motor plate nuts.
5. Remove the two front motor plate nuts and carriage bolts.
6. Slide motor plate to the rear (toward the coil) and remove fan belt(s).
7. Slide motor plate to the front and hand tighten one of the rear motor plate nuts (tight enough to prevent the motor plate from sliding back but loose enough to allow the plate to pivot upward).
8. Pivot the front of the motor plate upward enough to allow access to the motor mounting hex bolts and secure in place by inserting a prop.
9. Remove the nuts from the motor mounting hex bolts and remove motor.
10. Reverse above steps to install new motor.

## Condenser-Fan Adjustment

1. Shut off unit power supply.
2. Remove fan guard.
3. Loosen fan hub setscrews.
4. Adjust fan height on shaft using a straightedge placed across venturi and measure per Fig. 51.
5. Fill hub recess with permagum if rubber hubcap is missing.
6. Tighten setscrews and replace panel(s).
7. Turn on unit power.

**Power Failure** — The economizer damper motor is a spring return design. In event of power failure, dampers will return to fully closed position until power is restored.

**Refrigerant Charge** — Amount of refrigerant charge is listed on unit nameplate and in Table 1. Refer to Carrier GTAC II; Module 5; Charging, Recovery, Recycling, and Reclamation section for charging methods and procedures.

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

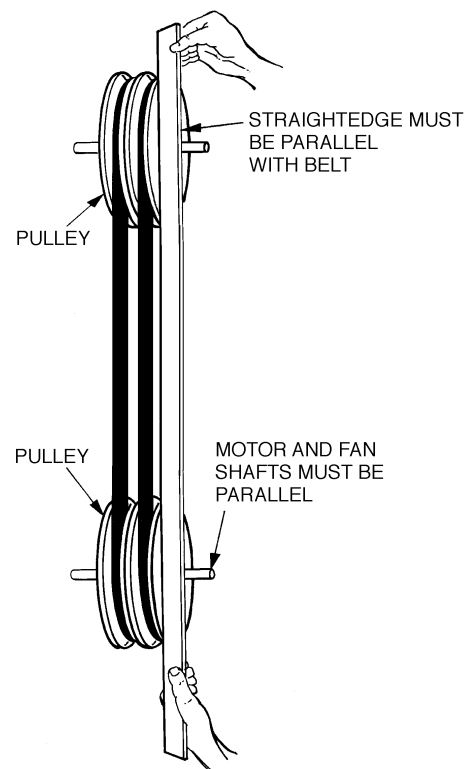
**NOTE:** Do not use recycled refrigerant as it may contain contaminants.

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

**LOW CHARGE COOLING** — Using appropriate cooling charging chart (see Fig. 52 and 53), add or remove refrigerant until conditions of the appropriate chart are met. Note that charging chart is different from those normally used. An accurate pressure gage and temperature sensing device are required. Measure liquid line pressure at the liquid line service valve using pressure gage. Connect temperature sensing device to the liquid line near the liquid line service valve and insulate it so that outdoor ambient temperature does not affect reading.

Using the above temperature and pressure readings, find the intersect point on the appropriate cooling charging chart. If intersection point on chart is above line, add refrigerant. If intersection point on chart is below line, carefully reclaim some of the charge. Recheck suction pressure as charge is adjusted.

**NOTE:** Indoor-air cfm must be within normal operating range of unit. All outdoor fans must be operating.



**Fig. 49 — Evaporator-Fan Alignment and Adjustment**

**Thermostatic Expansion Valve (TXV)** — Each circuit has a TXV. The TXV is nonadjustable and is factory set to maintain 10 to 13° F superheat leaving the evaporator coil. The TXV controls flow of liquid refrigerant to the evaporator coils.

## Gas Valve Adjustment

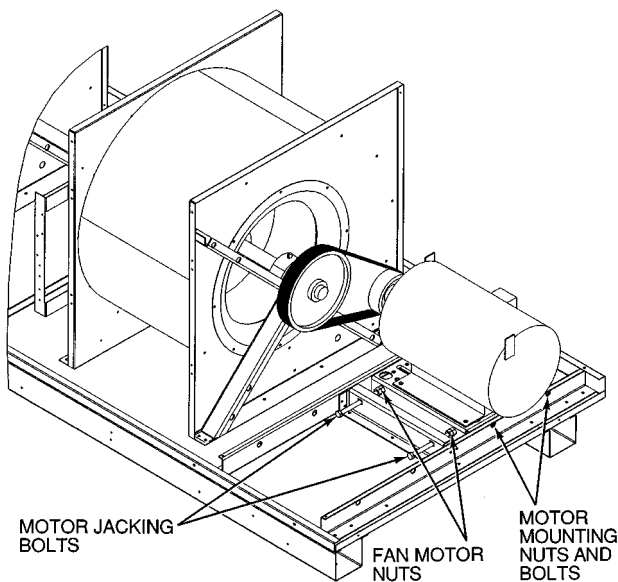
**NATURAL GAS** — The 2-stage gas valve opens and closes in response to the thermostat or limit control.

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

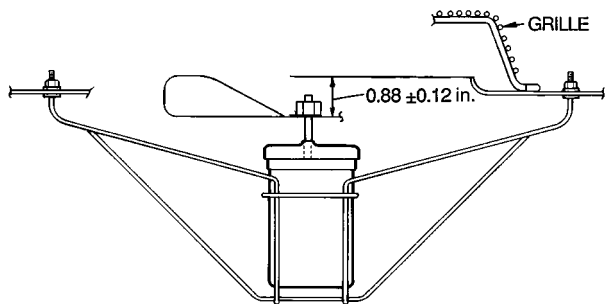
The regular factory setting is stamped on the valve body (3.5 in. wg).

To adjust regulator:

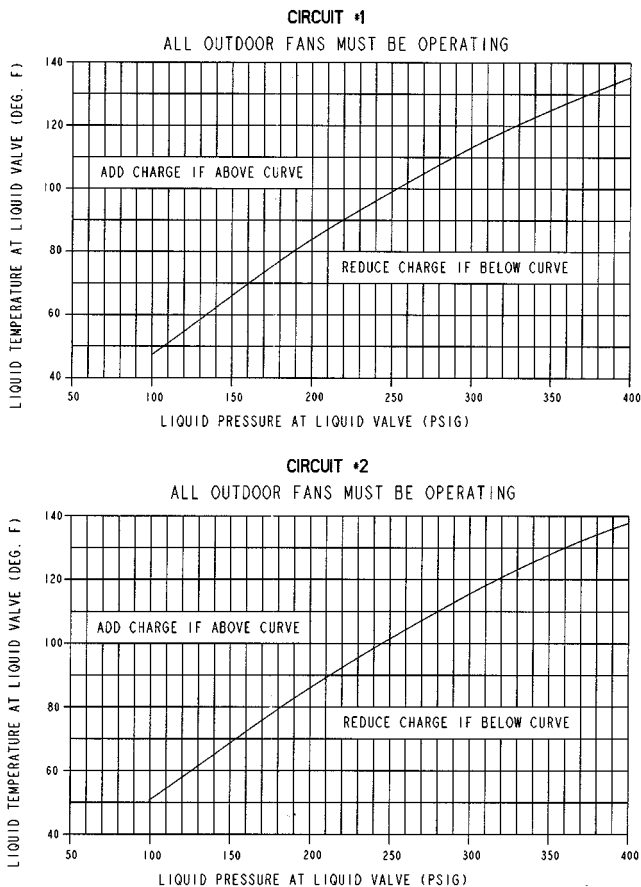
1. Set thermostat at setting for no call for heat.
2. Turn main gas valve to OFF position.
3. Remove  $\frac{1}{8}$ -in. pipe plug from manifold. Install a water manometer pressure-measuring device.
4. Set main gas valve to ON position.
5. Set thermostat at setting to call for heat.
6. Remove screw cap covering regulator adjustment screw (See Fig. 54).
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, set thermostat setting for no call for heat, turn off main gas valve, remove pressure-measuring device and replace  $\frac{1}{8}$ -in. pipe plug and screw cap.



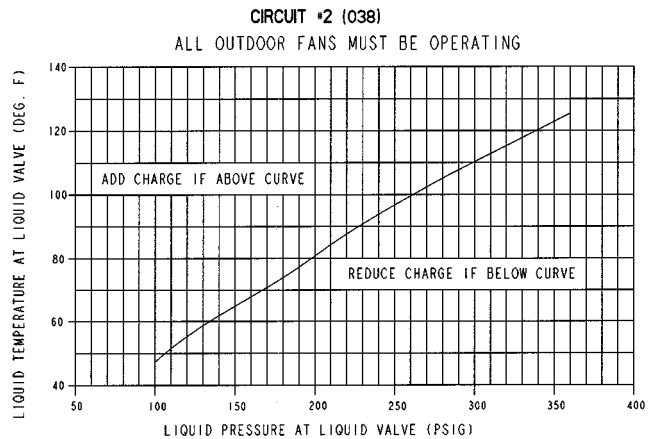
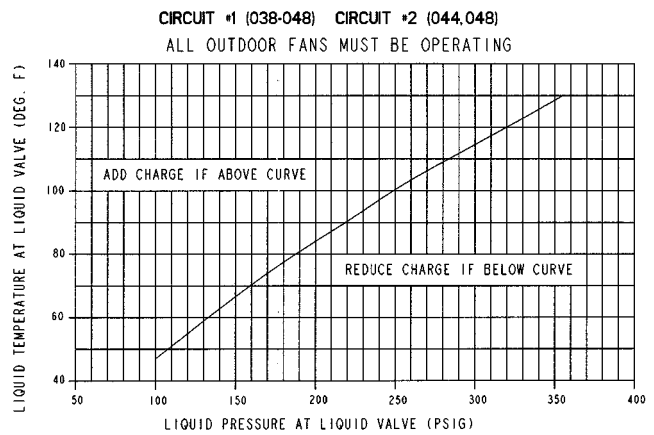
**Fig. 50 — Belt Tension Adjustment**



**Fig. 51 — Condenser-Fan Adjustment**



**Fig. 52 — Cooling Charging Chart, 48EJ,EK,EW,EY024-034**



**Fig. 53 — Cooling Charging Chart, 48EJ,EK,EW,EY038-048**

**Main Burners** — For all applications, main burners are factory set and should require no adjustment.

**MAIN BURNER REMOVAL (Fig. 55)**

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Remove heating access panel.
4. Disconnect gas piping from gas valve inlet.
5. Remove wires from gas valve.
6. Remove wires from rollout switch.
7. Remove sensor wire and ignitor cable from IGC board.
8. Remove 2 screws securing manifold bracket to basepan.
9. Remove 4 screws that hold the burner support plate flange to the vestibule plate.
10. Lift burner assembly out of unit.
11. Reverse procedure to re-install burners.

**Filter Drier** — Replace whenever refrigerant system is exposed to atmosphere.

**Protective Devices**

**COMPRESSOR PROTECTION**

**Overcurrent** — Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

**Overtemperature** — Each 06D type compressor (024-038 units) has an internal protector to protect it against excessively high discharge gas temperatures.



**Crankcase Heater** — Each compressor has a crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since power for the crankcase heaters is drawn from the unit incoming power, main unit power must be on for the heaters to be energized.

**IMPORTANT:** After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressors.

**EVAPORATOR FAN MOTOR PROTECTION** — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker. If the evaporator-fan motor is replaced with a different horsepower motor, resizing of the circuit breaker is required. Contact Carrier Application Engineering.

**CONDENSER-FAN MOTOR PROTECTION** — Each condenser-fan motor is internally protected against overtemperature.

**HIGH- AND LOW-PRESSURE SWITCHES** — If either switch trips, or if the compressor overtemperature switch activates, that refrigerant circuit will be automatically stopped. See Compressor Lockout Logic section on this page.

**FREEZE PROTECTION THERMOSTAT (FPT)** — Freeze protection thermostats are located on the evaporator coil for each circuit. One is located at the top and bottom of each circuit. It detects frost build-up and turns off the compressor, allowing the coil to clear. Once the frost has melted, the compressor can be reenergized.

**Relief Devices** — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices are installed on the suction line, liquid line, and on the compressor.

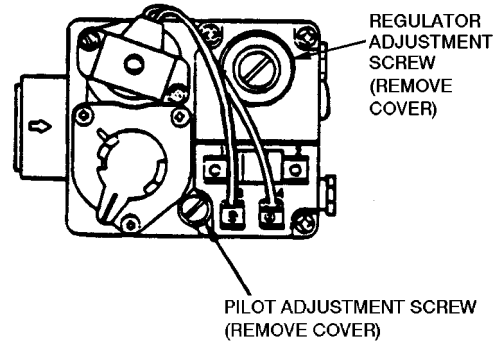
**Power Circuit** — A typical power wiring schematic is shown in Fig. 56.

**Control Circuit, 115-V** — This control circuit is protected against overcurrent by a 5.0 amp circuit breaker (CB3). Breaker can be reset. If it trips, determine cause of trouble before resetting. A typical 115-v control wiring schematic is shown in Fig. 57 and 58.

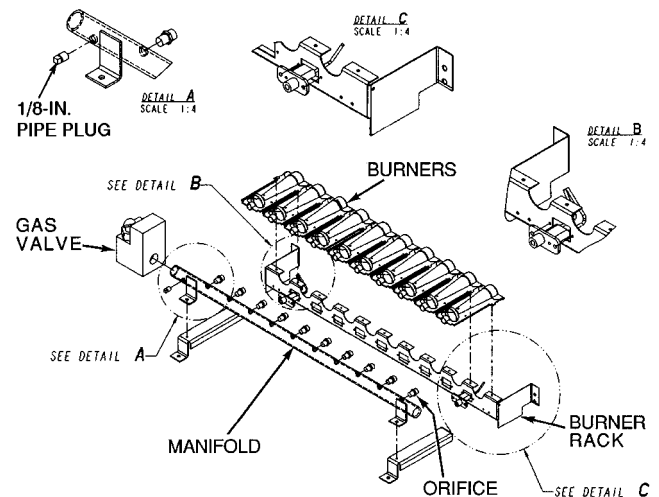
**Control Circuit, 24-V** — This control circuit is protected against overcurrent by a 3.2 amp circuit breaker (CB4). Breaker can be reset. If it trips, determine cause of trouble before resetting. A typical 24-v control wiring schematic is shown in Fig. 59 and 60.

**Compressor Lockout Logic** — If any of the safeties trip, the circuit will automatically reset (providing the safety has reset) and restart the compressor in 15 minutes. If any of the safeties trip 3 times within a 90-minute period, then the circuit will be locked out and will require manual resetting by turning off either the unit disconnect or the control circuit breaker, or opening the thermostat.

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










**Fig. 54 — Gas Valve**



**Fig. 55 — Main Burner Removal**

# LEGEND and NOTES for Fig. 56-60 — Typical Wiring Schematics

## LEGEND

<b>AHA</b> — Adjustable Heat Anticipator	<b>IFC</b> — Indoor Fan Contactor	<b>TC</b> — Thermostat Cooling
<b>BP</b> — Building Pressure	<b>IFCB</b> — Indoor Fan Circuit Breaker	<b>TH</b> — Thermostat Heating
<b>BR</b> — Burner Relay	<b>IFM</b> — Indoor-Fan Motor	<b>TRAN</b> — Transformer
<b>C</b> — Contactor, Compressor	<b>IFR</b> — Indoor-Fan Relay	<b>UL</b> — Compressor Unloader
<b>CAP</b> — Capacitor	<b>IGC</b> — Integrated Gas Unit Controller	<b>VFD</b> — Variable Frequency Drive
<b>CB</b> — Circuit Breaker	<b>IP</b> — Internal Protector	 Terminal (Marked)
<b>CC</b> — Cooling Compensator	<b>L</b> — Light	 Terminal (Unmarked)
<b>CCB</b> — Controller Circuit Breaker	<b>LPS</b> — Low-Pressure Switch	 Terminal Block
<b>CCH</b> — Crankcase Heater	<b>MGV</b> — Main Gas Valve	 Splice
<b>COM</b> — Communication	<b>NC</b> — Normally Closed	 Factory Wiring
<b>COMP</b> — Compressor Motor	<b>NO</b> — Normally Open	 Field Wiring
<b>CR</b> — Control Relay	<b>OAT</b> — Outdoor-Air Thermistor	 To Indicate Common Potential Only, Not To Represent Wiring
<b>DM</b> — Damper Motor	<b>OFC</b> — Outdoor-Fan Contactor	
<b>DP</b> — Duct Pressure	<b>OFM</b> — Outdoor-Fan Motor	
<b>EC</b> — Enthalpy Control	<b>PEC</b> — Power Exhaust Contactor	
<b>EQUIP</b> — Equipment	<b>PEM</b> — Power Exhaust Motor	
<b>FLA</b> — Full Load Amps	<b>PES</b> — Power Exhaust Sequencer	
<b>FPT</b> — Freeze Protection Thermostat	<b>PESC</b> — Power Exhaust Sequencer Controller	
<b>FU</b> — Fuse	<b>PL</b> — Plug Assembly	
<b>GRD</b> — Ground	<b>R</b> — Relay	
<b>GVR</b> — Gas Valve Relay	<b>RAT</b> — Return-Air Thermistor	
<b>HPS</b> — High-Pressure Switch	<b>RS</b> — Rollout Switch	
<b>HS</b> — Hall Effect Sensor	<b>SAT</b> — Supply-Air Thermistor	
<b>HV</b> — High Voltage	<b>TB</b> — Terminal Block	
<b>IDM</b> — Induced-Draft Motor		

### NOTES:

1. Connect TRAN1 to H4 for 460 v units. Connect to H3 for 230 v. If 208/230 v units are run with a 208 v power supply connect to H2.
2. Connect TRAN2 to black lead for 460 v units. Connect to orange lead for 230 v units. If 208/230 v units are run with a 208 v power supply connect to red lead.
3. Circuit breaker must trip amps are equal to or less than 156% FLA for CB1 and CB2. All others are 140%.
4. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
5. Compressors and/or fan motors are thermally protected.
6. Three phase motors are protected against primary single phasing conditions.
7. Red wire and violet wire are spliced together at the factory. The brown wire has a wire nut added at the factory.

**TABLE A**

THE FOLLOWING COMPRESSORS HAVE TWO PARALLEL WIRES RUN FROM TB1 TO THE COMPRESSORS (NOT SHOWN ON LABEL DIAGRAM)		
COMPRESSOR MODEL	VOLTAGE	WIRE QUANTITY
06D-537	208/230-3-60	2

**TABLE B**

THE FOLLOWING FAN MOTORS HAVE TWO PARALLEL WIRES RUN FROM TB1 TO THE FAN MOTORS (NOT SHOWN ON LABEL DIAGRAM)		
INDOOR MOTOR	VOLTAGE	WIRE QUANTITY
20 HP	208/230-3-60	2

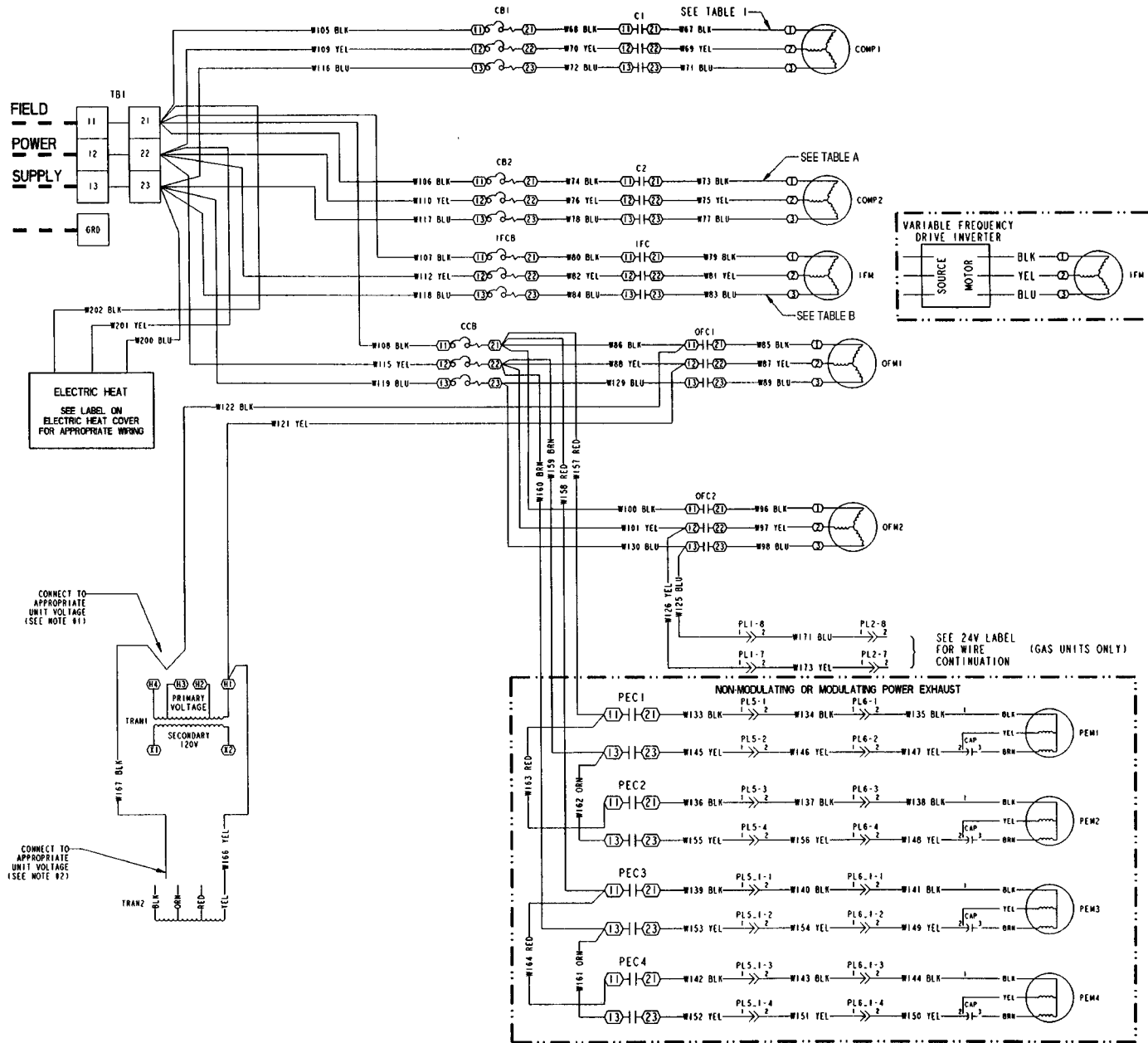


Fig. 56 — Typical Power Schematic; 48EJ,EK,EW,EY024-034; 208/230-3-60 and 460-3-60

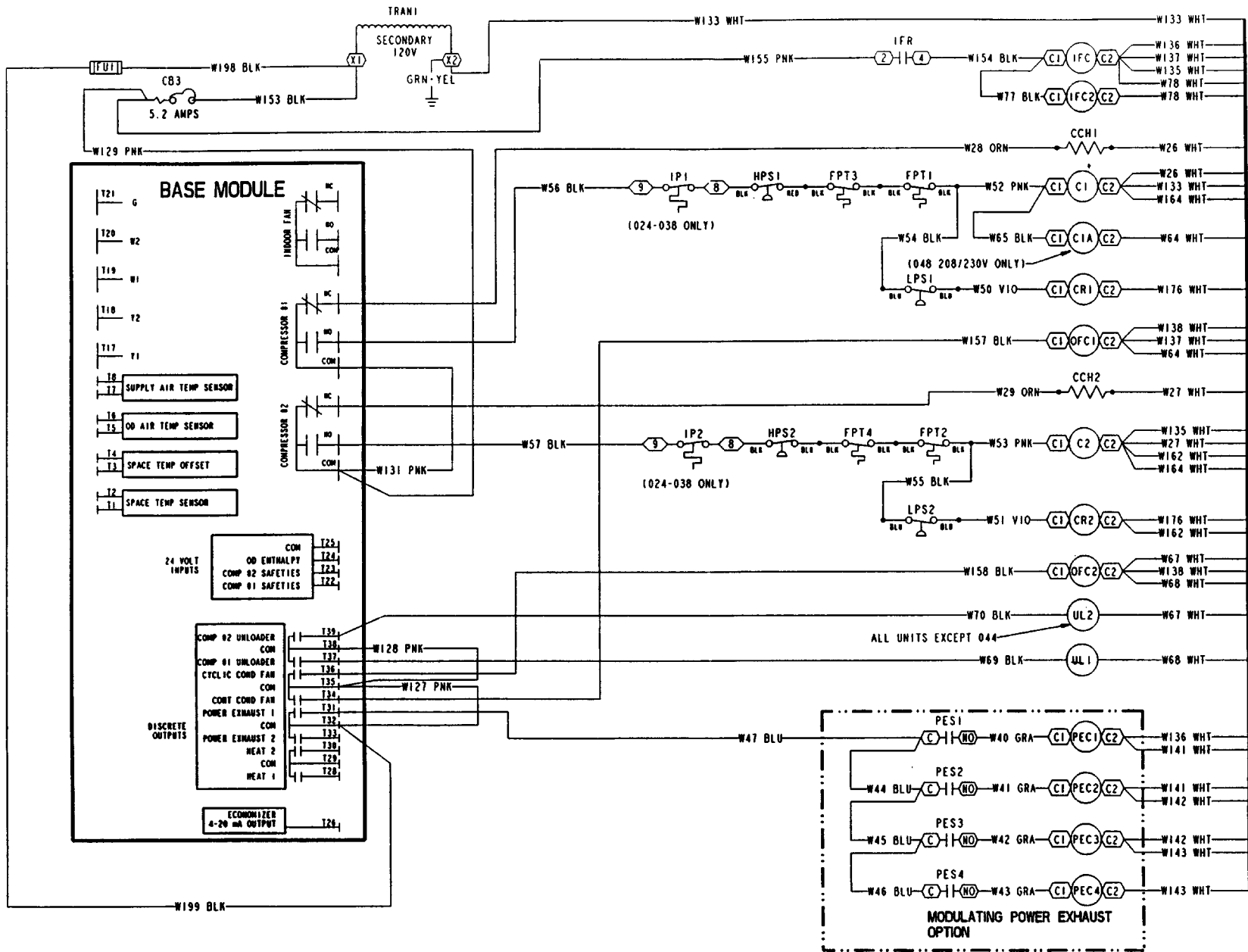


Fig. 57 — Typical VAV 115-v Control Circuit

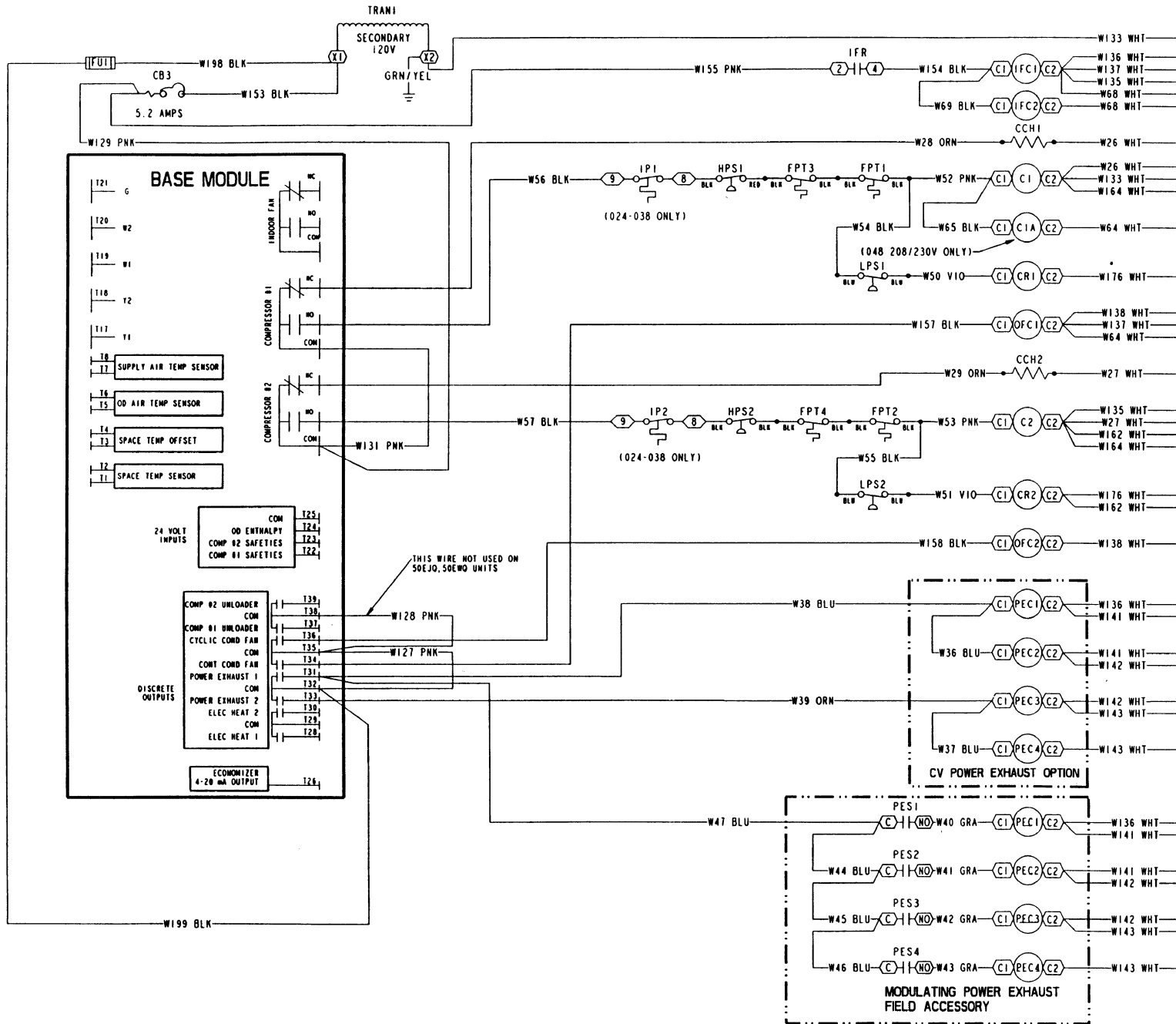
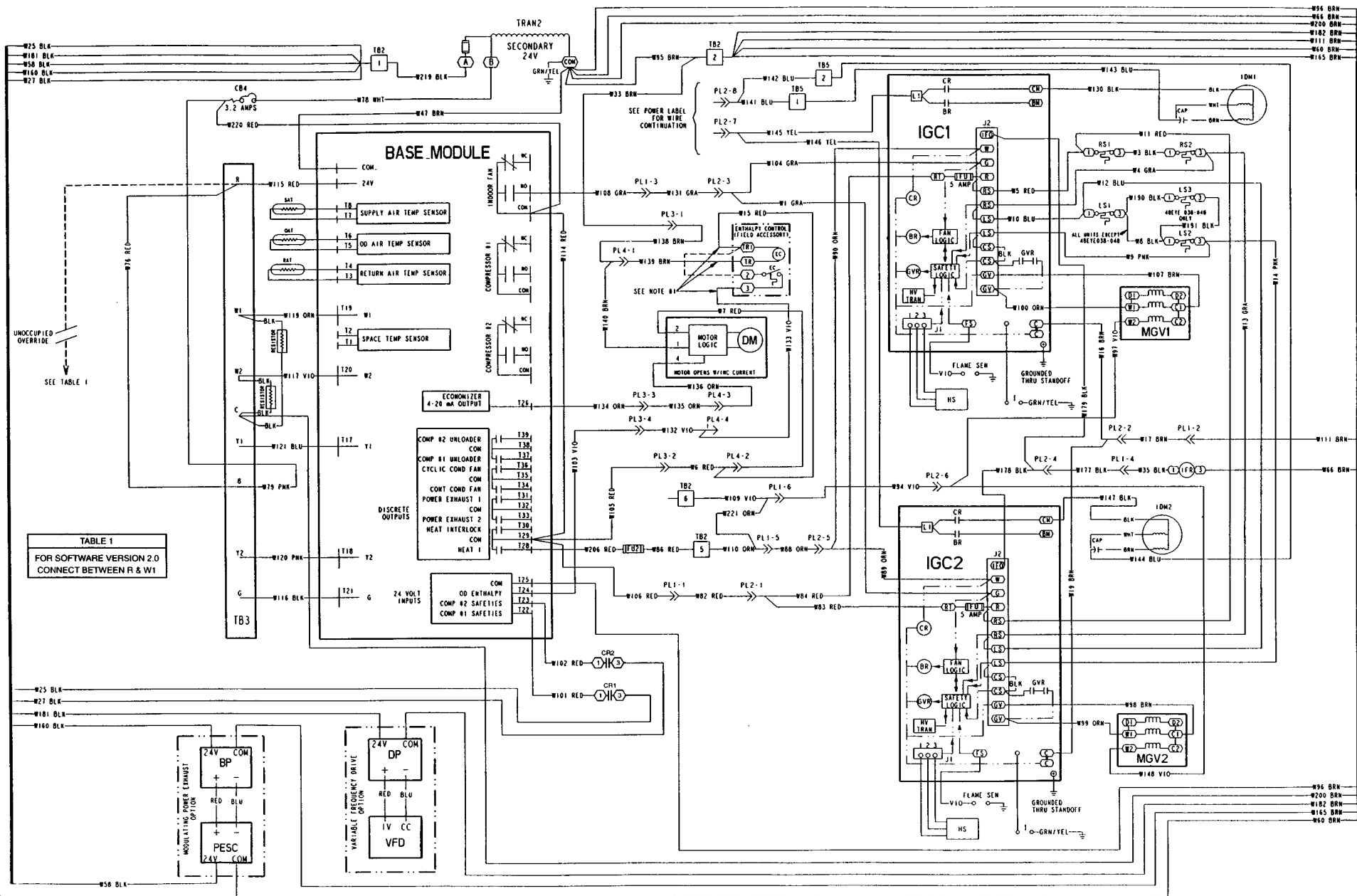


Fig. 58 — Typical CV 115-v Control Circuit



**TABLE 1**  
FOR SOFTWARE VERSION 2.0  
CONNECT BETWEEN R & W1

Terminal	Wire Color	Terminal	Wire Color
T1	W121 BLU	T1	W17
T2	W120 Pnk	T2	W18
T3	W116 BLK	T3	W19
T4	W115 RED	T4	W20
T5	W114 GRN	T5	W21
T6	W113 YEL	T6	W22
T7	W112 BLU	T7	W23
T8	W111 BRN	T8	W24
T9	W110 ORN	T9	W25
T10	W109 VIO	T10	W26
T11	W108 GRN	T11	W27
T12	W107 BRN	T12	W28
T13	W106 GRN	T13	W29
T14	W105 YEL	T14	W30
T15	W104 GRN	T15	W31
T16	W103 VIO	T16	W32
T17	W102 RED	T17	W33
T18	W101 RED	T18	W34
T19	W100 ORN	T19	W35
T20	W99 BRN	T20	W36
T21	W98 BRN	T21	W37
T22	W97 BRN	T22	W38
T23	W96 BRN	T23	W39
T24	W95 BRN	T24	W40
T25	W94 BRN	T25	W41
T26	W93 BRN	T26	W42
T27	W92 BRN	T27	W43
T28	W91 BRN	T28	W44
T29	W90 ORN	T29	W45
T30	W89 BRN	T30	W46
T31	W88 ORN	T31	W47
T32	W87 BRN	T32	W48
T33	W86 BRN	T33	W49
T34	W85 BRN	T34	W50
T35	W84 RED	T35	W51
T36	W83 RED	T36	W52
T37	W82 RED	T37	W53
T38	W81 RED	T38	W54
T39	W80 ORN	T39	W55
T40	W79 BRN	T40	W56
T41	W78 BRN	T41	W57
T42	W77 BRN	T42	W58
T43	W76 BRN	T43	W59
T44	W75 BRN	T44	W60
T45	W74 BRN	T45	W61
T46	W73 BRN	T46	W62
T47	W72 BRN	T47	W63
T48	W71 BRN	T48	W64
T49	W70 BRN	T49	W65
T50	W69 BRN	T50	W66
T51	W68 BRN	T51	W67
T52	W67 BRN	T52	W68
T53	W66 BRN	T53	W69
T54	W65 BRN	T54	W70
T55	W64 BRN	T55	W71
T56	W63 BRN	T56	W72
T57	W62 BRN	T57	W73
T58	W61 BRN	T58	W74
T59	W60 BRN	T59	W75
T60	W59 BRN	T60	W76
T61	W58 BRN	T61	W77
T62	W57 BRN	T62	W78
T63	W56 BRN	T63	W79
T64	W55 BRN	T64	W80
T65	W54 BRN	T65	W81
T66	W53 BRN	T66	W82
T67	W52 BRN	T67	W83
T68	W51 BRN	T68	W84
T69	W50 BRN	T69	W85
T70	W49 BRN	T70	W86
T71	W48 BRN	T71	W87
T72	W47 BRN	T72	W88
T73	W46 BRN	T73	W89
T74	W45 YEL	T74	W90
T75	W44 GRN	T75	W91
T76	W43 BLU	T76	W92
T77	W42 BLU	T77	W93
T78	W41 BLU	T78	W94
T79	W40 BRN	T79	W95
T80	W39 BRN	T80	W96
T81	W38 BRN	T81	W97
T82	W37 BRN	T82	W98
T83	W36 BRN	T83	W99
T84	W35 BRN	T84	W100
T85	W34 BRN	T85	W101
T86	W33 BRN	T86	W102
T87	W32 BRN	T87	W103
T88	W31 GRN	T88	W104
T89	W30 GRN	T89	W105
T90	W29 BRN	T90	W106
T91	W28 BRN	T91	W107
T92	W27 BRN	T92	W108
T93	W26 BRN	T93	W109
T94	W25 BRN	T94	W110
T95	W24 BRN	T95	W111
T96	W23 BRN	T96	W112
T97	W22 RED	T97	W113
T98	W21 BRN	T98	W114
T99	W20 BRN	T99	W115
T100	W19 BRN	T100	W116
T101	W18 BRN	T101	W117
T102	W17 BRN	T102	W118
T103	W16 BRN	T103	W119
T104	W15 BRN	T104	W120
T105	W14 BRN	T105	W121
T106	W13 BRN	T106	W122
T107	W12 BRN	T107	W123
T108	W11 BRN	T108	W124
T109	W10 BRN	T109	W125
T110	W9 BRN	T110	W126
T111	W8 BRN	T111	W127
T112	W7 BRN	T112	W128
T113	W6 BRN	T113	W129
T114	W5 BRN	T114	W130
T115	W4 GRN	T115	W131
T116	W3 BLK	T116	W132
T117	W2 BLK	T117	W133
T118	W1 BLK	T118	W134
T119	W0 BLK	T119	W135

Fig. 59 — Typical VAV 24-v Control Circuit

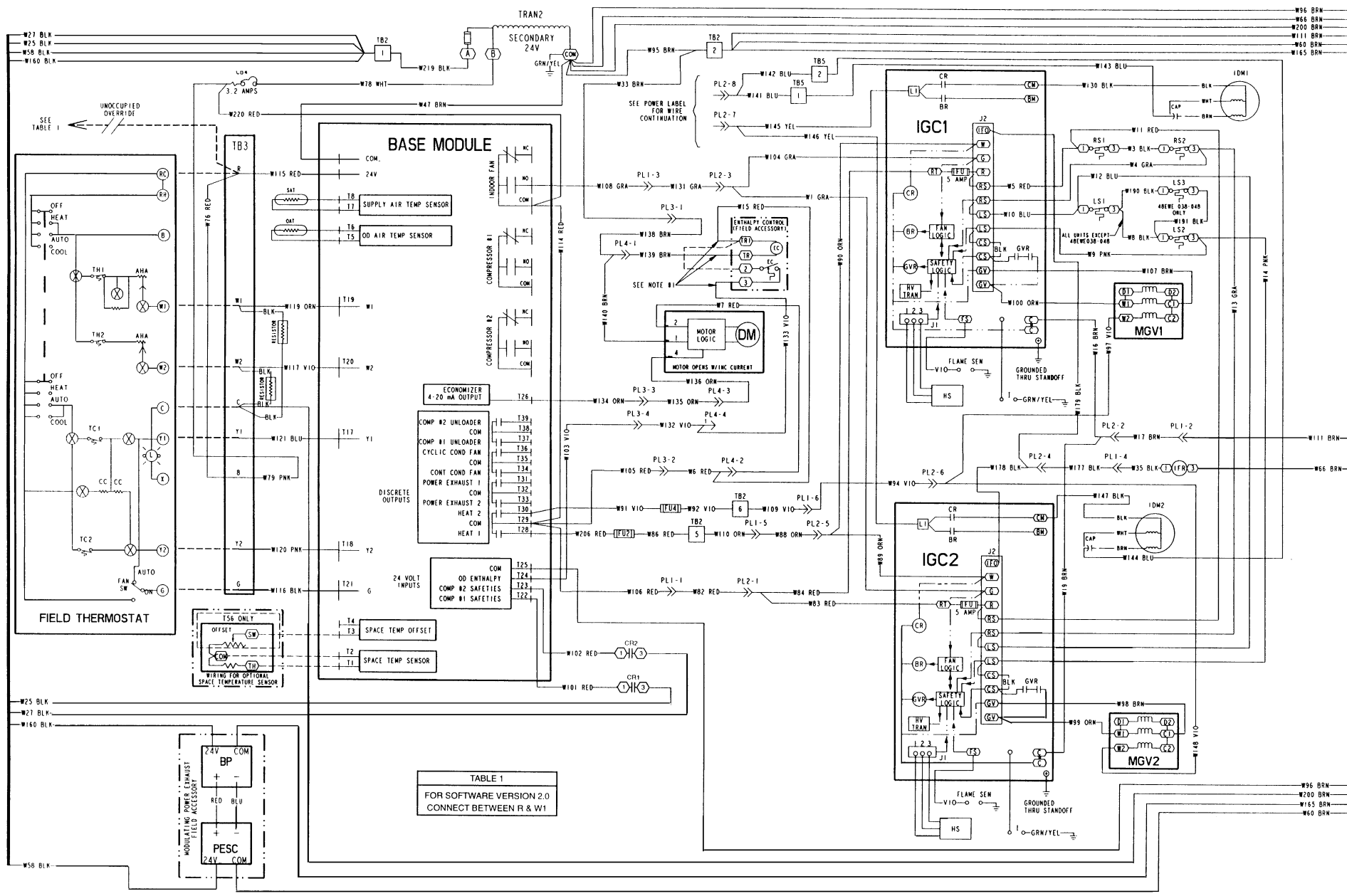
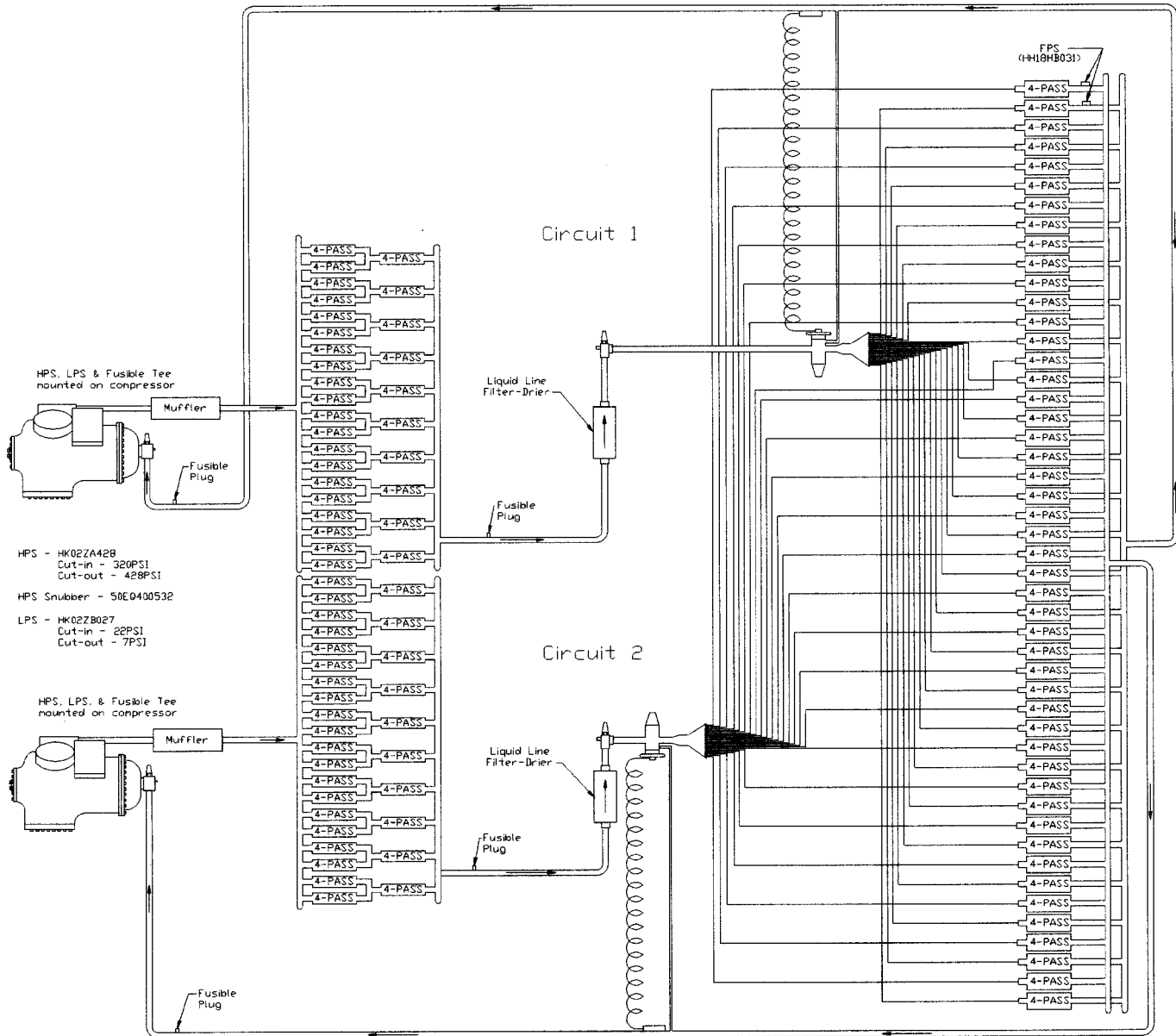


Fig. 60 — Typical CV 24-v Control Circuit

# TROUBLESHOOTING

Typical refrigerant circuiting diagrams are shown in Fig. 61-63. An algorithm diagram of the IGC (Integrated Gas Unit Controller) control is shown in Fig. 64.



HPS - HK02A42B  
Cut-in - 320PSI  
Cut-out - 428PSI

HPS Snubber - 50E0400532

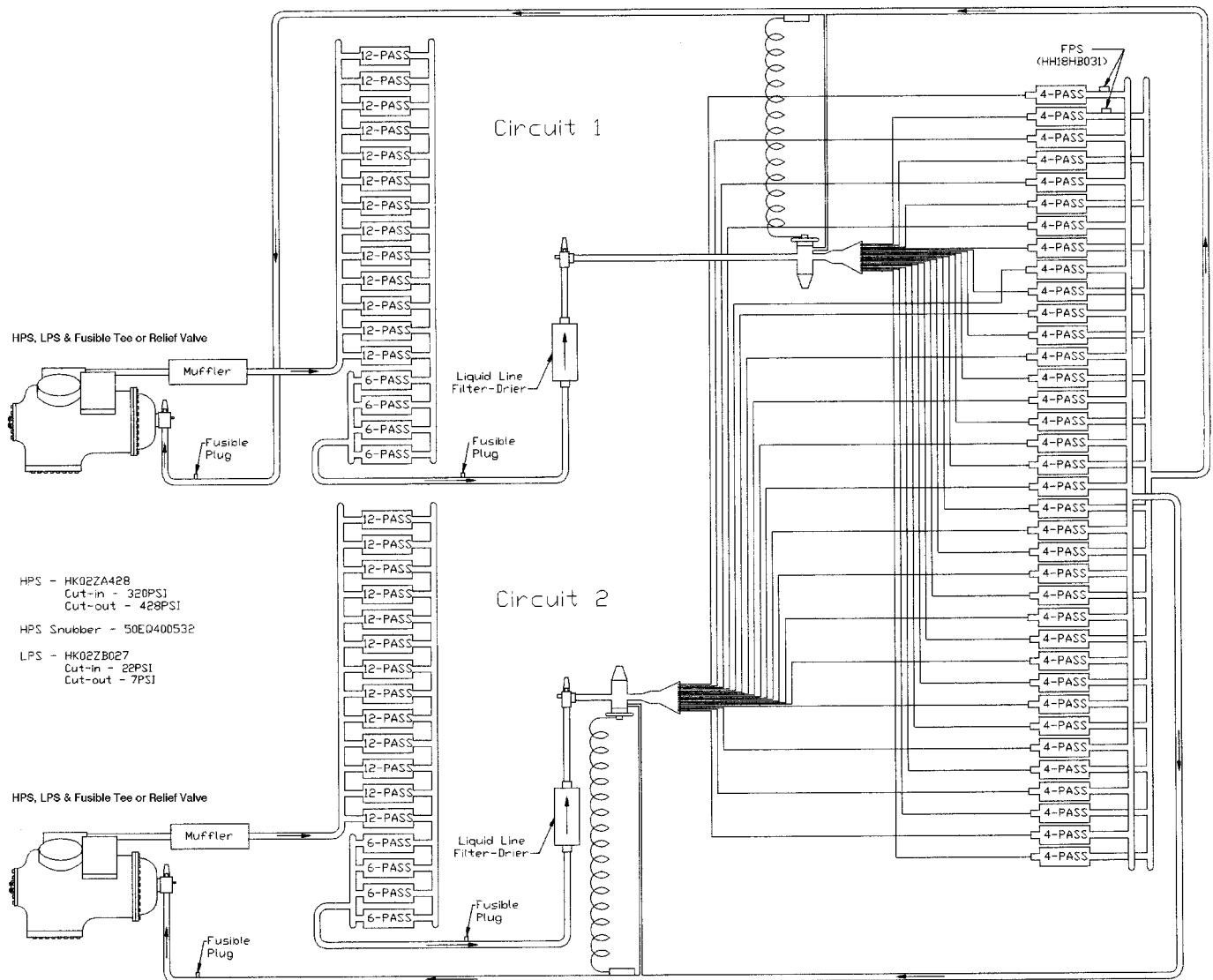
LPS - HK02ZB027  
Cut-in - 22PSI  
Cut-out - 7PSI

## LEGEND

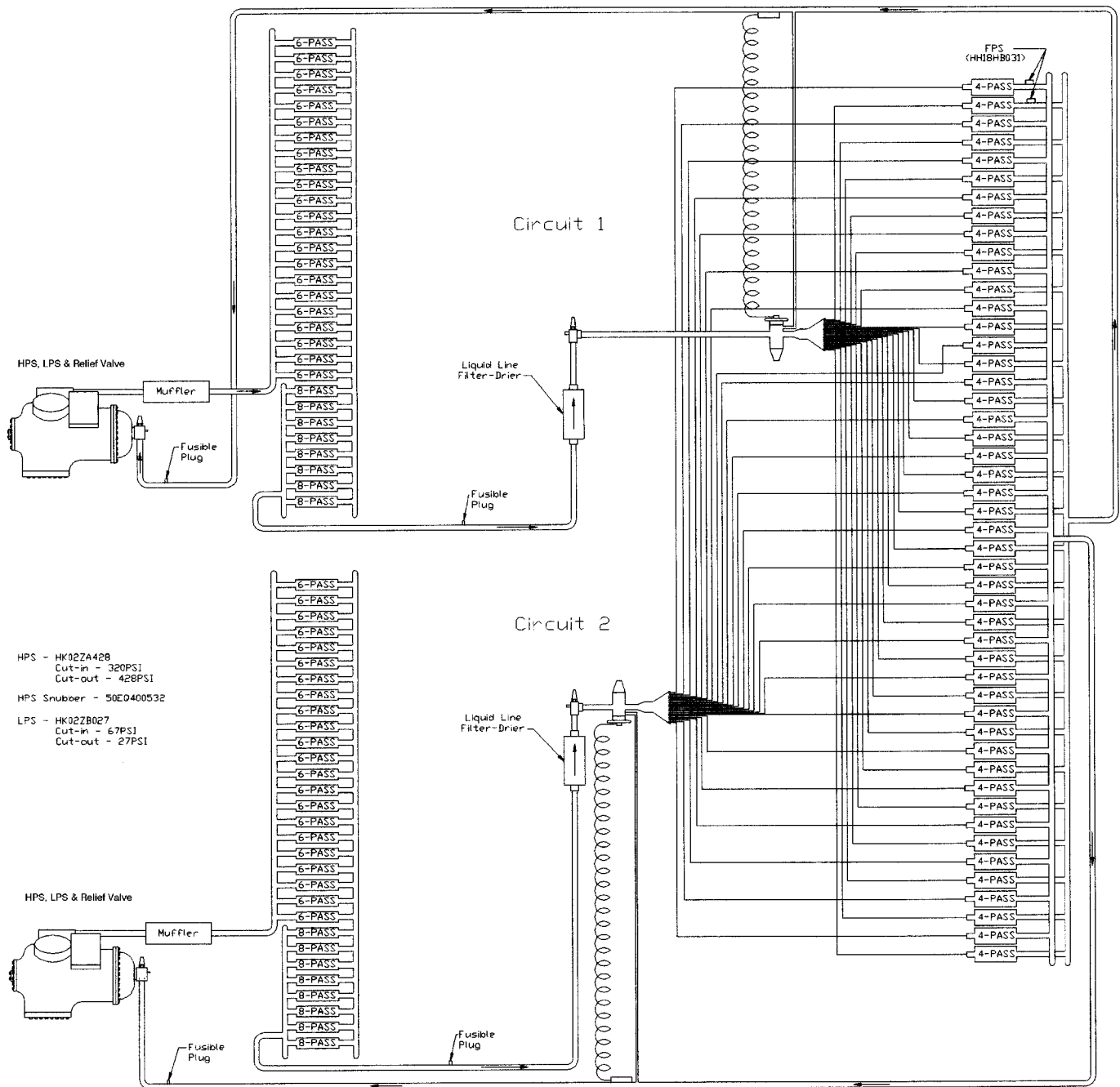
- FPS — Freezer Protection Switch
- HPS — High-Pressure Switch
- LPS — Low-Pressure Switch

**Fig. 61 — Typical Refrigerant Circuiting (48EJ,EK,EW,EY024-034)**





**Fig. 62 — Typical Refrigerant Circuiting (48EJ,EK,EW,EY038,044)**



HPS - HK02ZA42B  
 Cut-in - 320PSI  
 Cut-out - 428PSI

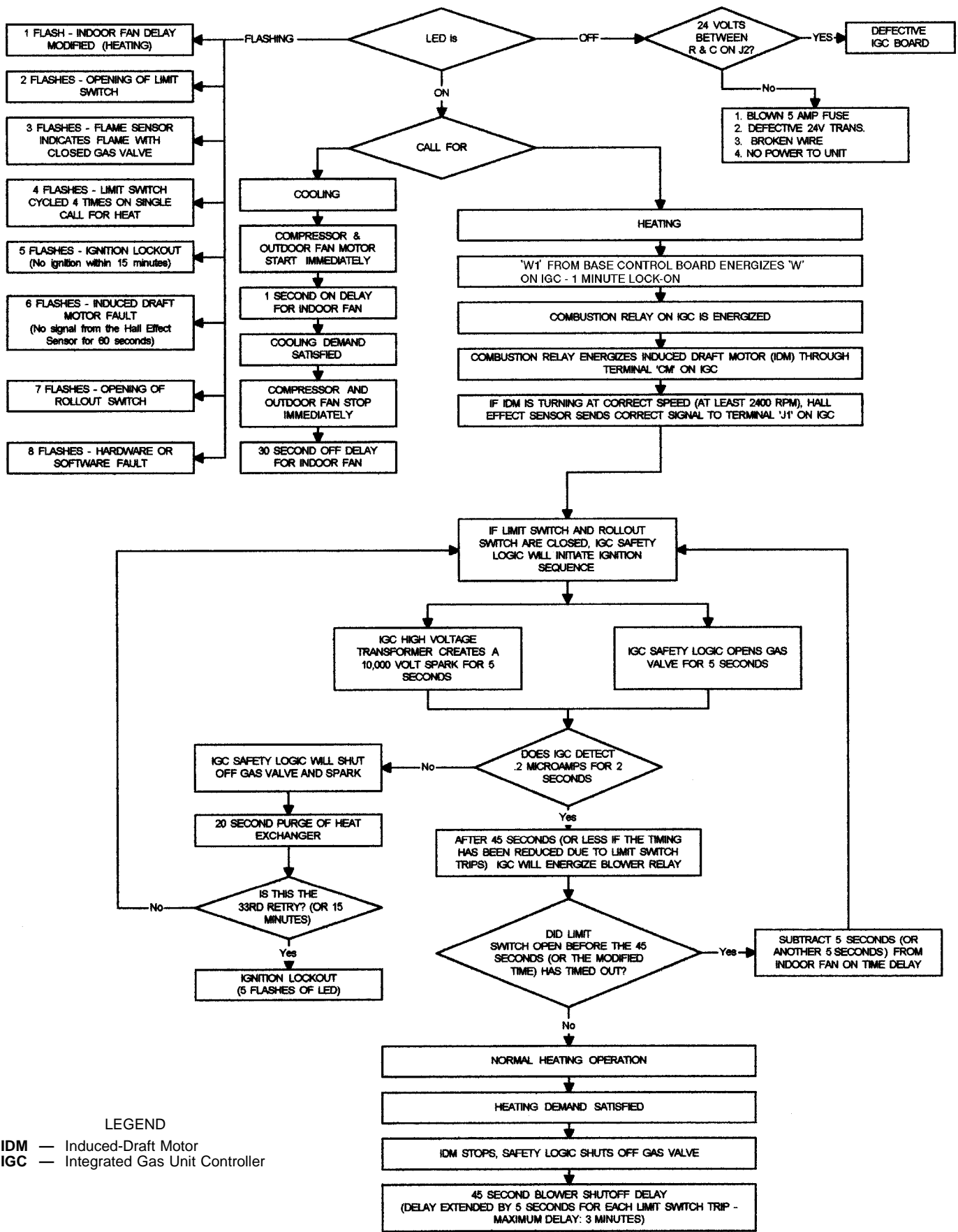
HPS Snubber - 50E0400532

LPS - HK02ZB027  
 Cut-in - 67PSI  
 Cut-out - 27PSI

**LEGEND**

**FPS** — Freeze Protection Switch  
**HPS** — High-Pressure Switch  
**LPS** — Low-Pressure Switch

**Fig. 63 — Typical Refrigerant Circuiting (48EJ,EK,EW,EY048)**



NOTE: Thermostat Fan Switch in the "AUTO" position or sensor-equipped unit.

Fig. 64 — IGC Control (Heating and Cooling)

The alarm codes for the IGC control board are shown in Table 22.

**Table 22 — IGC Control Board LED Alarms**

INDICATION	ERROR MODE
ON	Normal Operation
OFF	Hardware Failure
1 FLASH	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

**Diagnostic LEDs** — There are 3 LEDs (red, yellow, and green) on the lower right hand side of the control board. The red light is used to check unit operation and alarms. A constant pulse is normal unit operation. A series of quick blinks indicates an alarm. Refer to Table 23 below for a description of alarms. The yellow LED blinks during transmission with the CCN (Carrier Comfort Network). The green LED blinks during transmission with the expansion board.

**Table 23 — Control Board LED Alarms**

LED Blinks	Error Code	Description	Troubleshooting Comments
1	—	Normal Operation	The expansion board and control board flash the red LED in one-second intervals when the board is operating properly.
2	HF-13	Compressor 1 Safety	The high or low pressure safety switch for compressor no. 1 has opened for 3 seconds. The error will be cleared and compressor no. 1 will be allowed to turn on in 15 minutes. If the safeties have been tripped 3 times in 90 minutes, compressor no. 1 will be locked out until the control board has been manually reset.
3	HF-14	Compressor 2 Safety	The high or low pressure safety switch for compressor no. 2 has opened for 3 seconds. The error will be cleared and compressor no. 2 will be allowed to turn on in 15 minutes. If the safeties have been tripped 3 times in 90 minutes, compressor no. 2 will be locked out until the control board has been manually reset.
4	HF-15	Thermostat Failure	The thermostat is calling for both heating and cooling at the same time. The unit will operate on a first call basis and will automatically reset.
5	HF-05	SAT Thermistor Failure	The supply-air temperature (SAT) sensor has failed. First check for wiring errors, then replace sensor.
6	HF-06	OAT Thermistor Failure	The outside air temperature (OAT) sensor has failed. First check for wiring errors, then replace sensor.
7	HF-03	Space Temp. Sen. Failure	The space temperature sensor has failed. First check for wiring errors, then replace sensor.
8	HF-12	RAT Thermistor Failure	The return-air temperature (RAT) sensor has failed. Ensure that the unit is a VAV unit. If NOT a VAV unit set DIP switch position 1 to the closed position and reset power. Then check for wiring errors. Finally, replace sensor.
9	SE-05	Loss of Communications with Expansion Board	Communications between the expansion board and the control board have been interrupted. Ensure that an expansion board is installed and wired using the wire harness supplied with the expansion module. If an expansion board is not used ensure that DIP switch position 3 is in the closed position, and reset power.
10	HF-16	Control Board Failure	Generated when hardware has failed on control board. Replace the control board.
11	HF-17	Expansion Board Failure	Generated when hardware has failed on the expansion board. Replace the expansion board.

**DIP** — Dual In-Line Package  
**VAV** — Variable Air Volume

Tables 24-26 show the input and output channel designations.

**Table 24 — I/O Channel Designations Base Module — CV**

TERMINAL NO.	ASSIGNMENT	TERMINAL NO.	ASSIGNMENT
T1-2	SPT (CCN) — 10K $\Omega$ Thermistor	T23-25	Compressor 2 Safety — DI (24 vac)
T3-4	STO (CCN) — 10K $\Omega$ Thermistor	T24-25	Outside Air Enthalpy — DI (24 vac)
T5-6	OAT — 5K $\Omega$ Thermistor	T26-27	Economizer Pos. — AO (4-20 mA)
T7-8	SAT — 5K $\Omega$ Thermistor	T28-29	Heat 1 Relay — DO (24 vac)
T9-10	—	T30-29	Heat 2 Relay — DO (24 vac)
T11-12	SAT Reset — AI (4 to 20 mA)	T31-32	CV Power Exhaust 1/Modulating Power Exhaust — DO (115 vac)
T13-14	—	T33-32	CV Power Exhaust 2 — DO (115 vac)
T15-16	—	T34-35	Condenser Fan — DO (115 vac)
T17-25	Y1 or Remote Start/Stop — DI (24 vac)	T36-35	OFC2 — DO (115 vac)
T18-25	Y2 — DI (24 vac)	T37-38	—
T19-25	W1 — DI (24 vac)	T39-38	—
T20-25	W2 — DI (24 vac)	K1	Indoor Fan Relay — DO (LV)
T21-25	G — DI (24 vac)	K2	Compr. 1 — DO (HV)
T22-25	Compressor 1 Safety — DI (24 vac)	K3	Compr. 2 — DO (HV)

**Table 25 — I/O Channel Designations Base Module — VAV**

TERMINAL NO.	ASSIGNMENT	TERMINAL NO.	ASSIGNMENT
T1-2	SPT (CCN) — 10K $\Omega$ Thermistor	T23-25	Compressor 2 Safety — DI (24 vac)
T3-4	RAT — 5K $\Omega$ Thermistor	T24-25	Outside Air Enthalpy — DI (24 vac)
T5-6	OAT — 5K $\Omega$ Thermistor	T26-27	Economizer Pos. — AO (4-20 mA)
T7-8	SAT — 5K $\Omega$ Thermistor	T28-29	Heat 1 Relay — DO (24 vac)
T9-10	—	T30-29	Heat Interlock Relay — DO (24 vac)
T11-12	SAT Reset — AI (4 to 20 mA)	T31-32	Modulated Power Exhaust — DO (115 vac)
T13-14	—	T33-32	—
T15-16	—	T34-35	Condenser Fan — DO (115 vac)
T17-25	Remote Start/Stop — DI (24 vac)	T36-35	OFC2 — DO (115 vac)
T18-25	—	T37-38	Unloader 1 — DO (115 vac)
T19-25	—	T39-38	Unloader 2 — DO (115 vac)
T20-25	—	K1	Indoor Fan Relay — DO (LV)
T21-25	—	K2	Compr. 1 (HV)
T22-25	Compressor 1 Safety — DI (24 vac)	K3	Compr. 2 — DO (HV)

**Table 26 — I/O Channel Designations Expansion Module (Field-Installed) — CV and VAV**

TERMINAL NO.	ASSIGNMENT	TERMINAL NO.	ASSIGNMENT
T1-2	—	T23-25	Fire — Evacuation — DI (24 vac)
T3-4	—	T24-25	Fire — Smoke Purge — DI (24 vac)
T5-6	—	T26-27	—
T7-8	—	T28-29	—
T9-10	—	T30-29	Alarm Light Indicator — DO (24 vac)
T11-12	IAQ Indoor — AI (4 to 20 mA)	T31-32	Power Exhaust Fire No. 1 — DO (115 vac)
T13-14	IAQ Outdoor — AI (4 to 20 mA)	T33-32	Power Exhaust Fire No. 2 — DO (115 vac)
T15-16	—	T34-35	Power Exhaust Fire No. 3 — DO (115 vac)
T17-25	Fan Status — DI (24 vac)	T36-35	Power Exhaust Fire No. 4 — DO (115 vac)
T18-25	Filter Status — DI (24 vac)	T37-38	—
T19-25	Field Applied Status — DI (24 vac)	T39-38	—
T20-25	Demand Limit — DI (24 vac)	K1	—
T21-25	Fire — Unit Shutdown — DI (24 vac)	K2	—
T22-25	Fire — Pressurization — DI (24 vac)	K3	—

LEGEND (Tables 24-26)

AI — Analog Input  
 AO — Analog Output  
 CCN — Carrier Comfort Network  
 CV — Constant Volume  
 DI — Direct Input  
 DO — Direct Output  
 HV — High Voltage  
 IAQ — Indoor Air Quality

K $\Omega$  — Kilo-Ohms  
 LV — Low Voltage  
 OAT — Outdoor-Air Temperature  
 OFC — Outdoor Fan Contactor  
 RAT — Return-Air Temperature  
 SAT — Supply-Air Temperature  
 SPT — Space Temperature  
 STO — Space Temperature Offset  
 T — Terminal  
 VAV — Variable Air Volume

NOTE: For 4 to 20 mA signals, all even numbered terminals are negative (-) polarity, and all odd numbered terminals are positive (+) polarity.

## PACKAGED SERVICE TRAINING

Our packaged service training programs provide an excellent way to increase your knowledge of the equipment discussed in this manual. Product programs cover:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs is available. All programs include a video cassette and/or slides and a companion booklet. Use these for self teaching or to conduct full training sessions.

For a free Service Training Material Catalog (STM), call 1-800-962-9212. Ordering instructions are included.

# START-UP CHECKLIST

MODEL NO.: \_\_\_\_\_

SERIAL NO.: \_\_\_\_\_

SOFTWARE VERSION (SEE FIG. 16) \_\_\_\_\_

TECHNICIAN: \_\_\_\_\_

DATE: \_\_\_\_\_

## PRE-START-UP:

- VERIFY THAT DIP SWITCH SETTINGS ARE CORRECT
- VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- REMOVE ALL SHIPPING HOLDDOWN BOLTS AND BRACKETS PER INSTRUCTIONS
- VERIFY INSTALLATION OF ECONOMIZER HOOD
- VERIFY INSTALLATION OF ALL OPTIONS AND ACCESSORIES
- VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- CHECK GAS PIPING FOR LEAKS
- CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
- VERIFY THAT UNIT IS LEVEL WITHIN TOLERANCES
- CHECK FAN WHEELS AND PROPELLERS FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SETSCREW IS TIGHT
- VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- VERIFY THAT SUCTION, DISCHARGE, AND LIQUID SERVICE VALVES ON EACH CIRCUIT ARE OPEN

## START-UP

### ELECTRICAL

SUPPLY VOLTAGE L1-L2 \_\_\_\_\_ L2-L3 \_\_\_\_\_ L3-L1 \_\_\_\_\_

COMPRESSOR AMPS — COMPRESSOR NO. 1 L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_

— COMPRESSOR NO. 2 L1 \_\_\_\_\_ L2 \_\_\_\_\_ L3 \_\_\_\_\_

SUPPLY FAN AMPS (CV) \_\_\_\_\_ EXHAUST FAN AMPS \_\_\_\_\_  
(VAV) \_\_\_\_\_\*

\*VAV fan supply amps reading must be taken with a true RMS meter for accurate readings.

- ADJUST VARIABLE FREQUENCY DRIVE (VFD) TO APPLICATION REQUIREMENTS.

### TEMPERATURES

OUTDOOR-AIR TEMPERATURE \_\_\_\_\_ F DB (Dry Bulb)

RETURN-AIR TEMPERATURE \_\_\_\_\_ F DB \_\_\_\_\_ F WB (Wet Bulb)

COOLING SUPPLY AIR \_\_\_\_\_ F

GAS HEAT SUPPLY AIR \_\_\_\_\_ F

### PRESSURES

GAS INLET PRESSURE \_\_\_\_\_ IN. WG

GAS MANIFOLD PRESSURE STAGE NO. 1 \_\_\_\_\_ IN. WG STAGE NO. 2 \_\_\_\_\_ IN. WG

REFRIGERANT SUCTION CIRCUIT NO. 1 \_\_\_\_\_ PSIG CIRCUIT NO. 2 \_\_\_\_\_ PSIG

REFRIGERANT DISCHARGE CIRCUIT NO. 1 \_\_\_\_\_ PSIG CIRCUIT NO. 2 \_\_\_\_\_ PSIG

- VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS ON PAGE 48

**GENERAL**

- SET ECONOMIZER MINIMUM VENT POSITION TO JOB REQUIREMENTS
- ENSURE DRIVES OPERATE WITHIN LIMITS OF FAN PERFORMANCE TABLES

HIGH PRESSURE SWITCH SETTING \_\_\_\_\_ psig

LOW PRESSURE SWITCH SETTING \_\_\_\_\_ psig

MOTOR PULLEY PART NUMBER \_\_\_\_\_

FAN PULLEY PART NUMBER \_\_\_\_\_

BELT PART NUMBER \_\_\_\_\_

BELT SIZE \_\_\_\_\_ in.

FILTER QUANTITY \_\_\_\_\_

FILTER SIZES \_\_\_\_\_ in.

ADDITIONAL NOTES:

---

---

---

---

---

---

---

CUT ALONG DOTTED LINE



## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>