48TM016-028
Single-Package Rooftop Units
Electric Cooling/Gas Heating

Installation, Start-Up and Service Instructions

CONTENTS

SAFETY CONSIDERATIONS

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

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

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

⚠ WARNING

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).

IMPORTANT: Units have high ambient operating limits. If limits are exceeded, the units will automatically lock the compressor out of operation. Manual reset will be required to restart the compressor.

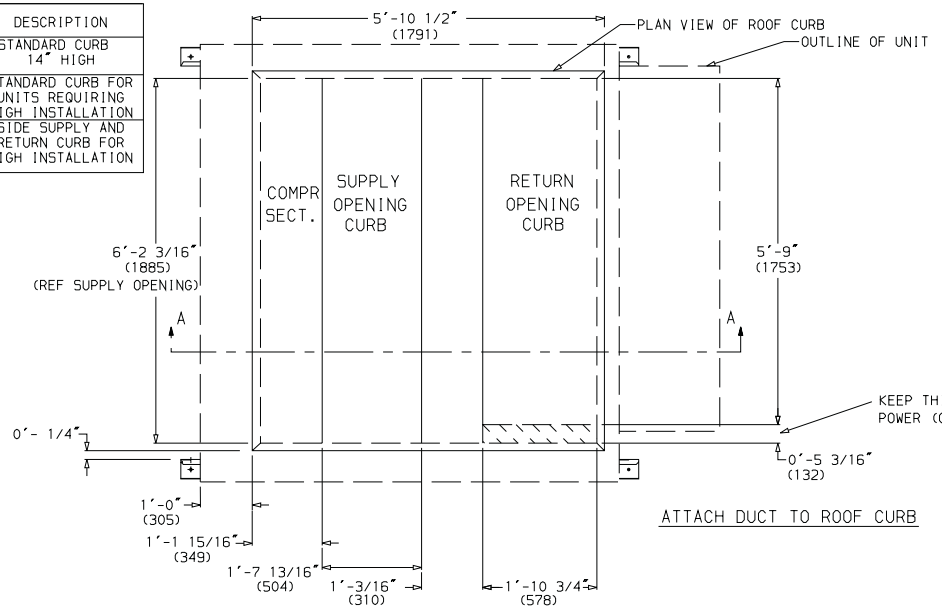
INSTALLATION

Step 1 — Provide Unit Support

ROOF CURB — Assemble and install accessory roof curb or horizontal adapter roof curb in accordance with instructions shipped with this accessory. See Fig. 1A-2. Install insulation, cant strips, roofing, and counter flashing as shown. Ductwork can be installed to roof curb or horizontal adapter roof curb before unit is set in place. Curb or adapter roof curb should be level. This is necessary to permit unit drain to function properly. Unit leveling tolerance is $\pm$ $^1/_{16}$ in. per linear ft in any direction. Refer to Accessory Roof Curb or Horizontal Adapter Roof Curb Installation Instructions for additional information as required. When accessory roof curb or horizontal adapter roof curb is used, unit may be installed on class A, B, or C roof covering material.

Instructions continued on page 4.

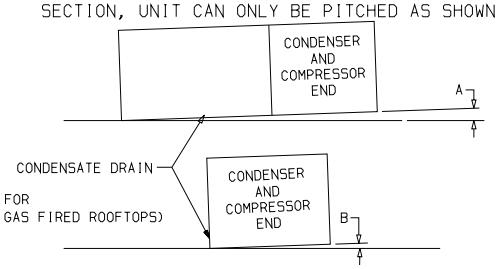
PKG. NO. REF.	CURB HEIGHT	DESCRIPTION
CRRFCURB010A00	1′-2″ (305)	STANDARD CURB 14″ HIGH
CRRFCURB011A00	2′-0″ (610)	STANDARD CURB FOR UNITS REQUIRING HIGH INSTALLATION
CRRFCURB012A00	2′-0″ (610)	SIDE SUPPLY AND RETURN CURB FOR HIGH INSTALLATION



ATTACH DUCT TO ROOF CURB

NOTES:
1. ROOF CURB ACCESSORY IS SHIPPED DISASSEMBLED.
2. INSULATED PANELS: 1″ THICK NEOPRENE COATED 1-1/2 LB DENSITY
3. DIMENSIONS IN ( ) ARE IN MILLIMETERS.
4. ⇨ DIRECTION OF AIR FLOW
5. ROOFCURB: 16 GA. (VA03-56) STL.
6. **A 90 DEGREE ELBOW MUST BE INSTALLED ON THE SUPPLY DUCT WORK BELOW THE UNIT DISCHARGE FOR UNITS EQUIPPED WITH . ELECTRIC HEATERS.**

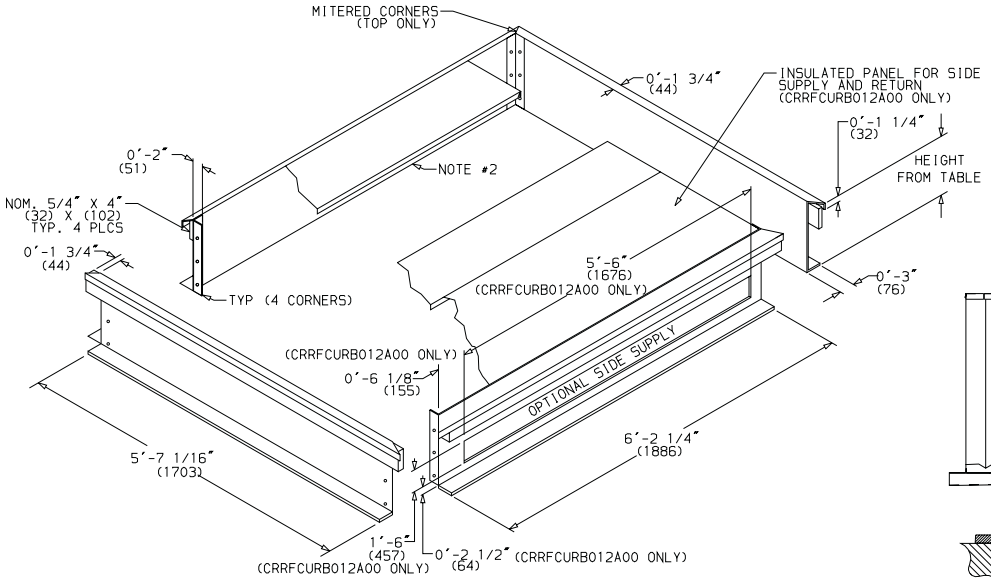
NOTE:
TO PREVENT THE HAZARD OF STAGNANT WATER BUILD-UP IN THE DRAIN PAN OF THE INDOOR SECTION, UNIT CAN ONLY BE PITCHED AS SHOWN.

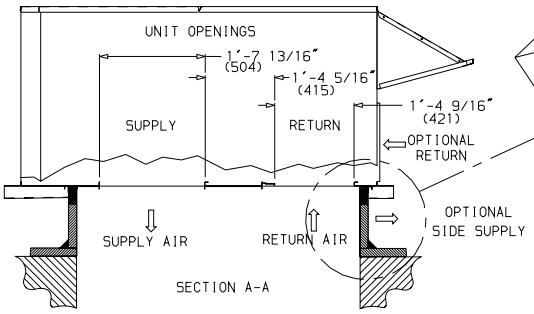


DIMENSIONS (degrees and inches)

UNIT	A		B	
	DEG.	IN.	DEG.	IN.
ALL	.28	.45	.28	.43

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.





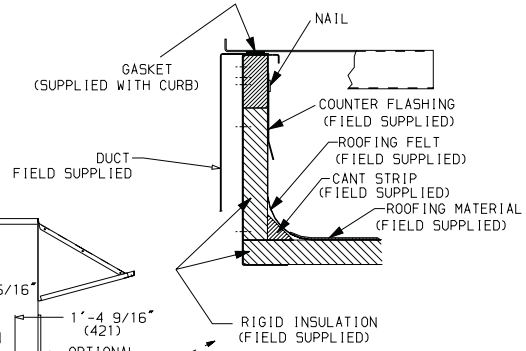
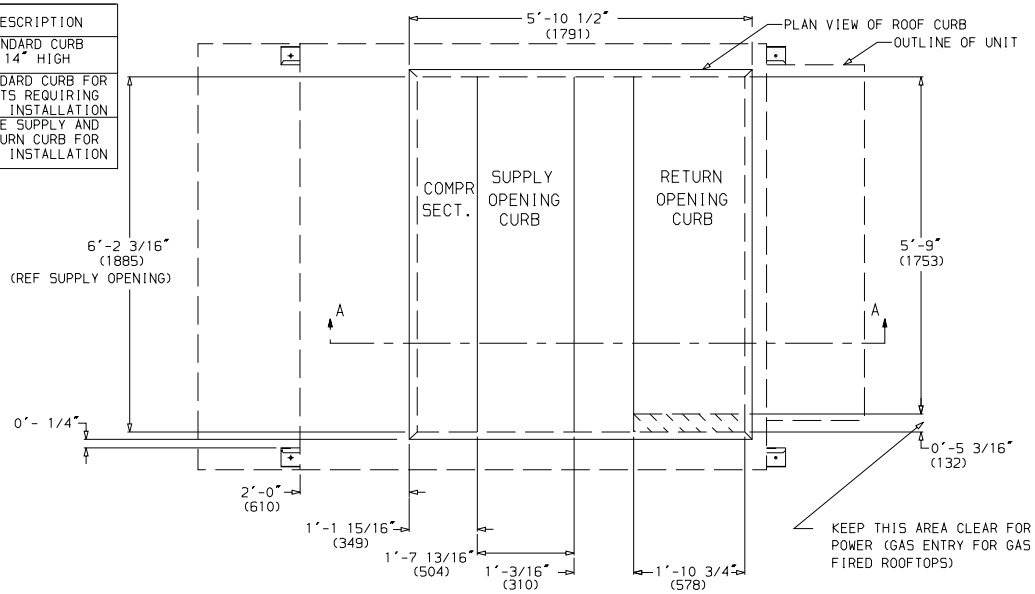


Fig. 1A — Roof Curb Details — 48TM016-025

PKG. NO. REF.	CURB HEIGHT	DESCRIPTION
CRRFCURB010A00	1′-2″ (305)	STANDARD CURB 14″ HIGH
CRRFCURB011A00	2′-0″ (610)	STANDARD CURB FOR UNITS REQUIRING HIGH INSTALLATION
CRRFCURB012A00	2′-0″ (610)	SIDE SUPPLY AND RETURN CURB FOR HIGH INSTALLATION



ATTACH DUCT TO ROOF CURB

NOTES:
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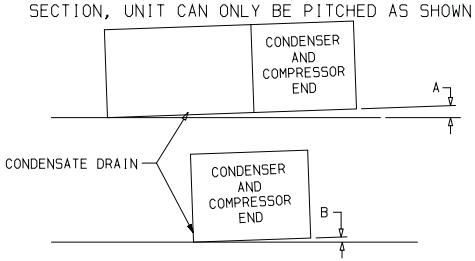
2. INSULATED PANELS: 1″ THICK NEOPRENE COATED 1-1/2 LB DENSITY
3. DIMENSIONS IN ( ) ARE IN MILLIMETERS.
4. ⇨ DIRECTION OF AIR FLOW
5. ROOFCURB: 16 GA. (VA03-56) STL.
6. **A 90 DEGREE ELBOW MUST BE INSTALLED ON THE SUPPLY DUCT WORK BELOW THE UNIT DISCHARGE FOR UNITS EQUIPPED WITH . ELECTRIC HEATERS.**

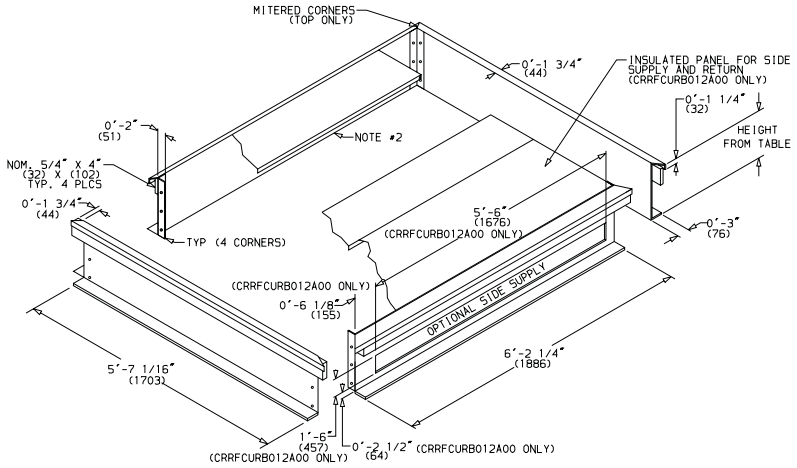
NOTE:
TO PREVENT THE HAZARD OF STAGNANT WATER BUILD-UP IN THE DRAIN PAN OF THE INDOOR SECTION, UNIT CAN ONLY BE PITCHED AS SHOWN.

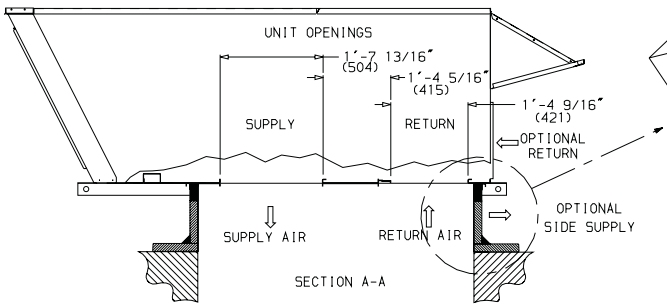


DIMENSIONS (degrees and inches)

UNIT	A		B	
	DEG.	IN.	DEG.	IN.
ALL	.28	.45	.28	.43

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.





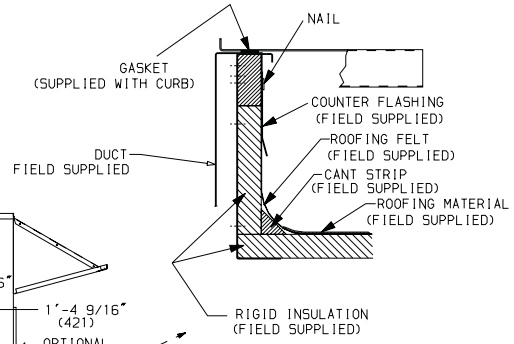
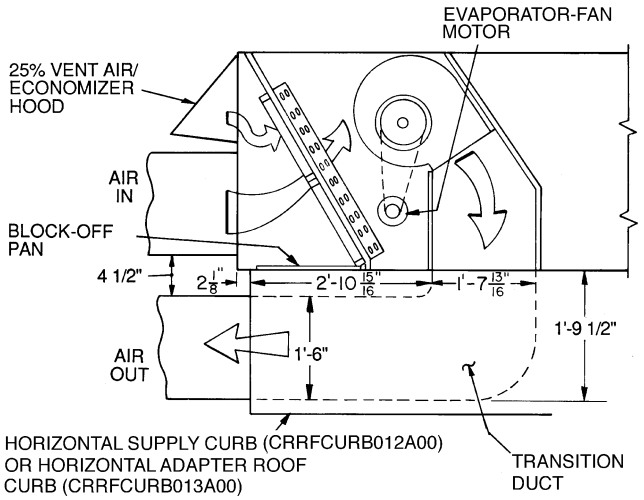


Fig. 1B — Roof Curb Details — 48TM028



NOTE: For preassembled horizontal adapter roof curb part no. CRRFCURB013A00, the accessory kit includes a factory-designed, high-static, transition duct. For horizontal curb part no. CRRFCURB012A00, a field-supplied transition duct is required.

Fig. 2 — Horizontal Adapter Roof Curbs and Roof Curbs

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

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

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. Rollers may be used to move unit across a roof. Level by using unit frame as a reference; leveling tolerance is ± 1/16 in. per linear ft in any direction. See Fig. 3 for additional information. Unit operating weight is shown in Table 1.

Four lifting holes are provided in ends of unit base rails as shown in Fig. 3. Refer to rigging instructions on unit.

NOTE: On 48TM028 units, the lower forklift braces must be removed prior to setting unit on roof curb.

POSITIONING — Maintain clearance, per Fig. 4-6, around and above unit to provide minimum distance from combustible materials, proper airflow, and service access.

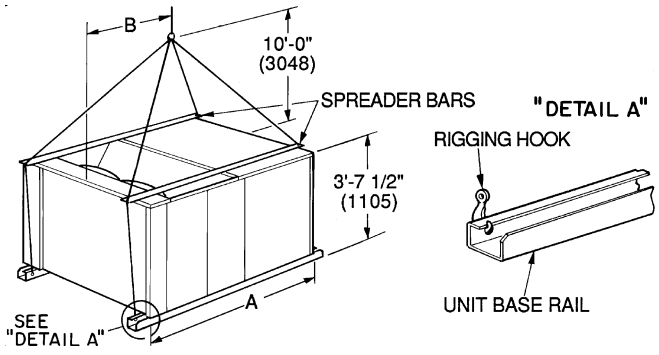
Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air. For proper unit operation, adequate combustion and ventilation air must be provided in accordance with Section 5.3 (Air for Combustion and Ventilation) of the National Fuel 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 operating weight is shown in Table 1.

Instructions continued on page 10.



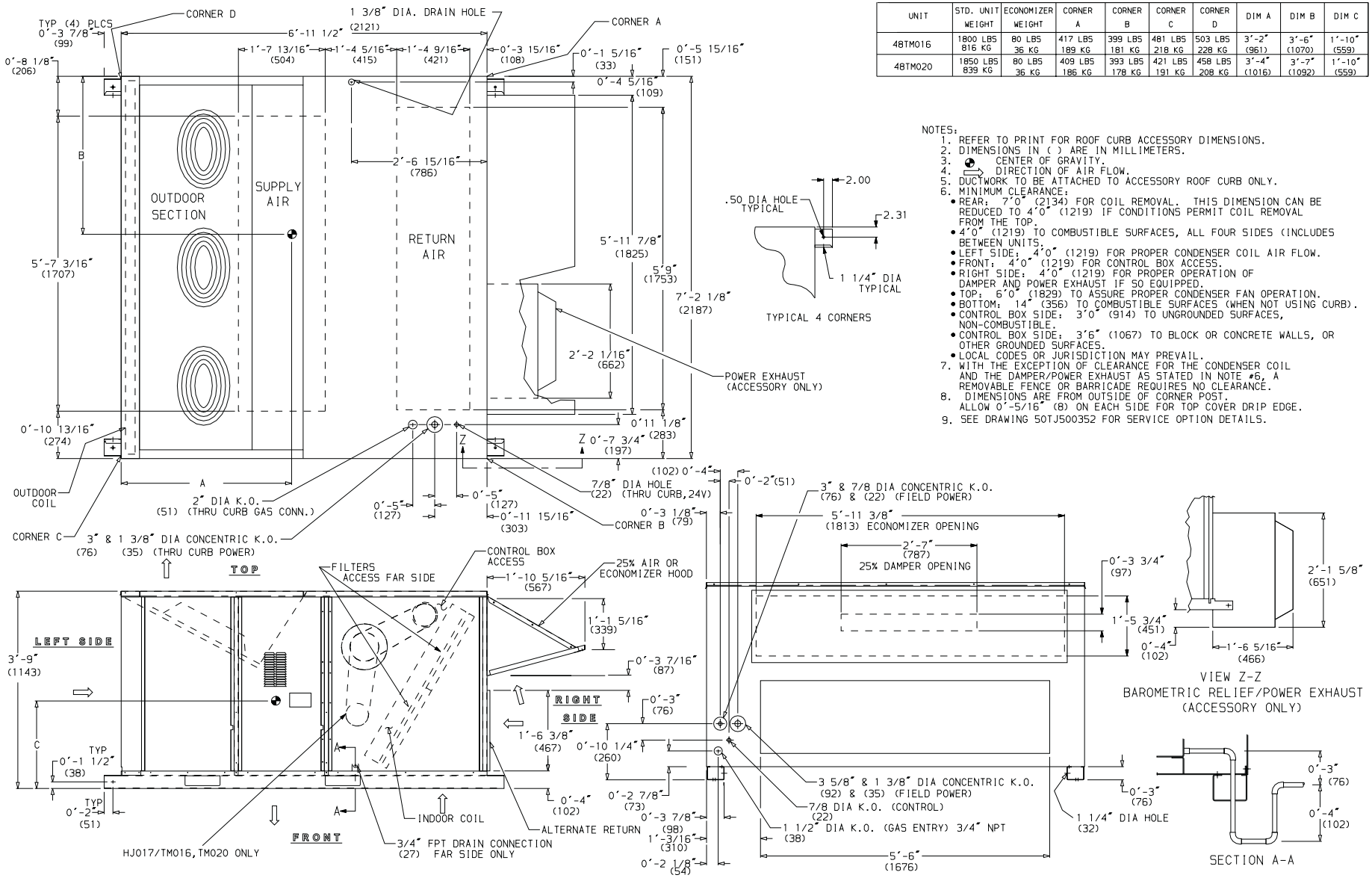
NOTES:
1. Dimensions in ( ) are in millimeters.
2. Refer to Fig. 4-6 for unit operating weights.
3. Remove boards at ends of unit and runners prior to rigging.
4. Rig by inserting hooks into unit base rails as shown. Use corner post from packaging to protect coil from damage. Use bumper boards for spreader bars on all units.
5. Weights do not include optional EconoMi$er. See Fig. 4-6 for EconoMi$er weight.
6. Weights given are for aluminum evaporator and condenser coil plate fins.

⚠ CAUTION

All panels must be in place when rigging.

UNIT 48TM	MAXIMUM SHIPPING WEIGHT		DIMENSIONS			
			A		B	
	Lb	Kg	Ft-in.	mm	Ft-in.	mm
016	1875	850	6-11 1/2	2121	4-0	1219
020	1925	873	6-11 1/2	2121	3-2	964
025	2035	923	6-11 1/2	2121	3-4	1016
028	2445	1109	6-11 1/2	2121	3-4	1016

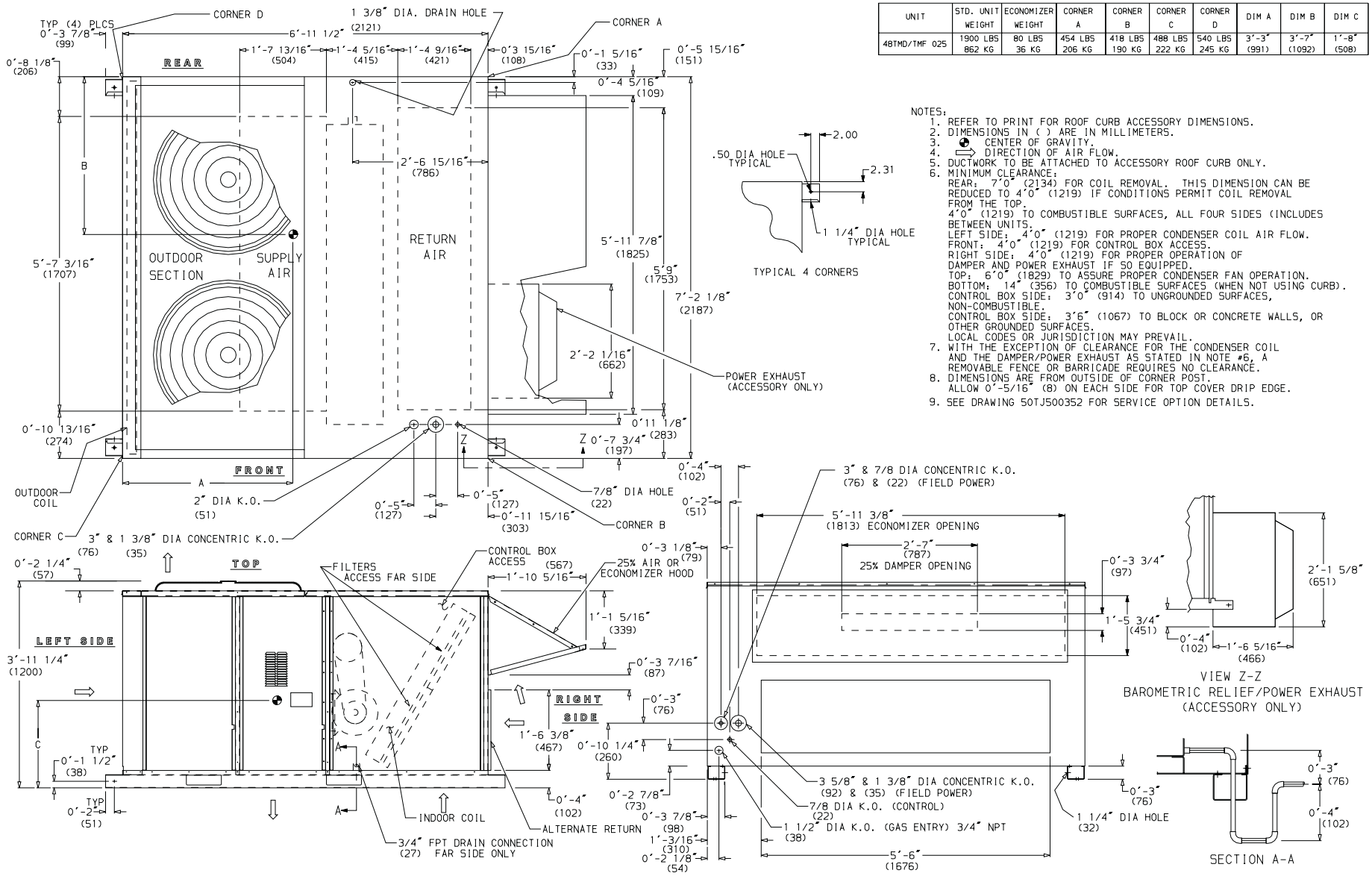
Fig. 3 — Rigging Details



UNIT	STD. UNIT WEIGHT	ECONOMIZER WEIGHT	CORNER A	CORNER B	CORNER C	CORNER D	DIM A	DIM B	DIM C
48TM016	1800 LBS 816 KG	80 LBS 36 KG	417 LBS 189 KG	399 LBS 181 KG	481 LBS 218 KG	503 LBS 228 KG	3'-2" (961)	3'-6" (1070)	1'-10" (559)
48TM020	1850 LBS 839 KG	80 LBS 36 KG	409 LBS 186 KG	393 LBS 178 KG	421 LBS 191 KG	458 LBS 208 KG	3'-4" (1016)	3'-7" (1092)	1'-10" (559)

NOTES:
1. REFER TO PRINT FOR ROOF CURB ACCESSORY DIMENSIONS.
2. DIMENSIONS IN ( ) ARE IN MILLIMETERS.
3. ⊕ CENTER OF GRAVITY.
4. ⇨ DIRECTION OF AIR FLOW.
5. DUCTWORK TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY.
6. MINIMUM CLEARANCE:
   - REAR: 7'0" (2134) FOR COIL REMOVAL. THIS DIMENSION CAN BE REDUCED TO 4'0" (1219) IF CONDITIONS PERMIT COIL REMOVAL FROM THE TOP.
   - 4'0" (1219) TO COMBUSTIBLE SURFACES, ALL FOUR SIDES (INCLUDES BETWEEN UNITS.
   - LEFT SIDE: 4'0" (1219) FOR PROPER CONDENSER COIL AIR FLOW.
   - FRONT: 4'0" (1219) FOR CONTROL BOX ACCESS.
   - RIGHT SIDE: 4'0" (1219) FOR PROPER OPERATION OF DAMPER AND POWER EXHAUST IF SO EQUIPPED.
   - TOP: 6'0" (1829) TO ASSURE PROPER CONDENSER FAN OPERATION.
   - BOTTOM: 14" (356) TO COMBUSTIBLE SURFACES (WHEN NOT USING CURB).
   - CONTROL BOX SIDE: 3'0" (914) TO UNGROUNDED SURFACES, NON-COMBUSTIBLE.
   - CONTROL BOX SIDE: 3'6" (1067) TO BLOCK OR CONCRETE WALLS, OR OTHER GROUNDED SURFACES.
   - LOCAL CODES OR JURISDICTION MAY PREVAIL.
7. WITH THE EXCEPTION OF CLEARANCE FOR THE CONDENSER COIL AND THE DAMPER/POWER EXHAUST AS STATED IN NOTE #6, A REMOVABLE FENCE OR BARRICADE REQUIRES NO CLEARANCE.
8. DIMENSIONS ARE FROM OUTSIDE OF CORNER POST. ALLOW 0'-5/16" (8) ON EACH SIDE FOR TOP COVER DRIP EDGE.
9. SEE DRAWING 50TJ500352 FOR SERVICE OPTION DETAILS.

Fig. 4 — Base Unit Dimensions — 48TM016,020



UNIT	STD. UNIT WEIGHT	ECONOMIZER WEIGHT	CORNER A	CORNER B	CORNER C	CORNER D	DIM A	DIM B	DIM C
48TMD/TMF 025	1900 LBS 862 KG	80 LBS 36 KG	454 LBS 206 KG	418 LBS 190 KG	488 LBS 222 KG	540 LBS 245 KG	3'-3" (991)	3'-7" (1092)	1'-8" (508)

NOTES:
1. REFER TO PRINT FOR ROOF CURB ACCESSORY DIMENSIONS.
2. DIMENSIONS IN ( ) ARE IN MILLIMETERS.
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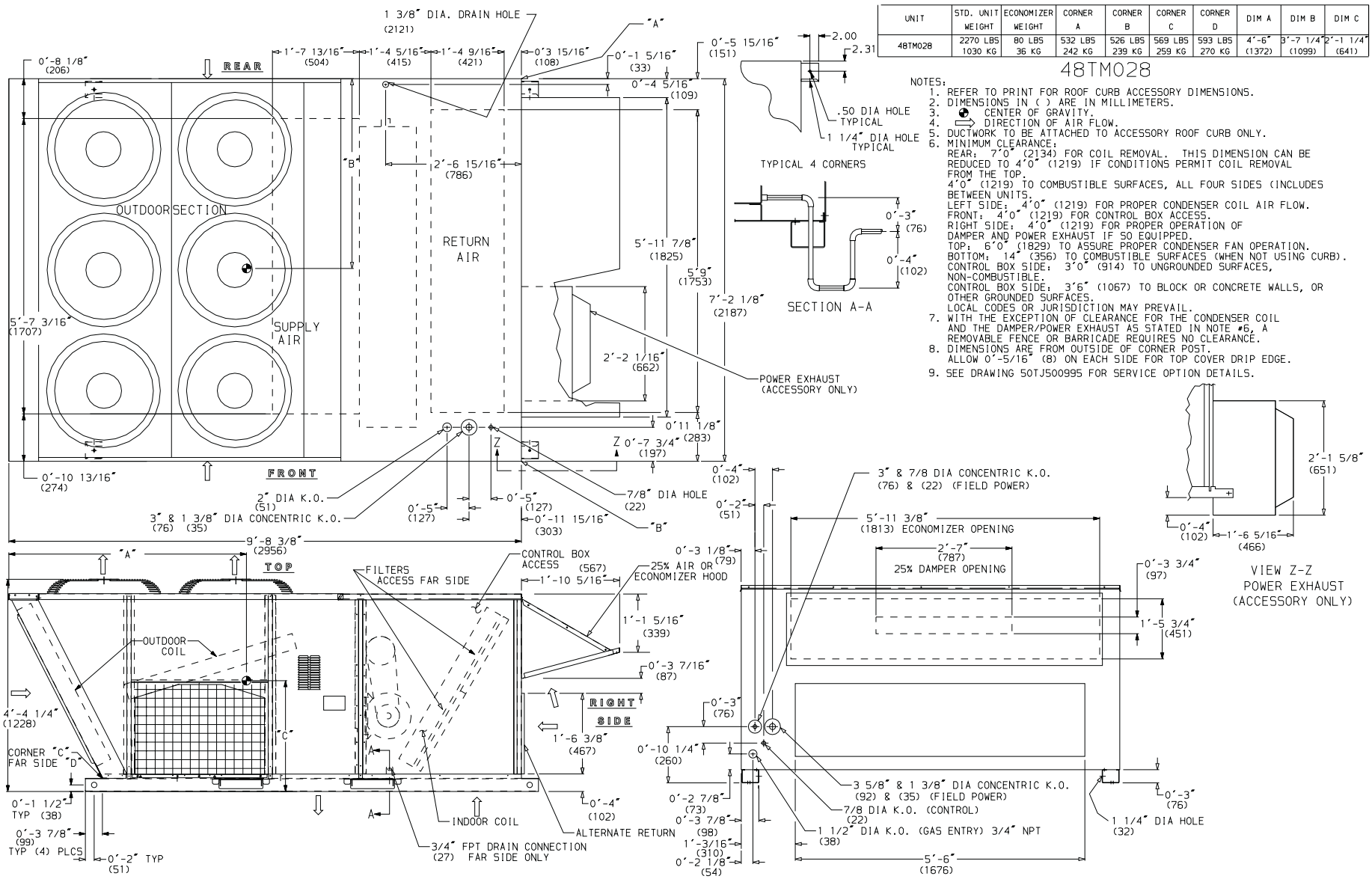
8. DIMENSIONS ARE FROM OUTSIDE OF CORNER POST. ALLOW 0'-5/16" (8) ON EACH SIDE FOR TOP COVER DRIP EDGE.
9. SEE DRAWING 50TJ500352 FOR SERVICE OPTION DETAILS.

Fig. 5 — Base Unit Dimensions — 48TM025



UNIT	STD. UNIT WEIGHT	ECONOMIZER WEIGHT	CORNER A	CORNER B	CORNER C	CORNER D	DIM A	DIM B	DIM C
48TM028	2270 LBS 1030 KG	80 LBS 36 KG	532 LBS 242 KG	526 LBS 239 KG	569 LBS 259 KG	593 LBS 270 KG	4'-6" (1372)	3'-7 1/4" (1099)	2'-1 1/4" (641)

48TM028

NOTES:
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9. SEE DRAWING 50TJ500995 FOR SERVICE OPTION DETAILS.

Fig. 6 — Base Unit Dimensions — 48TM028

Table 1 — Physical Data

UNIT 48TM		016D/F	020D/F	025D/F	028D/F
NOMINAL CAPACITY (tons)		15	18	20	25
OPERATING WEIGHT		1800	1850	1900	2270
EconoMi$er		80	80	80	80
MoistureMi$er™ Dehumidification Package		40	40	40	40
COMPRESSOR/MANUFACTURER		Scroll, Copeland			
Quantity...Model (Ckt 1, Ckt 2)		1...ZR94KC, 1...ZR72KC	1...ZR108KC, 1...ZR94KC	1...ZR125KC, 1...ZR108KC	1...ZRU140KC,* 1...ZR144KC
Capacity Stages (%)		60, 40	55, 45	55, 45	50, 50
Number of Refrigerant Circuits		2	2	2	2
Oil (oz) (Ckt 1, Ckt 2)		85, 60	106, 81	106,106	136, 106
REFRIGERANT TYPE		R-22			
Expansion Device		TXV			
Operating Charge (lb-oz)					
Circuit 1†		19-8	19-8	19-11	26-13
Circuit 2		13-8	19-2	13-14	25-10
CONDENSER COIL		Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins			
Rows...Fins/in.		4...15	4...15	4...15	3...15 (2 coils)
Total Face Area (sq ft)		21.7	21.7	21.7	43.4
CONDENSER FAN		Propeller Type			
Nominal Cfm		10,500	10,500	14,200	21,000
Quantity...Diameter (in.)		3...22	3...22	2...30	6...22
Motor Hp...Rpm		1/2...1050	1/2...1050	1...1075	1/2...1050
Watts Input (Total)		1100	1100	3400	2200
EVAPORATOR COIL		Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced or Copper Plate Fins, Face Split			
Rows...Fins/in.		4...15	4...15	4...15	4...15
Total Face Area (sq ft)		17.5	17.5	17.5	17.5
EVAPORATOR FAN		Centrifugal Type			
Quantity...Size (in.)		2...12 x 12	2...12 x 12	2...12 x 12	2...12 x 12
Type Drive		Belt	Belt	Belt	Belt
Nominal Cfm		6000	7200	8000	10,000
Motor Hp		5	5	7.5	10
Motor Nominal Rpm		1745	1745	1745	1740
Maximum Continuous Bhp		6.13	5.90	8.7 [208/230, 575 v] 9.5 [460 v]	10.2 [208/230, 575 v] 11.8 [460 v]
Motor Frame Size		184T	184T	213T	215T
Nominal Rpm High/Low		—	—	—	—
Fan Rpm Range	**Low-Medium Static**	873-1021	910-1095	1002-1151	1066-1283
	High Static	1025-1200	1069-1287	1193-1369	1332-1550
Motor Bearing Type		Ball	Ball	Ball	Ball
Maximum Allowable Rpm		1550	1550	1550	1550
Motor Pulley Pitch Diameter	**Low-Medium Static**	4.9/5.9	4.9/5.9	5.4/6.6	4.9/5.9
Min/Max (in.)	**High Static**	4.9/5.9	4.9/5.9	5.4/6.6	4.9/5.9
Nominal Motor Shaft Diameter (in.)		1 1/8	1 1/8	1 3/8	1 3/8
Fan Pulley Pitch Diameter (in.)	**Low-Medium Static**	9.4	9.4	9.4	8.0
	High Static	8.0	8.0	7.9	6.4
Nominal Fan Shaft Diameter (in.)		1 7/16	1 7/16	1 7/16	1 7/16
Belt, Quantity...Type...Length (in.)	**Low-Medium Static**	1...BX...50	1...BX...50	1...BX...53	2...BX...50
	High Static	1...BX...48	1...BX...48	1...BX...50	2...BX...47
Pulley Center Line Distance (in.)		13.3-14.8	13.3-14.8	14.6-15.4	14.6-15.4
Speed Change per Full Turn of	**Low-Medium Static**	37	37	37	36
Movable Pulley Flange (rpm)	**High Static**	44	34	44	45
Movable Pulley Maximum Full Turns From Closed Position		6**	6††	6**	6††
Factory Speed		3.5	3.5	3.5	3.5
Factory Speed Setting (rpm)	**Low-Medium Static**	965	1002	1120	1182
	High Static	1134	1178	1328	1470
Fan Shaft Diameter at Pulley (in.)		1 7/16	1 7/16	1 7/16	1 7/16

LEGEND

Bhp — Brake Horsepower
TXV — Thermostatic Expansion Valve

*The ZRU140KC compressor is a tandem compressor, consisting of a ZR72KC (25% total capacity) and a ZR68KC (24% total capacity).

†Circuit 1 uses the lower portion of the condenser coil and lower portion of the evaporator coils; and Circuit 2 uses the upper portion of both coils.

**Pulley has 6 turns. Due to belt and pulley size, movable pulley cannot be set to 0 to 1 1/2 turns open.

††Pulley has 6 turns. Due to belt and pulley size, movable pulley cannot be set to 0 to 1/2 turns open.

***Rollout switch is manual reset.

†††The 48TM028 unit requires 2-in. industrial-grade filters capable of handling face velocities up to 625 ft/min (such as American Air Filter no. 5700 or equivalent).

NOTE: The 48TM016-028 units have a low-pressure switch (standard) located on the suction side.

Table 1 — Physical Data (cont)

UNIT 48TM			016D/F	020D/F	025D/F	028D/F
FURNACE SECTION						
Rollout Switch Cutout Temp (F)* **			190	190	190	190
Burner Orifice Diameter (in. ...drill size)						
Natural Gas		**Std**	0.1285...30/0.136...29	0.1285...30/0.136...29	0.1285...30/0.136...29	0.1285...30/0.136...29
Thermostat Heat Anticipator Setting (amps)						
208/230, 575 v	**Stage 1**		0.98	0.98	0.98	0.98
	Stage 2		0.44	0.44	0.44	0.44
460 v	**Stage 1**		0.80	0.80	0.80	0.80
	Stage 2		0.44	0.44	0.44	0.44
Gas Input	**Stage 1**		206,000/270,000	206,000/270,000	206,000/270,000	206,000/270,000
	Stage 2		275,000/360,000	275,000/360,000	275,000/360,000	275,000/360,000
Efficiency (Steady-State) (%)			81	81	81	81
Temperature Rise Range			15-45/20-50	15-45/20-50	15-45/20-50	15-45/20-50
Manifold Pressure (in. wg)						
Natural Gas		**Std**	3.3	3.3	3.3	3.3
Liquid Propane¶		**Alt**	3.3	3.3	3.3	3.3
Gas Valve Quantity			1	1	1	1
Gas Valve Pressure Range						
in. wg			5.5-13.5	5.5-13.5	5.5-13.5	5.5-13.5
psig			0.235-0.487	0.235-0.487	0.235-0.487	0.235-0.487
Field Gas Connection Size (in.-FPT)			3/4	3/4	3/4	3/4
HIGH-PRESSURE SWITCH (psig)						
Cutout			426			
Reset (Auto)			320			
LOW-PRESSURE SWITCH (psig)						
Cutout			27			
Reset (Auto)			44			
FREEZE PROTECTION THERMOSTAT (F)						
Opens			30 ± 5			
Closes			45 ± 5			
OUTDOOR-AIR INLET SCREENS			Cleanable			
Quantity...Size (in.)			2...20 x 25 x 1 1...20 x 20 x 1			
RETURN-AIR FILTERS			Throwaway†††			
Quantity...Size (in.)			4...20 x 20 x 2 4...16 x20 x 2			
POWER EXHAUST			1/2 Hp, 208/230-460 v Motor Direct Drive, Propeller-Fan (Factory-Wired for 460 v)			

LEGEND

Bhp — Brake Horsepower
TXV — Thermostatic Expansion Valve

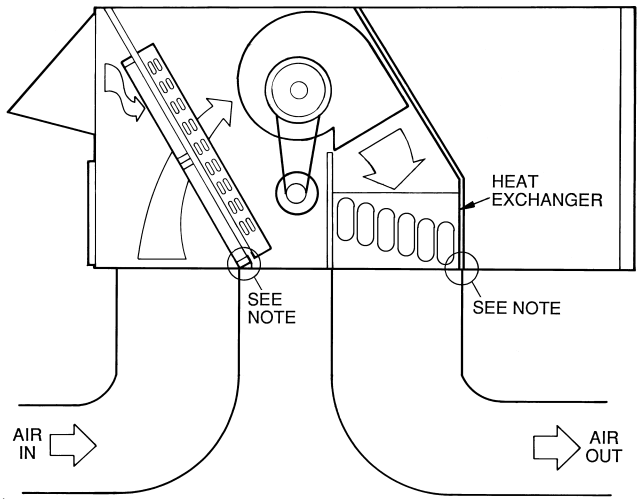
*The ZRU140KC compressor is a tandem compressor, consisting of a ZR72KC (25% total capacity) and a ZR68KC (24% total capacity).
†Circuit 1 uses the lower portion of the condenser coil and lower portion of the evaporator coils; and Circuit 2 uses the upper portion of both coils.
**Pulley has 6 turns. Due to belt and pulley size, movable pulley cannot be set to 0 to 1 1/2 turns open.
††Pulley has 6 turns. Due to belt and pulley size, movable pulley cannot be set to 0 to 1/2 turns open.
***Rollout switch is manual reset.
†††The 48TM028 unit requires 2-in. industrial-grade filters capable of handling face velocities up to 625 ft/min (such as American Air Filter no. 5700 or equivalent).
¶A Liquid Propane kit is available as an accessory.

NOTE: The 48TM016-028 units have a low-pressure switch (standard) located on the suction side.

Step 3 — Field Fabricate Ductwork — Secure all ducts to building structure. Use flexible duct connectors between unit and ducts as required. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

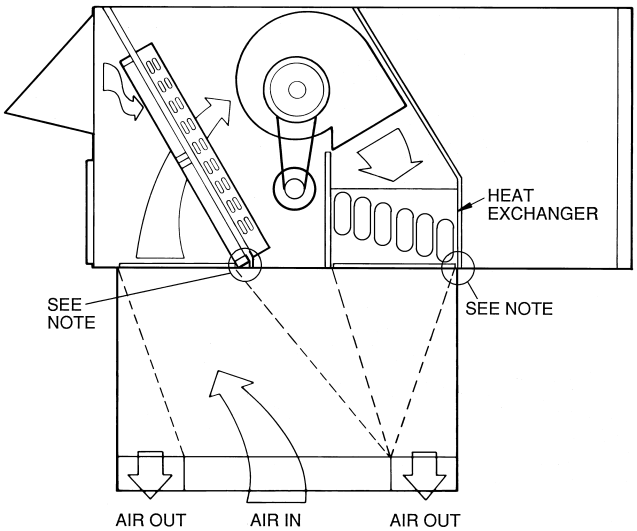
Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

Step 4 — Make Unit Duct Connections — Unit is shipped for thru-the-bottom duct connections. Ductwork openings are shown in Fig. 1 and 4-6. Duct connections are shown in Fig. 7. Field-fabricated concentric ductwork may be connected as shown in Fig. 8 and 9. Attach all ductwork to roof curb and roof curb basepans.



NOTE: Do not drill in this area; damage to basepan may result in water leak.

Fig. 7 — Air Distribution — Thru-the-Bottom



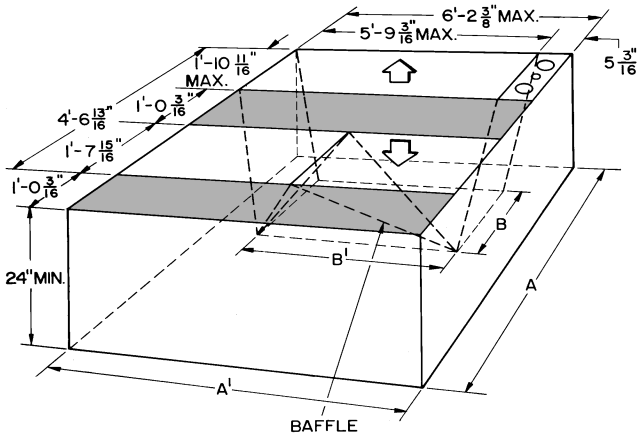
NOTE: Do not drill in this area; damage to basepan may result in water leak.

Fig. 8 — Concentric Duct Air Distribution

Step 5 — Install Flue Hood and Wind Baffle — Flue hood and wind baffle are shipped secured under main control box. To install, secure flue hood to access panel. See Fig. 10. The wind baffle is then installed over the flue hood.

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

Step 6 — Trap Condensate Drain — See Fig. 12 for drain location. One 3/4-in. half coupling is provided inside unit evaporator section for condensate drain connection. An 8 1/2-in. x 3/4-in. diameter and 2-in. x 3/4-in. diameter pipe nipple, coupled to standard 3/4-in. diameter elbows, provide a straight path down through hole in unit base rails (see Fig. 13). A trap at least 4-in. deep must be used.



NOTE: Dimensions A, A′, B, and B′ are obtained from field-supplied ceiling diffuser.

Shaded area indicates block-off panels.

Fig. 9 — Concentric Duct Details

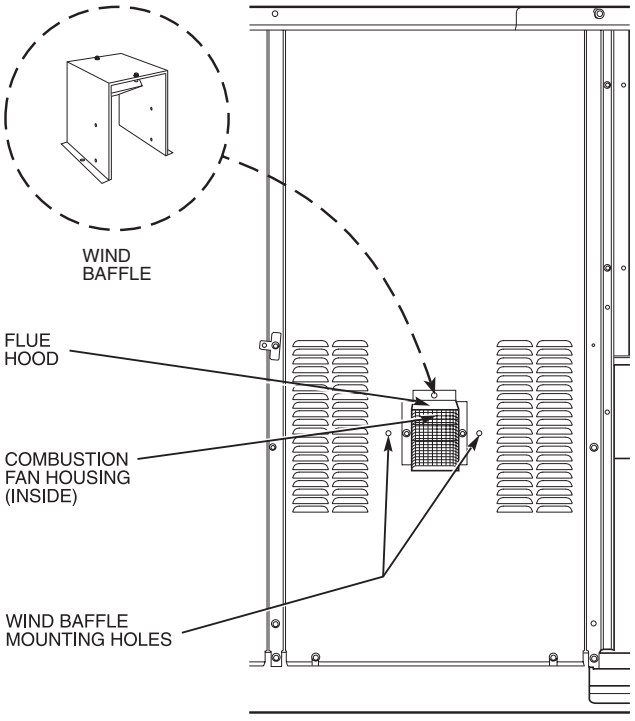


Fig. 10 — Flue Hood Location

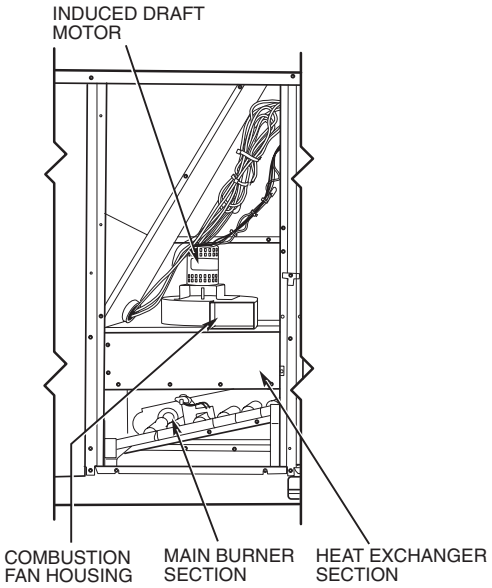


Fig. 11 — Combustion Fan Housing Location

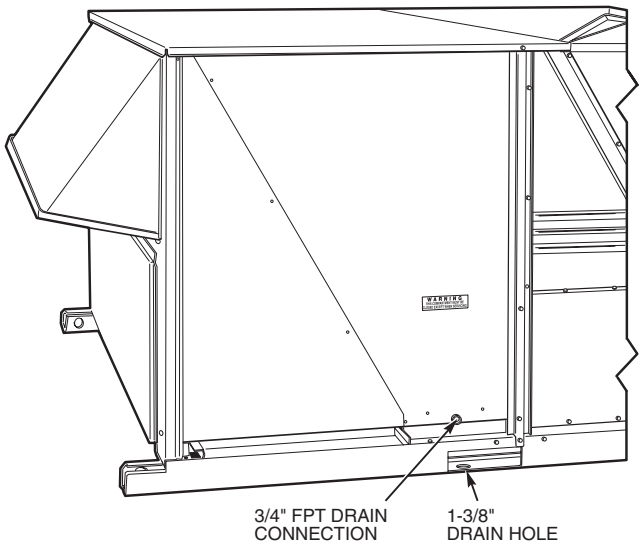


Fig. 12 — Condensate Drain Details (48TM016 Shown)

Step 7 — 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 field-supplied 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. 14.

⚠ 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 5.5 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 8 — Make Electrical Connections

FIELD POWER SUPPLY — Unit is factory wired for voltage shown on nameplate.

When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (Table 2).

All field wiring must comply with NEC and local requirements.

Route power ground lines through control box end panel or unit basepan (see Fig. 4-6) to connections as shown on unit wiring diagram and Fig. 15.

⚠ CAUTION

The correct power phasing is critical in the operation of the scroll compressors. An incorrect phasing will cause the compressor to rotate in the wrong direction. This may lead to premature compressor failure.

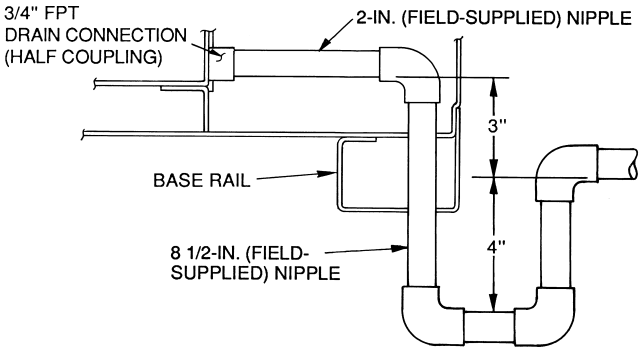


Fig. 13 — Condensate Drain Piping Details

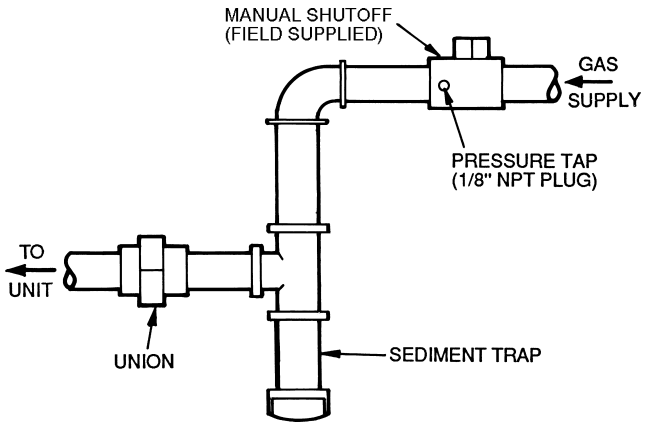


Fig. 14 — Field Gas Piping

⚠ WARNING

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

Field wiring must confirm to temperature limitations for type "T" wire. All field wiring must comply with NEC and local requirements.

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

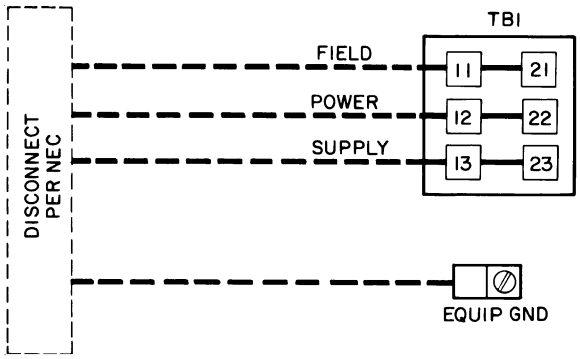
1. Remove cap from red (208 v) wire.
2. Remove cap from orange (230 v) spliced wire.
3. Replace orange wire with red wire.
4. Recap both wires.

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

Operating voltage to compressor must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2%.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

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



NOTE: The maximum wire size for TB1 is 2/0.

LEGEND

EQUIP — Equipment
GND — Ground
NEC — National Electrical Code
TB — Terminal Block

Fig. 15 — Field Power Wiring Connections

Route thermostat cable or equivalent single leads of colored wire from subbase terminals through conduit in unit to low-voltage connections as shown on unit label wiring diagram and in Fig. 16.

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 anticipator settings as follows:

VOLTAGE	W1	W2
208/230,575	0.98	0.44
460	0.80	0.44

Settings may be changed slightly to provide a greater degree of comfort for a particular installation.

OPTIONAL NON-FUSED DISCONNECT — On units with the optional non-fused disconnect, incoming power will be wired into the disconnect switch. Refer to Fig. 17 for wiring for 100 and 200 amp disconnect switches. Units with an MOCP (maximum overcurrent protection) under 100 will use the 100 amp disconnect switch. Units with an MOCP over 100 will use the 200 amp disconnect switch. Refer to the applicable disconnect wiring diagram.

To prevent breakage during shipping, the disconnect handle and shaft are shipped and packaged inside the unit control box. Install the disconnect handle before unit operation. To install the handle and shaft, perform the following procedure:

1. Open the control box door and remove the handle and shaft from shipping location.
2. Loosen the Allen bolt located on the disconnect switch. The bolt is located on the square hole and is used to hold the shaft in place. The shaft cannot be inserted until the Allen bolt is moved.
3. Insert the disconnect shaft into the square hole on the disconnect switch. The end of the shaft is specially cut and the shaft can only be inserted in the correct orientation.
4. Tighten the Allen bolt to lock the shaft into position.
5. Close the control box door.
6. Attach the handle to the external access door with the two screws provided. When the handle is in the ON position, the handle will be vertical. When the handle is in the OFF position, the handle will be horizontal.
7. Turn the handle to the OFF position and close the door. The handle should fit over the end of the shaft when the door is closed.
8. The handle must be in the OFF position to open the control box door.

OPTIONAL CONVENIENCE OUTLET — On units with optional convenience outlet, a 115-v GFI (ground fault interrupt) convenience outlet receptacle is provided for field wiring. Field wiring should be run through the $^{7}/_{8}$-in. knockout provided in the basepan near the return air opening.

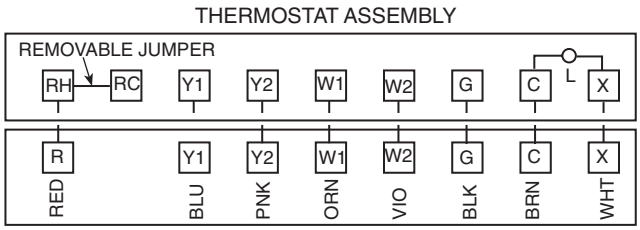
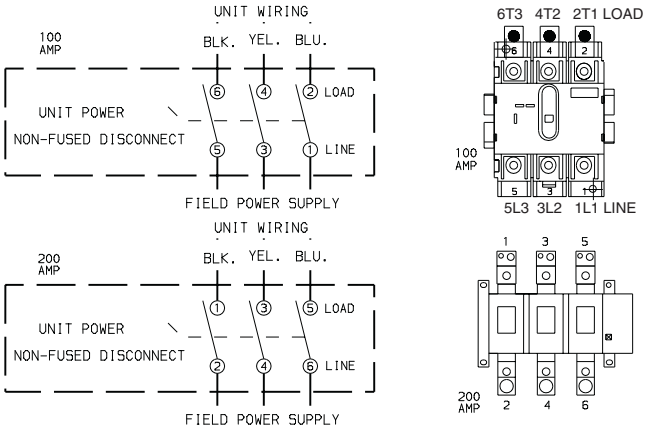


Fig. 16 — Field Control Thermostat Wiring



NOTE: The disconnect takes the place of TB-1 as shown on the unit wiring diagram label and the component arrangement label.

Fig. 17 — Optional Non-Fused Disconnect Wiring

Table 2 — Electrical Data

UNIT 48TM	NOMINAL VOLTAGE (3 Ph, 60 Hz)	VOLTAGE RANGE		COMPRESSOR						OFM			IFM		POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY	
				No. 1		No. 1A		No. 2											
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	FLA	MCA	MOCP*
016	208/230	187	253	32.1	195	—	—	20.7	156	3	0.5	1.7	5.0	15.8/15.8	—	—	0.57	82/82	110/110
															4.6	18.8	0.57	86/86	110/110
	460	414	508	16.4	95	—	—	10	70	3	0.5	0.8	5.0	7.9	—	—	0.30	41	50
															2.3	6.0	0.30	43	50
	575	518	633	12	80	—	—	8.2	54	3	0.5	0.75	5.0	6.0	—	—	0.57	31	40
															2.1	4.8	0.57	34	40
020	208/230	187	253	30.1	225	—	—	28.8	195	3	0.5	1.7	5.0	15.8/15.8	—	—	0.57	87/87	110/110
															4.6	18.8	0.57	92/92	110/110
	460	414	508	15.5	114	—	—	14.7	95	3	0.5	0.8	5.0	7.9	—	—	0.30	44	50
															2.3	6.0	0.30	47	60
	575	518	632.5	12.1	80	—	—	10.7	80	3	0.5	0.75	5.0	6.0	—	—	0.57	34	40
															2.1	4.8	0.57	36	40
025	208/230	187	253	42	239	—	—	33.6	225	2	1	6.6	7.5	25.0/25.0	—	—	0.57	124/124	150/150
															4.6	18.8	0.57	129/129	150/150
	460	414	508	19.2	125	—	—	17.3	114	2	1	3.3	7.5	13.0	—	—	0.30	61	80
															2.3	6.0	0.30	63	80
	575	518	633	13.8	80.0	—	—	13.5	80.0	2	1.0	3.4	7.5	10.0	—	—	0.57	48	60
															2.1	4.8	0.57	50	60
028	208/230	187.2	253	20.7	156	20.7	156	47.1	245	6	0.5	1.7	10.0	28.0/28.0	—	—	0.57	138/138	175/175
															4.6	18.8	0.57	143/143	150/175
	460	414	508	10	75	10	75	19.6	125	6	0.5	0.8	10.0	14.6	—	—	0.30	64	80
															2.3	6	0.30	66	80
	575	517.5	632.5	8.2	54	8.2	54	15.8	100	6	0.5	0.8	10.0	13.0	—	—	0.57	54	60
															2.1	4.8	0.57	56	70

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.

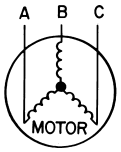
NOTES:

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.

% Voltage Imbalance

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

EXAMPLE: Supply voltage is 460-3-60.



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

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

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

$$= 457$$

Determine maximum deviation from average voltage.
(AB) 457 – 452 = 5 v
(BC) 464 – 457 = 7 v
(AC) 457 – 455 = 2 v

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.

Step 9 — Make Outdoor-Air Inlet Adjustments

MANUAL OUTDOOR-AIR DAMPER — All units (except those equipped with a factory-installed economizer) have a manual outdoor-air damper to provide ventilation air.

Damper can be preset to admit up to 25% outdoor air into return-air compartment. To adjust, loosen securing screws and move damper to desired setting, then retighten screws to secure damper (Fig. 18).

OPTIONAL ECONOMI$ER

EconoMi$er Control Module (See Fig. 19-21) — Set ECON SP dial to the D setting (Fig. 20).

Damper Vent Position Setting

1. Set fan switch at ON position (continuous fan operation) and close night switch if used.
2. Set system selector switch to OFF position.
3. Turn MIN POS (%) knob located on control module clockwise slowly until dampers assume desired vent position. *Do not manually operate EconoMi$er motor. Damage to motor will result.*

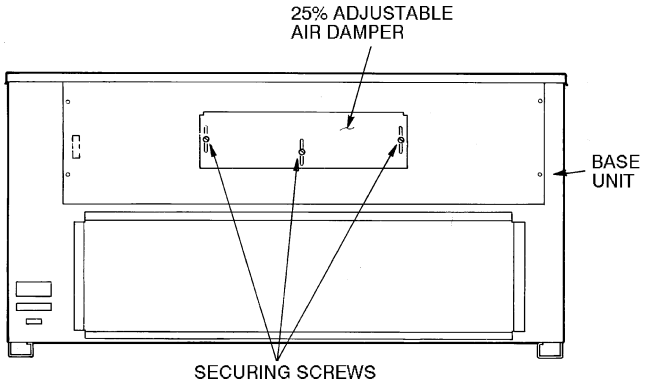


Fig. 18 — Standard 25% Outdoor-Air Section Details

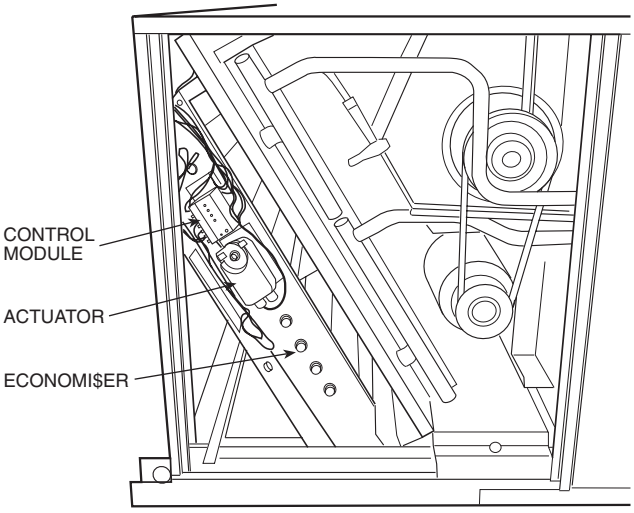


Fig. 19 — EconoMi$er Damper Assembly Assembly-End View

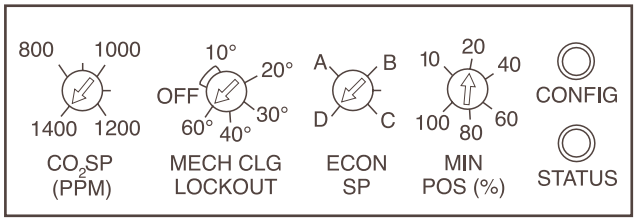


Fig. 20 — EconoMi$er Control Module Adjustment Potentiometers

Step 10 — Install Outdoor-Air Hood —

The outdoor-air hood is common to 25% air ventilation and EconoMi$er. If EconoMi$er is used, all electrical connections have been made and adjusted at the factory. Assemble and install hood in the field.

NOTE: The hood top panel, upper and lower filter retainers, hood drain pan, baffle (sizes 025 and 028), and filter support bracket are secured opposite the condenser end of the unit. The screens, hood side panels, remaining section of filter support bracket, seal strip, and hardware are in a package located inside the return-air filter access panel (Fig. 22).

1. Attach seal strip to upper filter retainer. See Fig. 23.
2. Assemble hood top panel, side panels, upper filter retainer, and drain pan (see Fig. 24).

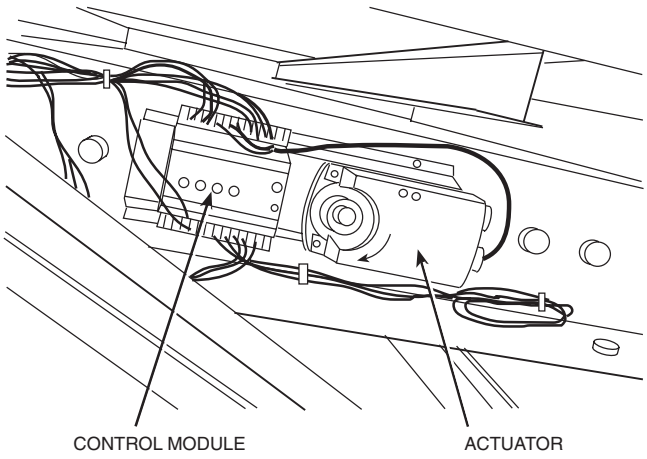


Fig. 21 — EconoMi$er Control Module Location

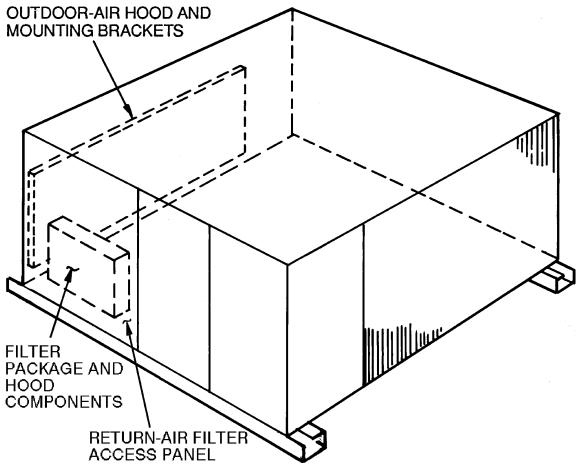


Fig. 22 — Outdoor-Air Hood Component Location

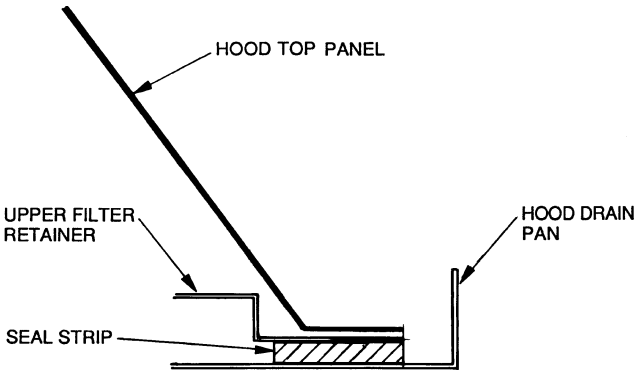


Fig. 23 — Seal Strip Location

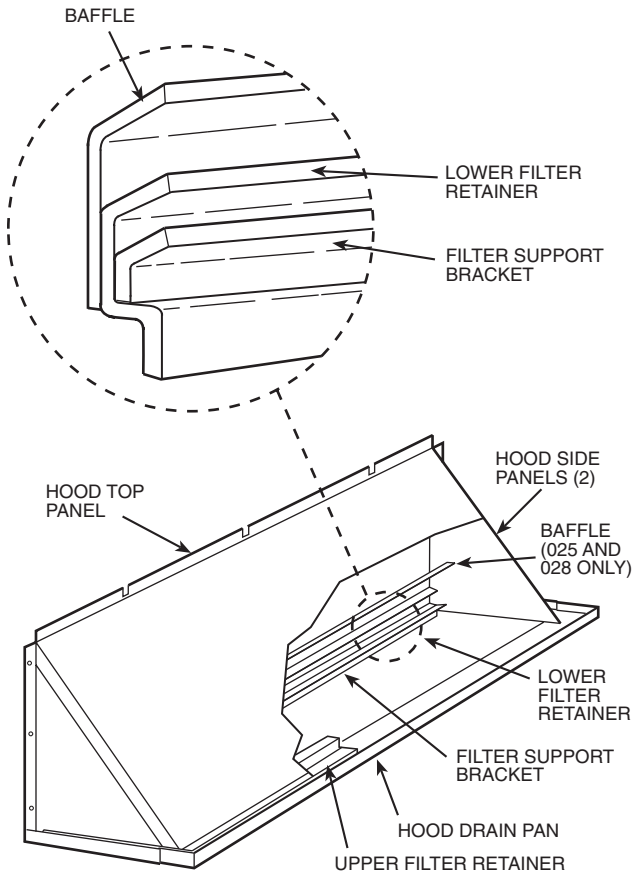


Fig. 24 — Outdoor-Air Hood Details

3. Secure lower filter retainer and support bracket to unit. See Fig. 24. Leave screws loose on 025 and 028 units.
4. Slide baffle (sizes 025 and 028) behind lower filter retainer and tighten screws.
5. Loosen sheet metal screws for top panel of base unit located above outdoor-air inlet opening, and remove screws for hood side panels located on the sides of the outdoor-air inlet opening.
6. Match notches in hood top panel to unit top panel screws. Insert hood flange between top panel flange and unit. Tighten screws.
7. Hold hood side panel flanges flat against unit, and install screws removed in Step 5.
8. Insert outdoor-air inlet screens and spacer in channel created by lower filter retainer and filter support bracket.
9. Attach remaining section of filter support bracket.

OUTDOOR-AIR ENTHALPY SENSOR INSTALLATION — Perform the following procedure to install the outdoor-air enthalpy sensor (part no. CROUTENT001A00).

1. Remove the outdoor-air temperature sensor cover. Save cover and screws. See Fig. 25.
2. Disconnect the wiring from the installed outdoor-air temperature sensor. See Fig. 26.
3. Use a $^1/_4$-in. nut driver to remove the 2 screws securing the outdoor-air temperature sensor to the sheet metal.
4. Mount the outdoor-air enthalpy sensor in the outdoor-air temperature sensor location using the screws removed in Step 3.
5. Connect the outdoor-air enthalpy sensor wiring harness to the EconoMi$er control module and sensor.
6. Re-install the sensor cover saved from Step 1.

RETURN-AIR TEMPERATURE SENSOR OR RETURN-AIR ENTHALPY SENSOR INSTALLATION — Perform the following procedure to install the return-air temperature sensor (part no. CRRETTMP001A00) or return-air enthalpy sensor (part no. CRRETENT001A00).

1. Attach the sensor to the mounting bracket using 2 self-tapping $^1/_2$-in. screws provided.
2. Mount the bracket to the inside of the return air opening flange using a $^1/_4$-in. nut driver and 2 no. 6 sheet metal screws.

NOTE: The sensor must be mounted in an upright position.

3. Feed the sensor wiring through the bushing in EconoMi$er to secure wires.
4. Route sensor wiring harness from sensor to EconoMi$er control module. Secure wiring harness to the original harness using tie wraps.
5. Wire the sensor to the EconoMi$er control module. See Fig. 27 and 28.

COMMISSIONING — The EconoMi$er saves energy when it uses outdoor air to provide free cooling instead of mechanical air conditioning. The EconoMi$er switchover strategy determines if the outdoor air is suitable for free cooling. The EconoMi$er chooses the switchover strategy with the most energy savings, provided that the required sensors are connected and functioning normally.

IMPORTANT: If a sensor stops functioning normally (becomes unreliable), the EconoMi$er switches to the next best strategy.

Refer to Table 3 to determine the sensors required for each strategy.

Table 3 — EconoMi$er Switchover Control Strategy

ECONOMI$ER SWITCHOVER STRATEGY	SENSORS REQUIRED			
	Outdoor-Air Temperature	Outdoor-Air Enthalpy	Return-Air Temperature	Return-Air Enthalpy
Dry Bulb	X			
Single Enthalpy		X		
Differential Temperature	X		X	
Differential Enthalpy*		X		X

*Must be selected manually.

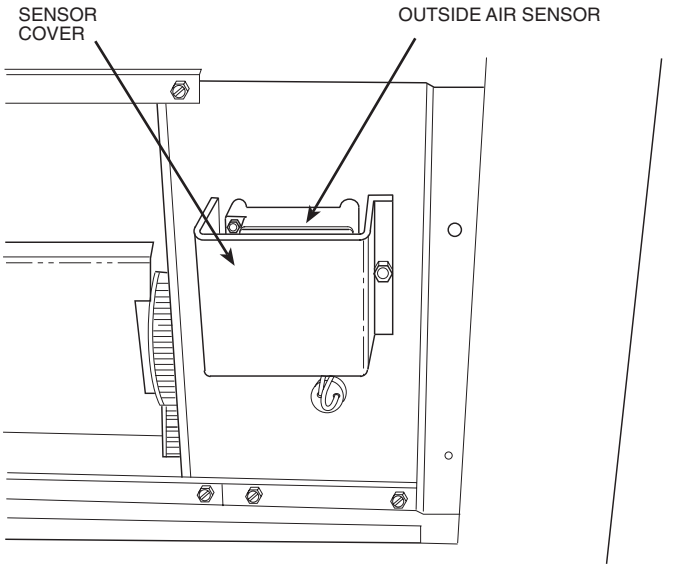


Fig. 25 — Outdoor-Air Sensor Location

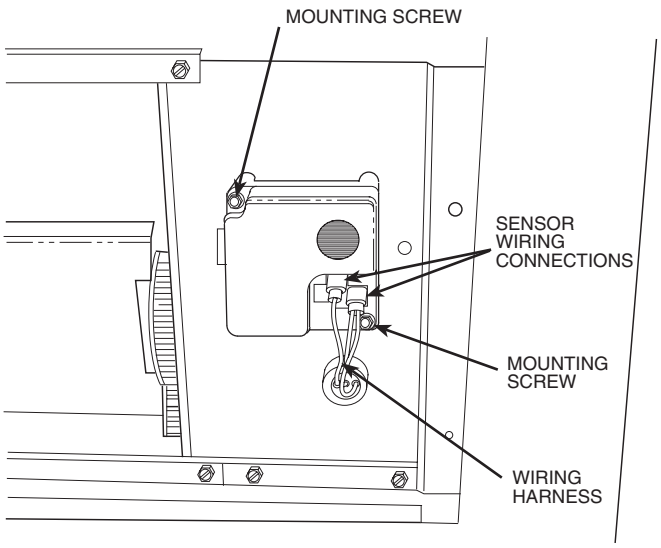
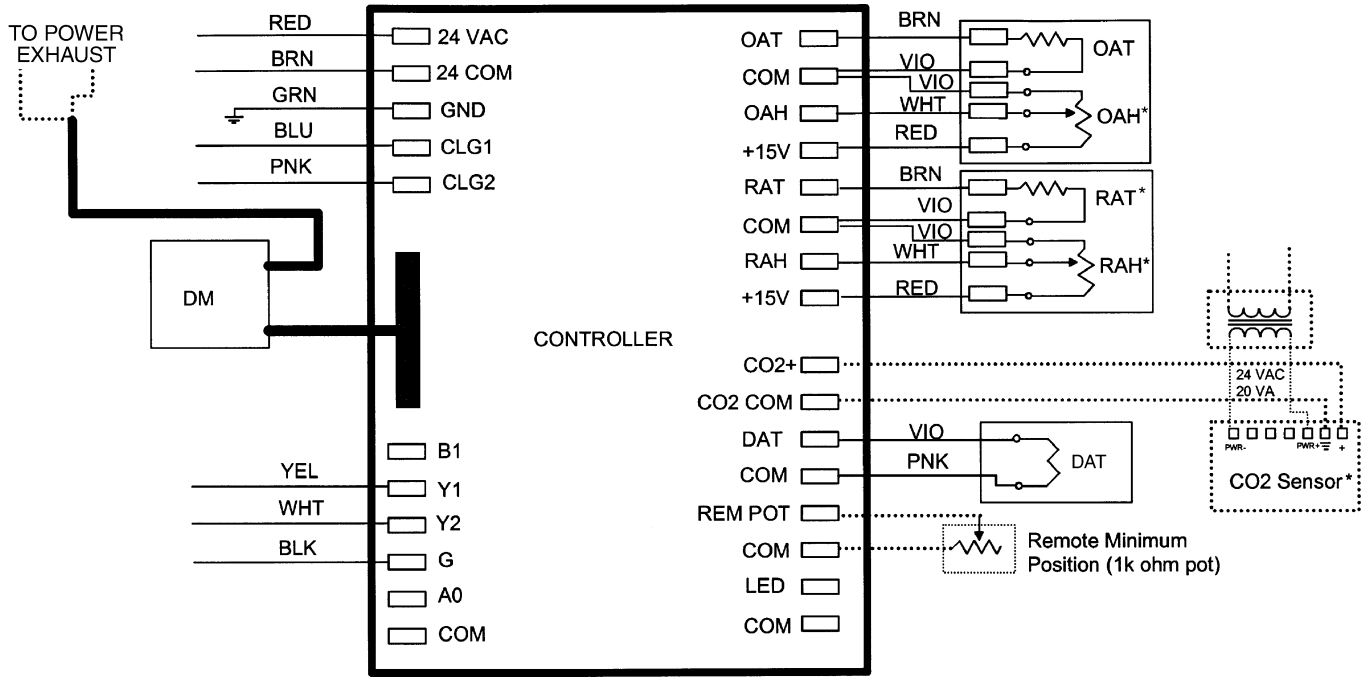


Fig. 26 — Outdoor-Air Sensor Details



LEGEND

CLG — Cooling
COM — Common
DAT — Discharge Air Thermistor
DM — Damper Motor
GND — Ground
LED — Light Emitting Diode
OAH — Outdoor-Air Enthalpy Sensor
OAT — Outdoor-Air Temperature Sensor
POT — Potentiometer
RAH — Return-Air Enthalpy Sensor
RAT — Return-Air Temperature Sensor
REM — Remote

*OAT sensor shipped with economizer option. OAH, RAT, RAH and CO_2 are field-installed accessories.

Fig. 27 — Typical EconoMi$er Wiring

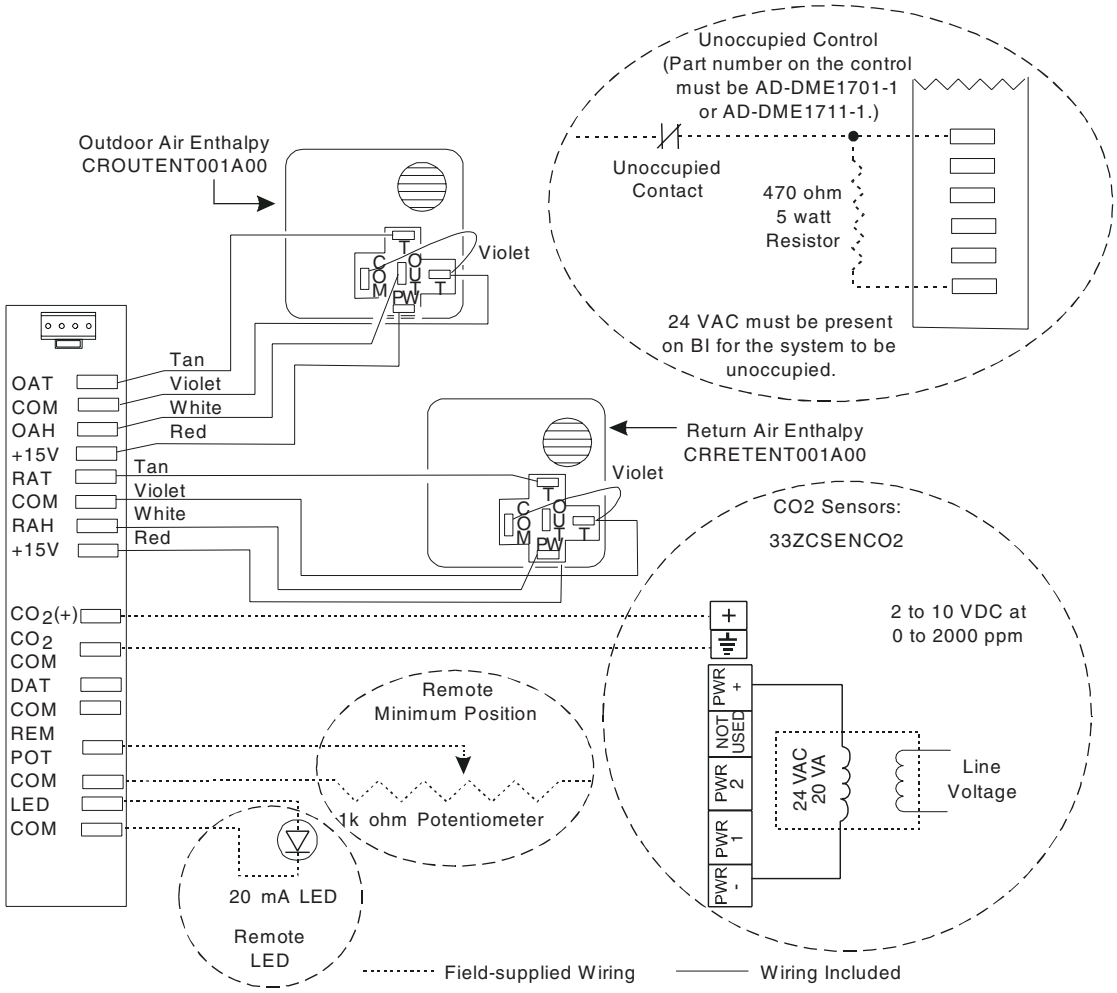


Fig. 28 — Typical EconoMi$er Sensor Wiring

Differential Enthalpy Switchover Strategy — The differential enthalpy switchover strategy must be selected manually, if required. To enable, press and hold the CONFIG button for 30 seconds, then release. The LED will flash twice to indicate the change of configuration.

To return to single enthalpy mode, press and hold the CONFIG button for 30 seconds. The LED will flash once to indicate the change of configuration.

DISCHARGE AIR THERMISTOR (DAT) — The DAT is factory mounted on the supply fan housing in the fan section of the unit. The thermistor is factory wired to the EconoMi$er control module.

CO_2 CONTROL SETUP — The CO_2 sensor monitors carbon dioxide levels. This information is used to modify the position of the outdoor-air dampers to admit more or less outdoor air.

1. Determine the value at which you want the minimum position of the dampers to begin opening to allow a greater amount of outdoor air to enter. The range is 800 to 1,400 ppm.
2. Locate the CO_2 SP (PPM) potentiometer and adjust to the desired set point. See Fig. 20.

MECHANICAL COOLING LOCKOUT — Determine the outdoor-air temperature at which you want the mechanical cooling (compressors) to be disabled. Locate the mechanical cooling lockout (MECH CLG LOCKOUT) potentiometer. To disable this feature, turn the potentiometer counterclockwise (CCW) to the OFF position. Otherwise, set the value between 10 and 60 F. Mechanical cooling will not operate when the outdoor-air temperature is below this value. See Fig. 20.

DRY BULB CHANGEOVER SET UP — Determine the dry bulb changeover set point from Table 4. The settings are A, B, C and D. Locate the ECON SP potentiometer and set the dry bulb changeover set point. See Fig. 20. When the OAT is above this set point, the damper is limited to minimum position setting.

Table 4 — Changeover Set Points

SETTINGS	A	B	C	D
Dry Bulb (°F)	73	69	66	63
Single Enthalpy* (Btu/lb)	27	25	24	22
Differential Temperature* (°F, Not Adjustable)	2	2	2	2
Differential Enthalpy* (Btu/lb, Not Adjustable)	1	1	1	1

*Field-installed accessory.

If a potentiometer fails, its setting will default to the values in Table 5.

Table 5 — Default Potentiometer Settings

POTENTIOMETER	DEFAULT SETTING
CO_2 SP (PPM)	1,000
MECH CLG LOCKOUT	50 F
ECON SP	D
MIN POS (%)	20

VENTILATION AIR (Minimum Position Set Up) — If ventilation air is not required, skip this section. If ventilation air is required, perform the following:

1. The indoor fan must be on to set the ventilation air. Either put the thermostat in the continuous fan mode or jumper the R and G terminals at the rooftop unit connection board.
2. Locate the minimum position (MIN POS) potentiometer. Turn the potentiometer full CCW to fully close the outdoor air dampers. Turn the potentiometer gradually clockwise (CW) to the desired position. See Fig. 20.
3. Replace the filter access panel. See Fig. 22. Ensure the filter access panel slides along the tracks and is securely engaged.
4. Calculate the minimum airflow across the EconoMi$er.
   a. Calculate % of outside air using the following formula.

      % Outdoor air through EconoMi$er

      $$\%\ \text{Outdoor air} = \frac{\text{Mixture Temp} - \text{Return Air Temp}}{\text{Outdoor Temp} - \text{Return Air Temp}}$$

   b. Multiply total CFM by percentage outdoor air, this gives outdoor air volume in CFM.

⚠ WARNING

Personal Injury Hazard. Avoid possible injury by keeping fingers away from damper blades.

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® I CONTROL INSTALLATION (48TM016, 020, and 028 Only)

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. 29 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. Drill required screw holes for mounting baffles.

⚠ CAUTION

To avoid damage to the refrigerant coils and electrical components, use recommended screw sizes only. Use care when drilling holes.

Install Motormaster I Controls — Only one Motormaster I control is required for 48TM016 and 020 units. The 48TM028 requires 2 Motormaster I controls — one for circuit 1 and one for circuit 2. The Motormaster I control must be used in conjunction with the Accessory 0° F Low Ambient Kit (purchased separately). The Motormaster I device controls outdoor fan no. 1 (and 4 on size 028 units) while outdoor fans no. 2 and 3 (and 5 and 6 on 028 units) are sequenced off by the Accessory 0° F Low Ambient Kit.

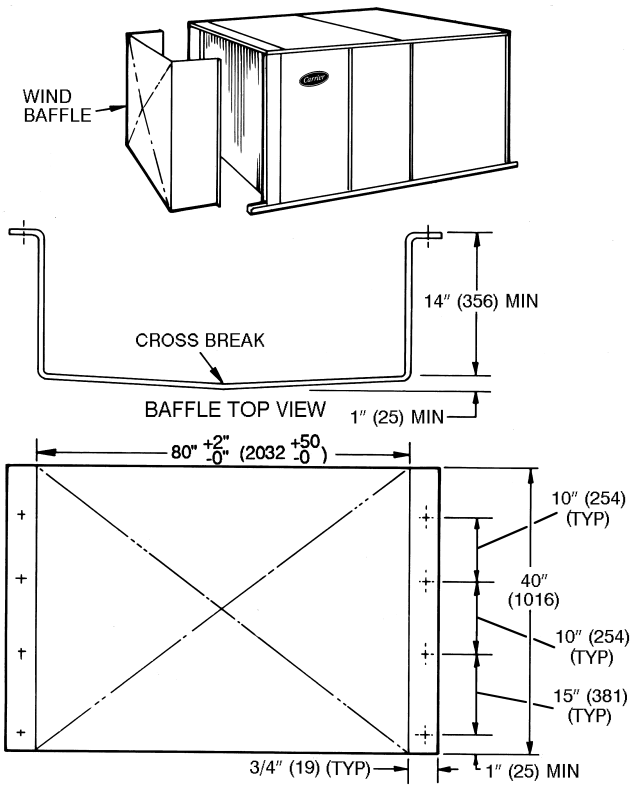
Accessory 0° F Low Ambient Kit — Install the Accessory 0° F Low Ambient Kit per instruction supplied with accessory.

Sensor Assembly — Install the sensor assembly in the location shown in Fig. 30.

Motor Mount — To ensure proper fan height, replace the existing motor mount with the new motor mount provided with accessory.

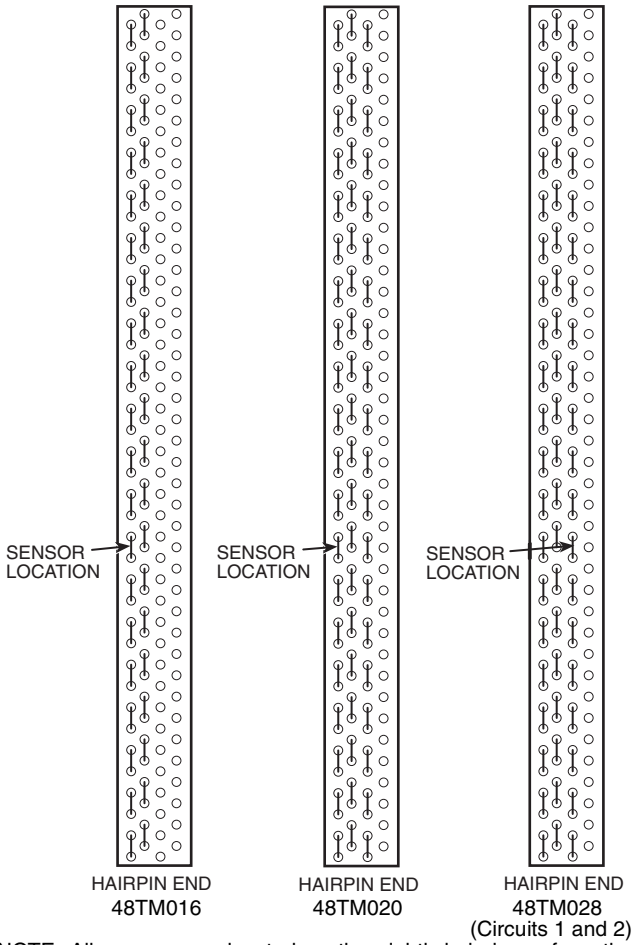
Transformer (460 and 575-v Units Only) — On 460 and 575-v units, a transformer is required. The transformer is provided with the accessory and must be field-installed.

Motormaster I Control — Recommended mounting location is on the inside of the panel to the left of the control box. The control should be mounted on the inside of the panel, vertically, with leads protruding from bottom of extrusion.



NOTE: Dimensions in ( ) are in mm.

Fig. 29 — Wind Baffle Details



NOTE: All sensors are located on the eighth hairpin up from the bottom.

Fig. 30 — Motormaster® I Sensor Locations

MOTORMASTER III CONTROL INSTALLATION (48TM025 Only)

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. 29 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. Drill required screw holes for mounting baffles.

⚠ CAUTION

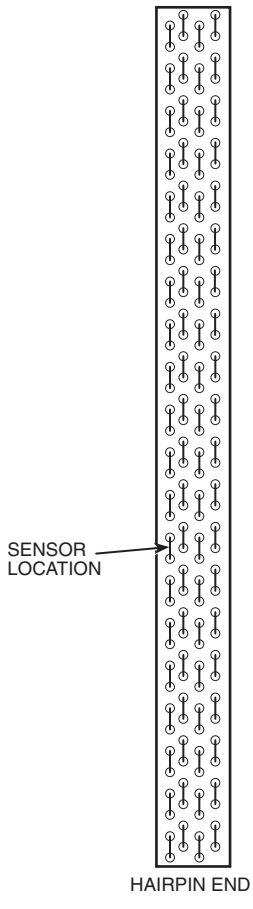
To avoid damage to the refrigerant coils and electrical components, use recommended screw sizes only. Use care when drilling holes.

Replace Outdoor Motor — Replace outdoor fan motor no.1 with motor included in accessory kit. Existing motor is not Motormaster III compatible.

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

Sensor — Install the sensor for thermistor input control in the location shown in Fig. 31. Connect sensor leads to the purple and grey 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).



NOTE: All sensors are located on the eighth hairpin up from the bottom.

Fig. 31 — Motormaster III Sensor Locations

Motormaster® III Control — Recommended mounting location is beneath the control box, mounted to the partition that separates the control box section from the indoor section.

NOTE: If unit power is supplied through the roof curb and basepan of the unit, mount the Motormaster III control on the corner post adjacent to the conduit running from the basepan to the bottom of the control box.

Step 12 — Install Humidistat for Optional MoistureMi$er™ Dehumidification Package —

MositureMi$er dehumidification package operation can be controlled by field installation of a Carrier-approved humidistat. Refer to humidistat installation instructions for more details. To install the humidistat perform the following procedure:

1. Locate humidistat on a solid interior wall in the conditioned space. Location should be a well ventilated area to sense average humidity.
2. Route thermostat cable or equivalent single leads of colored wire from Humidistat terminals through conduit in unit to the low voltage connection on the 2-pole terminal strip (TB3) as shown in Fig. 32 and Fig. 33. Remove jumper.

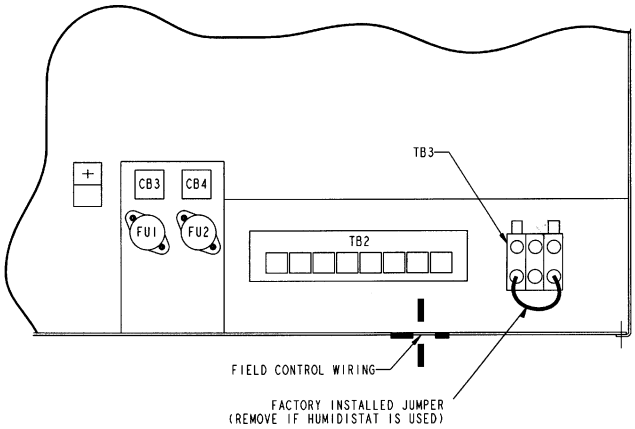


Fig. 33 — Typical MoistureMi$er Dehumidification Package Control Box

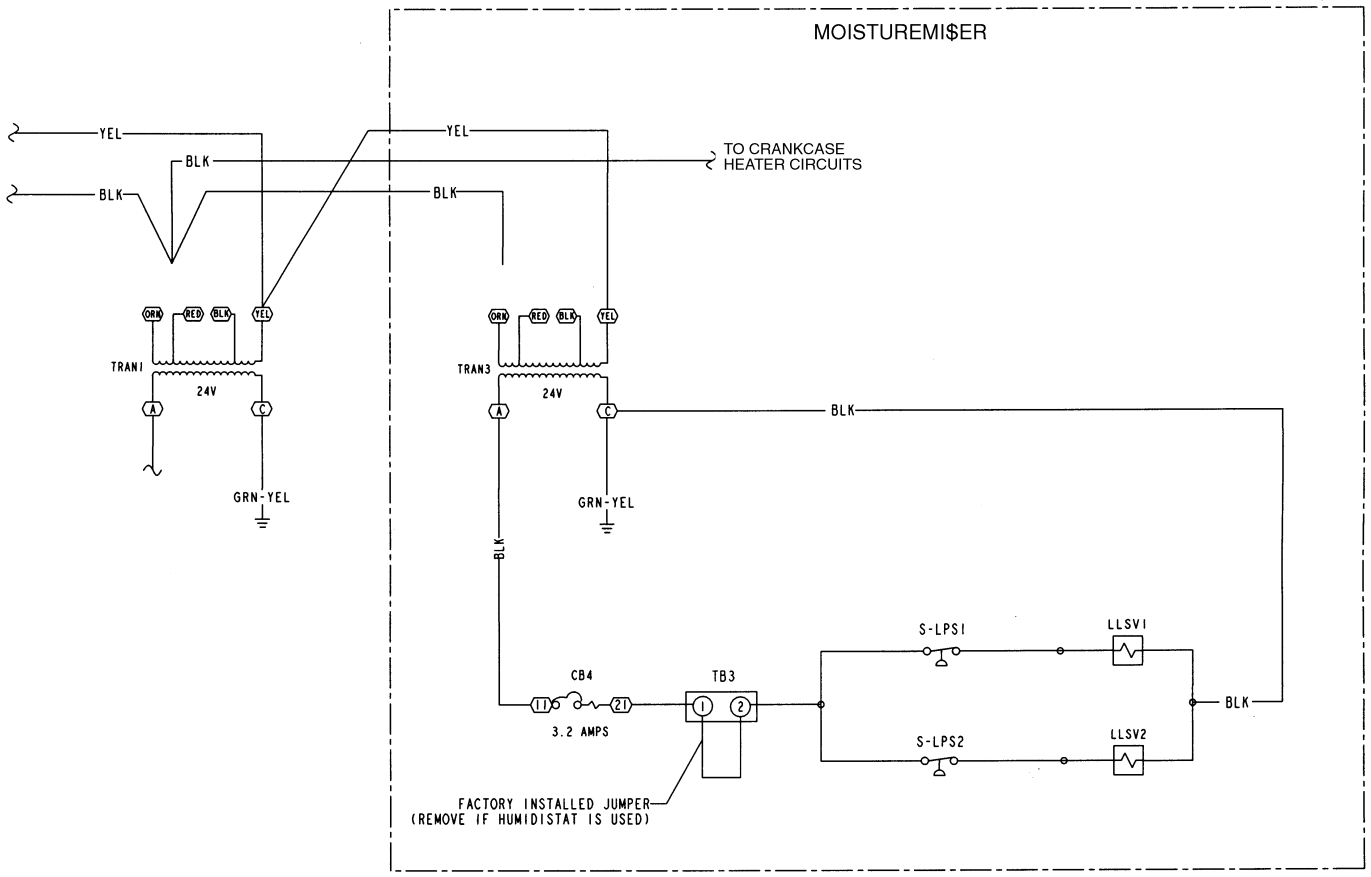


Fig. 32 — Typical MoistureMi$er Dehumidification Package Humidistat Wiring Schematic (460V Unit Shown)

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 all applicable codes.

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

Refrigerant Service Ports — Each refrigerant system has a total of 3 Schrader-type service gage ports. One port is located on the suction line, one on the compressor discharge line, and one on the liquid line. In addition Schrader-type valves are located underneath the low-pressure switches. Be sure that caps on the ports are tight.

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

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

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

1. Note that the evaporator fan is probably also rotating in the wrong direction.
2. Turn off power to the unit.
3. Reverse any two of the incoming power leads.
4. Turn on power to the compressor.

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

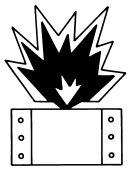
NOTE: When compressors are rotating in the wrong direction, the unit will have increased noise levels and will not provide heating and cooling.

After a few minutes of reverse operation, the scroll compressor internal overload protection will open, which will activate the unit's lockout and requires a manual reset. Reset is accomplished by turning the thermostat on and off.

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

Gas Piping — Check gas piping for leaks.

⚠ WARNING



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

Crankcase Heater — Crankcase heater(s) is energized as long as there is power to the unit and the compressor is not operating.

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

Evaporator Fan — Fan belt and variable pulleys are factory-installed. See Tables 6-13 for Fan Performance Data. Be sure that fans rotate in the proper direction. See Table 14 for air quantity limits. See Table 15 for static pressure information for accessories and options. See Table 16 for fan rpm at various motor pulley settings. See Tables 17 and 18 for Evaporator Fan Motor data. To alter fan performance, see Evaporator-Fan Performance Adjustment section on page 32.

NOTE: A 3 1/2-in. bolt and threaded plate are included in the installer's packet. They can be added to the motor support channel below the motor mounting plate to aid in raising the fan motor.

Condenser-Fans and Motors — Condenser fans and motors are factory set. Refer to Condenser-Fan Adjustment section on page 33 as required. Be sure that fans rotate in the proper direction.

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

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

Accessory EconoMi$er Adjustment — Remove filter access panel. Check that the outdoor-air damper blades are closed and return-air damper blades are open.

EconoMi$er operation and adjustment is described in Base Unit Operation section on page 29, and in EconoMi$er Adjustment section on page 33.

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

1. Turn off manual gas stop.
2. Connect pressure gage to supply gas pressure tap (see Fig. 14).
3. Connect pressure gage to manifold pressure tap on gas valve.
4. Turn on manual gas stop and set thermostat to HEAT position. After the unit has run for several minutes, verify that incoming pressure is 5.5 in. wg or greater, and that the manifold pressure is 3.3 in. wg. If manifold pressure must be adjusted, refer to Gas Valve Adjustment section on page 35.
5. After unit has been in operation for 5 minutes, check temperature rise across the heat exchangers. See unit informative plate for correct rise limits of the heat supplied. Air quantities may need to be adjusted to bring the actual rise to within the allowable limits.

Table 6 — Fan Performance — 48TMD016 (Low Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
4500	753	1307	1.53	761	1330	1.56	840	1572	1.84	912	1822	2.14	980	2080	2.44
4800	747	1384	1.62	790	1515	1.78	866	1765	2.07	936	2023	2.37	1002	2289	2.68
5100	741	1465	1.72	820	1718	2.01	893	1977	2.32	961	2243	2.63	1025	2516	2.95
5700	810	1911	2.24	882	2182	2.56	950	2459	2.88	1014	2741	3.21	1075	3029	3.55
6000	844	2164	2.54	914	2444	2.87	980	2730	3.20	1042	3021	3.54	1100	3317	3.89
6300	879	2439	2.86	947	2729	3.20	1010	3023	3.55	1070	3322	3.90	1127	3626	4.25
6600	915	2737	3.21	980	3035	3.56	1041	3338	3.91	1099	3645	4.28	1155	3957	4.64
6900	950	3057	3.59	1013	3364	3.95	1072	3675	4.31	1129	3991	4.68	1183	4311	5.06
7200	986	3401	3.99	1047	3717	4.36	1104	4037	4.74	1159	4361	5.11	1211	4689	5.50
7500	1022	3770	4.42	1081	4095	4.80	1136	4423	5.19	1189	4755	5.58	1241	5091	5.97

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
4500	1044	2345	2.75	1105	2619	3.07	1163	2899	3.40	1218	3187	3.74	1271	3481	4.08
4800	1065	2561	3.00	1124	2841	3.33	1180	3127	3.67	1235	3420	4.01	1287	3720	4.36
5100	1086	2795	3.28	1144	3082	3.61	1199	3375	3.96	1252	3674	4.31	1304	3979	4.67
5700	1132	3324	3.90	1187	3624	4.25	1240	3929	4.61	1291	4241	4.97	1341	4558	5.35
6000	1157	3619	4.24	1210	3925	4.60	1262	4239	4.97	1312	4557	5.34	1361	4880	5.72
6300	1182	3935	4.62	1234	4249	4.98	1285	4569	5.36	1334	4894	5.74	—	—	—
6600	1208	4274	5.01	1259	4595	5.39	1309	4922	5.77	—	—	—	—	—	—
6900	1235	4636	5.44	1285	4964	5.82	—	—	—	—	—	—	—	—	—
7200	1262	5021	5.89	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	2.2			2.4			2.6			2.8			3.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
4500	1322	3781	4.43	1372	4088	4.79	1419	4400	5.16	1466	4719	5.53	1511	5042	5.91
4800	1337	4025	4.72	1386	4337	5.09	1433	4655	5.46	1479	4978	5.84	—	—	—
5100	1353	4290	5.03	1401	4607	5.40	1448	4930	5.78	—	—	—	—	—	—
5700	1388	4881	5.72	—	—	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 873 to 1021 rpm. Alternate high-static drive range is 1025 to 1200. Other rpms require a field-supplied drive.

Refer to page 27 for general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 6.13. The maximum continuous watts is 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.

Table 7 — Fan Performance — 48TMF016 (High Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
4500	753	1307	1.53	786	1404	1.65	861	1644	1.93	932	1893	2.22	997	2150	2.52
4800	747	1384	1.62	818	1603	1.88	890	1852	2.17	958	2108	2.47	1022	2373	2.78
5100	775	1571	1.84	850	1822	2.14	920	2079	2.44	986	2344	2.75	1048	2616	3.07
5700	849	2054	2.41	918	2323	2.73	982	2598	3.05	1044	2879	3.38	1102	3166	3.71
6000	886	2329	2.73	952	2607	3.06	1015	2891	3.39	1074	3180	3.73	1130	3474	4.08
6300	924	2628	3.08	987	2915	3.42	1047	3207	3.76	1105	3504	4.11	1160	3807	4.46
6600	962	2951	3.46	1023	3246	3.81	1081	3547	4.16	1136	3853	4.52	1190	4163	4.88
6900	1000	3298	3.87	1059	3603	4.23	1115	3912	4.59	1168	4225	4.96	1220	4543	5.33
7200	1038	3672	4.31	1095	3986	4.67	1149	4303	5.05	1201	4625	5.42	1251	4950	5.81
7500	1077	4072	4.78	1131	4394	5.15	1184	4720	5.54	1234	5050	5.92	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
4500	1060	2414	2.83	1119	2685	3.15	1175	2964	3.48	1230	3250	3.81	1282	3542	4.15
4800	1082	2644	3.10	1140	2922	3.43	1195	3207	3.76	1248	3498	4.10	1299	3795	4.45
5100	1106	2894	3.39	1163	3178	3.73	1216	3470	4.07	1268	3767	4.42	1319	4071	4.77
5700	1157	3459	4.06	1211	3757	4.41	1262	4061	4.76	1312	4371	5.13	1360	4686	5.50
6000	1184	3774	4.43	1236	4080	4.79	1287	4391	5.15	1335	4707	5.52	1382	5029	5.90
6300	1212	4114	4.83	1263	4427	5.19	1312	4745	5.57	1359	5067	5.94	—	—	—
6600	1241	4478	5.25	1290	4798	5.63	1338	5122	6.01	—	—	—	—	—	—
6900	1270	4866	5.71	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	2.2			2.4			2.6			2.8			3.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
4500	1332	3841	4.50	1381	4145	4.86	1428	4456	5.23	1473	4772	5.60	1518	5095	5.98
4800	1349	4100	4.81	1397	4409	5.17	1443	4725	5.54	1488	5046	5.92	—	—	—
5100	1367	4380	5.14	1414	4695	5.51	1460	5016	5.88	—	—	—	—	—	—
5700	1407	5007	5.87	—	—	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 873 to 1021 rpm. Alternate high-static drive range is 1025 to 1200. Other rpms require a field-supplied drive.

Refer to page 27 for general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 6.13. The maximum continuous watts is 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.

Table 8 — Fan Performance — 48TMD020 (Low Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2			0.4			0.6			0.8			1.0			1.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
5,500	755	2.27	1908	831	2.58	2171	901	2.91	2443	968	3.24	2723	1031	3.58	3009	1091	3.93	3302
6,000	810	2.72	2287	881	3.04	2556	947	3.37	2833	1010	3.71	3116	1070	4.05	3406	1127	4.40	3702
6,500	866	3.22	2710	932	3.55	2985	994	3.88	3266	1054	4.23	3554	1111	4.57	3847	1166	4.93	4146
7,000	923	3.78	3177	985	4.11	3458	1044	4.45	3744	1100	4.80	4036	1155	5.15	4333	1207	5.51	4635
7,500	980	4.39	3690	1038	4.73	3976	1094	5.07	4267	1148	5.43	4564	1200	5.78	4864	1250	6.15	5170
8,000	1038	5.06	4251	1093	5.40	4542	1146	5.75	4838	1197	6.11	5138	1246	6.47	5443	1294	6.84	5752
8,500	1096	5.78	4859	1148	6.13	5156	1198	6.49	5456	1247	6.85	5761	1294	7.22	6070	1340	7.59	6382
9,000	1154	6.56	5517	1204	6.92	5818	1251	7.28	6123	1298	7.65	6432	1343	8.02	6745	1388	8.40	7062
9,500	1213	7.40	6224	1260	7.77	6531	1306	8.13	6840	1350	8.51	7154	1394	8.88	7471	1436	9.26	7791
10,000	1272	8.30	6983	1317	8.67	7294	1360	9.05	7608	1403	9.43	7926	1445	9.81	8247	1486	10.19	8570

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.4			1.6			1.8			1.9			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
5,500	1149	4.28	3602	1204	4.65	3907	1258	5.02	4217	1284	5.20	4375	1309	5.39	4533
6,000	1183	4.76	4003	1236	5.13	4310	1288	5.50	4622	1313	5.68	4780	1337	5.87	4939
6,500	1219	5.29	4450	1270	5.66	4759	1320	6.03	5073	1344	6.22	5232	1368	6.41	5391
7,000	1258	5.88	4942	1307	6.25	5253	1355	6.62	5569	1378	6.81	5729	1402	7.00	5890
7,500	1299	6.52	5480	1346	6.89	5794	1392	7.27	6113	1415	7.46	6273	1437	7.65	6435
8,000	1341	7.21	6065	1387	7.59	6383	1392	7.97	6704	1453	8.16	6866	1475	8.36	7028
8,500	1385	7.97	6699	1429	8.35	7019	1472	8.73	7343	1493	8.93	7506	1514	9.12	7670
9,000	1431	8.78	7382	1473	9.15	7705	1515	9.55	8032	1535	9.75	8196	—	—	—
9,500	1478	9.65	8114	1519	10.04	8441	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 910 to 1095 rpm. Alternate high-static drive range is 1069 to 1287. Other rpms require a field-supplied drive.

Refer to page 27 for general Fan Performance Data notes.

NOTE: Maximum continuous bhp is 5.90. The maximum continuous watts is 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Evaporator Fan Motor Data tables for more information.

Table 9 — Fan Performance — 48TMF020 (High Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2			0.4			0.6			0.8			1.0			1.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
5,500	795	2.43	2043	866	2.74	2306	934	3.07	2578	998	3.40	2856	1059	3.74	3142	1117	4.08	3434
6,000	854	2.92	2452	921	3.24	2722	984	3.57	3998	1044	3.90	3281	1102	4.25	3570	1158	4.60	3865
6,500	914	3.46	2909	977	3.79	3184	1036	4.12	3465	1093	4.46	3752	1148	4.81	4045	1201	5.16	4343
7,000	975	4.06	3414	1034	4.39	3695	1090	4.73	3981	1144	5.08	4272	1196	5.43	4569	1246	5.79	4870
7,500	1037	4.72	3969	1092	5.06	4255	1145	5.41	4546	1196	5.76	4842	1256	6.12	5142	1294	6.48	5447
8,000	1099	5.44	4575	1150	5.79	4866	1201	6.14	5162	1249	6.50	5462	1297	6.86	5766	1343	7.22	6075
8,500	1161	6.22	5232	1210	6.57	5529	1258	6.93	5829	1304	7.29	6134	1349	7.66	6443	1393	8.03	6755
9,000	1223	7.07	5943	1270	7.43	6245	1315	7.79	6550	1360	8.16	6869	1403	8.53	7171	1445	8.90	7487
9,500	1286	7.98	6708	1331	8.34	7014	1374	8.71	7324	1416	9.08	7638	1457	9.46	7954	1498	9.84	8274
10,000	1349	8.95	7528	1392	9.32	7839	1433	9.70	8154	1473	10.07	8471	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.4			1.6			1.8			1.9			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
5,500	1173	4.44	3732	1227	4.80	4036	1279	5.17	4345	1304	5.35	4502	1329	5.54	4629
6,000	1211	4.95	4165	1263	5.32	4471	1313	5.69	4782	1337	5.87	4939	1361	6.06	5097
6,500	1252	5.53	4646	1302	5.89	4954	1350	6.26	5267	1373	6.56	5425	1396	6.64	5584
7,000	1295	6.16	5176	1343	6.52	5487	1389	6.90	5802	1412	7.09	5961	1434	7.28	6121
7,500	1340	6.85	5756	1386	7.22	6070	1431	7.60	6387	1452	7.79	6547	1474	7.98	6709
8,000	1388	7.60	6388	1431	7.97	6704	1474	8.35	7024	1495	8.54	7186	1516	8.74	7348
8,500	1436	8.41	7071	1478	8.79	7390	1520	9.17	7713	1540	9.37	7876	—	—	—
9,000	1486	9.28	7807	1527	9.67	8130	—	—	—	—	—	—	—	—	—
9,500	1538	10.22	8597	—	—	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 910 to 1095 rpm. Alternate high-static drive range is 1069 to 1287. Other rpms require a field-supplied drive.

Refer to page 27 for general Fan Performance Data notes.

NOTE: Maximum continuous bhp is 5.90. The maximum continuous watts is 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Evaporator Fan Motor Data tables for more information.

Table 10 — Fan Performance — 48TMD025 (Low Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
6,000	824	2607	3.09	894	2844	3.37	961	3085	3.66	1023	3330	3.95	1083	3578	4.24
6,500	881	3030	3.59	947	3266	3.88	1009	3507	4.16	1069	3751	4.45	1126	3998	4.74
7,000	939	3488	4.14	1001	3725	4.42	1060	3965	4.70	1116	4208	4.99	1170	4454	5.28
7,500	998	3982	4.72	1055	4218	5.00	1111	4458	5.29	1165	4701	5.58	1217	4946	5.87
8,000	1056	4512	5.35	1111	4748	5.63	1164	4988	5.92	1215	5230	6.20	1264	5474	6.49
8,500	1116	5077	6.02	1167	5314	6.30	1218	5553	6.59	1266	5795	6.87	1314	6039	7.16
9,000	1175	5678	6.74	1224	5915	7.02	1272	6154	7.30	1319	6395	7.59	1364	6639	7.88
9,500	1235	6315	7.49	1282	6552	7.77	1327	6791	8.06	1372	7033	8.34	1415	7276	8.63
10,000	1295	6988	8.29	1340	7225	8.57	1383	7465	8.86	1426	7706	9.14	1468	7949	9.43

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
6,000	1141	3829	4.54	1196	4082	4.84	1249	4337	5.15	1301	4596	5.45	1351	4856	5.76
6,500	1181	4247	5.04	1234	4499	5.34	1285	4753	5.64	1334	5009	5.94	1383	5267	6.25
7,000	1223	4702	5.58	1274	4953	5.88	1323	5205	6.18	1371	5460	6.48	1417	5716	6.78
7,500	1267	5194	6.16	1316	5443	6.46	1363	5694	6.76	1409	5947	7.06	1454	6202	7.36
8,000	1313	5721	6.79	1359	5970	7.08	1405	6220	7.38	1449	6472	7.68	1493	6726	7.98
8,500	1360	6285	7.46	1405	6533	7.75	1449	6783	8.05	1491	7034	8.34	1533	7286	8.64
9,000	1408	6885	8.17	1451	7132	8.46	1494	7381	8.76	1535	7631	9.05	—	—	—
9,500	1458	7521	8.92	1499	7768	9.22	1540	8016	9.51	—	—	—	—	—	—
10,000	1508	8193	9.72	1549	8440	10.01	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	2.2			2.4			2.6			2.8			3.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
6,000	1399	5118	6.07	1446	5381	6.38	1492	5647	6.70	1537	5914	7.02	—	—	—
6,500	1429	5527	6.56	1475	5789	6.87	1520	6052	7.18	—	—	—	—	—	—
7,000	1462	5974	7.09	1507	6234	7.40	1550	6495	7.71	—	—	—	—	—	—
7,500	1498	6459	7.66	1540	6717	7.97	—	—	—	—	—	—	—	—	—
8,000	1535	6981	8.28	—	—	—	—	—	—	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 1002 to 1151 rpm. Alternate high-static drive range is 1193 to 1369. Other rpms require a field-supplied drive.

Refer to page 27 for general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 8.7 (for 208/230 and 575-v units) and 9.5 (for 460-v units). The maximum continuous watts is 7915 (for 208/230 and 575-v units) and 8640 (for 460-v units). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Evaporator Fan Motor Data tables for additional information.

Table 11 — Fan Performance — 48TMF025 (High Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
6,000	868	2752	3.26	934	2987	3.54	997	3227	3.83	1058	3470	4.12	1115	3716	4.41
6,500	929	3201	3.80	991	3436	4.08	1051	3675	4.36	1108	3917	4.65	1162	4163	4.94
7,000	991	3687	4.37	1049	3923	4.65	1105	4161	4.94	1159	4403	5.22	1211	4647	5.51
7,500	1054	4211	5.00	1109	4447	5.28	1161	4686	5.56	1213	4926	5.84	1262	5170	6.13
8,000	1117	4773	5.66	1168	5009	5.94	1218	5247	6.22	1267	5488	6.51	1314	5731	6.80
8,500	1180	5373	6.37	1229	5609	6.65	1277	5847	6.94	1323	6088	7.22	1368	6331	7.51
9,000	1244	6011	7.13	1290	6247	7.41	1335	6485	7.69	1380	6726	7.98	1423	6968	8.27
9,500	1308	6687	7.93	1352	6924	8.21	1395	7162	8.50	1437	7402	8.78	1479	7644	9.07
10,000	1372	7401	8.78	1414	7638	9.06	1455	7876	9.34	1496	8117	9.63	1535	8358	9.92

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
6,000	1171	3965	4.70	1224	4216	5.00	1276	4469	5.30	1326	4726	5.61	1374	4983	5.91
6,500	1215	4410	5.23	1266	4659	5.53	1316	4911	5.83	1364	5165	6.13	1411	5421	6.43
7,000	1262	4894	5.81	1311	5142	6.10	1358	5392	6.40	1404	5645	6.70	1449	5899	7.00
7,500	1310	5415	6.42	1357	5663	6.72	1403	5912	7.01	1447	6164	7.31	1490	6416	7.61
8,000	1360	5976	7.09	1405	6222	7.38	1449	6471	7.68	1492	6721	7.97	1533	6973	8.27
8,500	1412	6575	7.80	1455	6821	8.09	1497	7068	8.39	1538	7318	8.68	—	—	—
9,000	1465	7212	8.56	1506	7457	8.85	1547	7705	9.14	—	—	—	—	—	—
9,500	1519	7888	9.36	—	—	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	2.2			2.4			2.6			2.8			3.0		
	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp	Rpm	Watts	Bhp
6,000	1422	5243	6.22	1468	5505	6.53	1513	5768	6.84	—	—	—	—	—	—
6,500	1456	5679	6.74	1501	5938	7.04	1544	6199	7.35	—	—	—	—	—	—
7,000	1493	6155	7.30	1536	6412	7.61	—	—	—	—	—	—	—	—	—
7,500	1533	6670	7.91	—	—	—	—	—	—	—	—	—	—	—	—
8,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 1002 to 1151 rpm. Alternate high-static drive range is 1193 to 1369. Other rpms require a field-supplied drive.

Refer to page 27 for general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 8.7 (for 208/230 and 575-v units) and 9.5 (for 460-v units). The maximum continuous watts is 7915 (for 208/230 and 575-v units) and 8640 (for 460-v units). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Evaporator Fan Motor Data tables for more information.

Table 12 — Fan Performance — 48TMD028 (Low Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2			0.4			0.6			0.8			1.0			1.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
7,000	941	3.35	2,769	1002	3.80	3,140	1061	4.27	3528	1117	4.76	3,934	1171	5.27	4,356	1224	5.80	4,794
7,500	999	4.05	3,348	1057	4.53	3,742	1112	5.02	4152	1166	5.54	4,579	1218	6.07	5,020	1268	6.63	5,478
8,000	1058	4.85	4,007	1113	5.35	4,424	1165	5.87	4856	1216	6.41	5,304	1266	6.97	5,766	1314	7.55	6,243
8,500	1117	5.74	4,750	1169	6.28	5,190	1219	6.83	5645	1268	7.40	6,114	1315	7.98	6,597	1361	8.58	7,094
9,000	1177	6.75	5,583	1226	7.31	6,047	1274	7.89	6524	1320	8.48	7,015	1365	9.09	7,520	1410	9.72	8,037
9,500	1237	7.98	6,511	1284	8.46	6,999	1329	9.07	7499	1374	9.69	8,012	1417	10.33	8,538	1459	10.98	9,076
10,000	1297	9.12	7,450	1342	9.74	8,051	1385	10.37	8574	1428	11.02	9,110	1469	11.68	9,657	1510	12.36	10,217
10,500	1358	10.49	8,674	1400	11.14	9,209	1442	11.80	9755	1483	12.47	10,314	1523	13.16	10,883	—	—	—
11,000	1418	12.00	9,919	1459	12.67	10,478	—	—	—	—	—	—	—	—	—	—	—	—
11,250	1449	12.80	10,585	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)								
	1.4			1.6			1.8		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
7,000	1274	6.35	5248	1323	6.92	5,718	1371	5.54	6204
7,500	1316	7.20	6960	1364	7.79	6,437	1410	6.41	6939
8,000	1360	8.14	6734	1406	8.76	7,239	1450	7.40	7759
8,500	1406	9.20	7605	1449	9.83	8,129	1492	8.48	8666
9,000	1453	10.36	8568	1495	11.02	9,111	1536	9.69	9667
9,500	1501	11.64	9627	1541	12.32	10,190	—	—	—
10,000	—	—	—	—	—	—	—	—	—
10,500	—	—	—	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 1066 to 1283 rpm. Alternate high-static drive range is 1332 to 1550. Other rpms require a field-supplied drive.

Refer to this page for general Fan Performance Data notes.

NOTE: Maximum continuous bhp is 10.20 (208/230, 575 v) or 11.80 (460 v) and the maximum continuous watts are 9510 (208/230, 575 v) or 11,000 (460 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Evaporator Fan Motor Data tables for more information.

Table 13 — Fan Performance — 48TMF028 (High Heat Units)*

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2			0.4			0.6			0.8			1.0			1.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
7,000	992	4.05	3,348	1051	4.44	3,668	1106	4.83	3995	1160	5.24	4331	1212	5.65	4675	1262	6.08	5026
7,500	1055	4.77	3,947	1110	5.17	4,277	1162	5.58	4615	1214	6.00	4960	1263	6.43	5312	1311	6.86	5672
8,000	1118	5.58	4,610	1170	5.99	4,950	1220	6.41	5298	1268	6.84	5653	1315	7.27	6014	1361	7.72	6382
8,500	1182	6.46	5,339	1231	6.88	5,690	1278	7.31	6047	1324	7.75	6411	1369	8.20	6782	1413	8.66	7158
9,000	1246	7.42	6,136	1292	7.86	6,498	1337	8.30	6865	1381	8.75	7239	1424	9.21	7618	1466	9.68	8003
9,500	1310	8.47	7,005	1354	8.92	7,377	1397	9.38	7754	1439	9.84	8137	1480	10.31	8525	1520	10.79	8918
10,000	1374	9.61	7,947	1416	10.07	8,329	1457	10.54	8715	1497	11.02	9107	1537	11.50	9504	—	—	—
10,500	1439	10.84	8,964	1479	11.32	9,356	1518	11.79	9752	—	—	—	—	—	—	—	—	—
11,000	1503	12.17	10,059	1542	12.65	10,460	—	—	—	—	—	—	—	—	—	—	—	—
11,250	1536	12.86	10,636	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)								
	1.4			1.6			1.8		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
7,000	1311	6.51	5385	1359	6.96	5751	1405	6.00	6124
7,500	1358	7.30	6039	1403	7.76	6412	1448	6.84	6792
8,000	1406	8.17	6767	1560	8.63	7137	1492	7.75	7524
8,500	1456	9.12	7541	1498	9.59	7929	1539	8.75	8323
9,000	1507	10.15	8393	1548	10.63	8790	—	—	—
9,500	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—
10,500	—	—	—	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
Watts — Input Watts to Motor

*Standard low-medium static drive range is 1066 to 1283 rpm. Alternate high-static drive range is 1332 to 1550. Other rpms require a field-supplied drive.

Refer to this page for general Fan Performance Data notes.

NOTE: Maximum continuous bhp is 10.20 (208/230, 575 v) or 11.80 (460 v) and the maximum continuous watts are 9510 (208/230, 575 v) or 11,000 (460 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Evaporator Fan Motor Data tables for more information.

GENERAL NOTES FOR FAN PERFORMANCE DATA TABLES

1. Static pressure losses (i.e., EconoMi$er) must be added to external static pressure before entering Fan Performance table.
2. Interpolation is permissible. Do not extrapolate.
3. Fan performance is based on wet coils, clean filters, and casing losses. See Accessory/FIOP Static Pressure table on page 28.
4. Extensive motor and drive testing on these units ensures that the full horsepower and watts range of the motor can be utilized with confidence. Using your fan motors up to the watts or bhp rating shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Use of a field-supplied motor may affect wire size. Contact your Carrier representative for details.

Table 14 — Air Quantity Limits

UNIT 48TM	MINIMUM COOLING CFM	MINIMUM HEATING CFM		MAXIMUM CFM
		Low Heat	High Heat	
016	4500	3800	3800	7,500
020	5400	4750	5450	9,000
025	6000	4750	5450	10,000
028	7000	4750	5450	11,250

Table 15 — Accessory/FIOP Static Pressure (in. wg)* — 48TM016-028

COMPONENT	CFM								
	4500	5000	5400	6000	7200	7500	9000	10,000	11,250
EconoMi$er	0.040	0.050	0.060	0.070	0.090	0.100	0.110	0.120	0.140
MoistureMi$er™ Dehumidification	0.045	0.048	0.060	0.071	0.103	0.111	0.160	0.197	0.250

LEGEND

FIOP — Factory-Installed Option

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

Table 16 — Fan Rpm at Pulley Settings*

UNIT 48TM	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
016†	††	††	††	††	1021	1002	984	965	947	928	910	891	873
016**	††	††	††	††	1200	1178	1156	1134	1112	1091	1069	1047	1025
020†	††	††	1095	1077	1058	1040	1021	1002	984	965	947	928	910
020**	††	††	1287	1265	1243	1222	1200	1178	1156	1134	1112	1091	1069
025†	††	††	††	††	1151	1132	1114	1095	1077	1058	1040	1021	1002
025**	††	††	††	††	1369	1347	1325	1303	1281	1259	1237	1215	1193
028†	††	††	1283	1269	1247	1225	1203	1182	1160	1138	1116	1095	1066
028**	††	††	††	††	1551	1524	1497	1470	1443	1415	1388	1361	1332

*Approximate fan rpm shown.
†Indicates standard drive package.
**Indicates alternate drive package.
††Due to belt and pulley size, pulley cannot be set to this number of turns open.

Table 17 — Evaporator-Fan Motor Data

UNIT 48TM	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*	MAXIMUM ACCEPTABLE CONTINUOUS BkW*	MAXIMUM ACCEPTABLE OPERATING WATTS	MAXIMUM AMP DRAW
016	208/230	6.13	4.57	5,180	15.8
	460				7.9
	575				6.0
020	208/230	5.90	4.40	5,180	15.8
	460				7.9
	575				6.0
025	208/230	8.70	6.49	7,915	22.0
	460	9.50	7.08	8,640	13.0
	575	8.70	6.49	7,915	10.0
028	208/230	10.20	7.61	9,510	28.0
	460	11.80	8.80	11,000	14.6
	575	10.20	7.61	9,510	13.0

LEGEND

BHP — Brake Horsepower
BkW — Brake Kilowatts

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

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

Table 18 — Evaporator-Fan Motor Efficiency

UNIT 48TM	MOTOR EFFICIENCY (%)
5 Hp	87.5
7.5 Hp	88.5
10 Hp	89.5

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

Base Unit Operation

COOLING, UNITS WITHOUT ECONOMI$ER — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized and evaporator-fan motor (IFM), compressor no. 1, and condenser fans start. The condenser-fan motors run continuously while unit is cooling. If the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

HEATING, UNITS WITHOUT ECONOMI$ER

NOTE: The 48TM016-028 units have 2 stages of heat.

When the thermostat calls for heating, power is sent to W on the IGC (integrated gas unit controller) board. An LED (light-emitting diode) on the IGC board will be on during normal operation. A check is made to ensure that the rollout switch and limit switch are closed and the induced-draft motor is running. The induced-draft motor is 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.

If the burners do not light, there is a 22-second delay before another 5-second attempt. If the burners still do not light, this sequence is repeated for 15 minutes. After the 15 minutes have elapsed, if the burners still have not lighted, heating is locked out. To reset the control, break 24-v power to the thermostat.

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.

When additional heat is required, W2 closes and initiates power to the second stage of the main gas valve. When the thermostat is satisfied, W1 and W2 open and the gas valve closes, 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.

A LED indicator is provided on the IGC to monitor operation. The IGC is located by removing the side panel and viewing the IGC through the view port located in the control box access panel. See Fig. 34. During normal operation, the LED is continuously on. See Table 19 for error codes.

Table 19 — IGC LED Indications

ERROR CODE	LED INDICATION
Normal Operation	On
Hardware Failure	Off
Fan On/Off Delay Modified	1 Flash
Limit Switch Fault	2 Flashes
Flame Sense Fault	3 Flashes
Five Consecutive Limit Switch Faults	4 Flashes
Ignition Lockout Fault	5 Flashes
Inducer Switch Fault	6 Flashes
Rollout Switch Fault	7 Flashes
Internal Control Fault	8 Flashes
Software Lockout	9 Flashes

LEGEND

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

NOTES:
1. There is a 3-second pause between error code displays.
2. If more than one error code exists, all applicable error codes will be displayed in numerical sequence.
3. Error codes on the IGC will be lost if power to the unit is interrupted.

COOLING UNITS WITH ECONOMI$ER — When the OAT is above the ECON SP set point and the room thermostat calls for Stage 1 cooling (R to G + Y1), the indoor-fan motor (IFM) is energized and the EconoMi$er damper modulates to minimum position. The compressor contactor and outdoor-fan contactor (OFC) are energized to start the compressor and outdoor-fan motors (OFM). After the thermostat is satisfied, the damper modulates to the fully closed position when the IFM is deenergized.

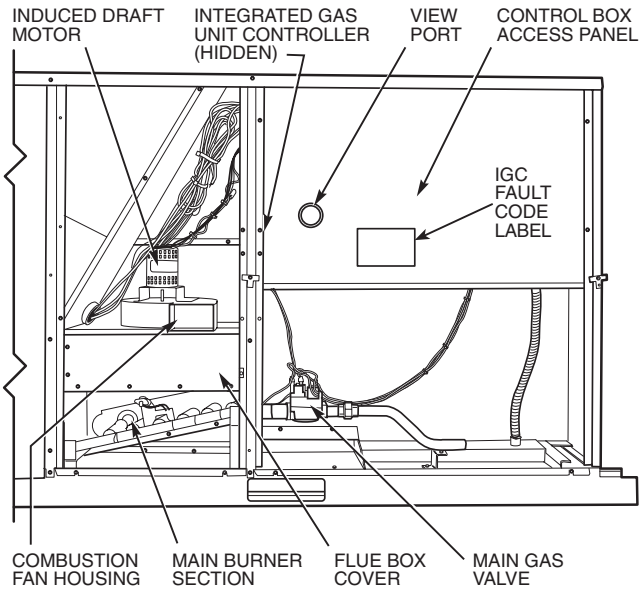


Fig. 34 — Typical Gas Heating Section

When the OAT is below the ECON SP setting and the room thermostat calls for Stage 1 cooling (R to G + Y1), the EconoMi$er modulates to the minimum position when the IFM is energized. The EconoMi$er provides Stage 1 of cooling by modulating the return and outdoor air dampers to maintain a 55 F supply air set point. If the supply-air temperature (SAT) is greater than 57 F, the EconoMi$er modulates open, allowing a greater amount of outdoor air to enter the unit. If the SAT drops below 53 F, the outdoor air damper modulates closed to reduce the amount of outdoor air. When the SAT is between 53 and 57 F, the EconoMi$er maintains its position.

If outdoor air alone cannot satisfy the cooling requirements of the conditioned space, and the OAT is above the MECH CLG LOCKOUT set point, the EconoMi$er integrates free cooling with mechanical cooling. This is accomplished by the strategies below.

NOTE: Compressors have a two-minute Minimum On and Minimum Off, which are accomplished by the strategies below.

1. If Y1 is energized, and the room thermostat calls for Y2 (2-stage thermostat), the compressor and OFC are energized. The position of the EconoMi$er damper is maintained at its current value.
2. If Y1 is energized for more than 20 minutes, and Y2 is not energized (whether or not a 2-stage thermostat is used), the compressor and OFC are energized. The position of the EconoMi$er damper is maintained at its current value.
3. If Y1 is energized, and compressor no. 1 is already energized (see Step 2) and the room thermostat calls for Y2, compressor no. 1 continues to operate. If Y2 remains energized for more than 20 minutes, compressor no. 2 is energized.

NOTE: Compressor no. 2 cannot be energized unless there is a signal for Y2 from the space thermostat.

4. If compressor no. 2 is energized, and the Y2 signal from the thermostat is satisfied, compressors 1 and 2 are deenergized. Re-asserting Y2 will start compressor no. 1 and (after a 20-minute interstage delay) compressor no. 2.
5. If compressor no. 1 is energized and the thermostat is satisfied, compressor no. 1, the OFM, and IFM are deenergized and the EconoMi$er modulates closed.

When the OAT is below the MECH CLG LOCKOUT set point, the compressors remain off.

Freeze protection thermostats (FPT) are located on the top and bottom of the evaporator coil. It detects frost build-up and locks out the compressors, allowing the coil to clear. Once frost has melted. the compressors can be reenergized by resetting the compressor lockout.

HEATING, UNITS WITH ECONOMI$ER — When the room thermostat calls for heat, the heating controls are energized as described in the Heating, Units Without EconoMi$er section. The IFM is energized and the EconoMi$er damper modulates to the minimum position. When the thermostat is satisfied, the damper modulates closed.

COOLING, UNITS WITH MOISTUREMI$ER™ DEHUMIDIFICATION PACKAGE — When thermostat calls for cooling, terminals G and Y1 and/or Y2 and the compressor contactor C1 and/or C2 are energized. The indoor (evaporator) fan motor (IFM), compressors, and outdoor (condenser) fan motors (OFM) start. The OFMs run continuously while the unit is in cooling. As shipped from the factory, both MoistureMi$er dehumidification circuits are always energized.

If MoistureMi$er circuit modulation is desired, a field-installed, wall-mounted humidistat is required. If the MoistureMi$er humidistat is installed and calls for the MoistureMi$er subcooler coil to operate, the humidistat internal switch closes. This energizes the 3-way liquid line solenoid valve coils (LLSV1 for circuit 1 and LLSV2 for circuit 2) of the MoistureMi$er circuits, forcing the warm liquid refrigerant of the liquid line to enter the subcooler coils. See Fig. 35.

As the warm liquid passes through the subcooler coils, it is exposed to the cold supply airflow coming off the evaporator coils and the liquid is further cooled to a temperature approaching the evaporator coil leaving-air temperature. The state of the refrigerant leaving the subcooler coils is a highly subcooled liquid refrigerant. The liquid then enters a thermostatic expansion valve (TXV) where the liquid is dropped to the evaporator pressure. The TXVs can throttle the pressure drop of the liquid refrigerant and maintain proper conditions at the compressor suction valves over a wide range of operating conditions. The liquid proceeds to the evaporator coils at a temperature lower than normal cooling operation. This lower temperature is what increases the latent and sensible capacity of the evaporator coils.

The 2-phase refrigerant passes through the evaporators and is changed into a vapor. The air passing over the evaporator coils will become colder than during normal operation as a result of the colder refrigerant temperatures. However, as it passes over the subcooler coils, the air will be warmed, decreasing the sensible capacity and reducing the sensible heat of the rooftop unit.

As the refrigerant leaves the evaporator, the refrigerant passes a subcooler control low-pressure switch (S-LPS1 for circuit 1 or S-LPS2 for circuit 2) in the suction line. This low-pressure switch will deactivate the MoistureMi$er package when the suction pressure reaches 60 psig. The subcooler control low-pressure switch is an added safety device to protect against evaporator coil freeze-up during low ambient operation. The subcooler control low-pressure switch will only deactivate the 3-way liquid line solenoid valve in the MoistureMi$er circuit. The compressors will continue to run as long as there is a call for cooling, regardless of the position of the subcooler control low-pressure switch. The 3-way solenoid valve and the MoistureMi$er package will be reactivated only when the call for cooling has been satisfied, the subcooler control low-pressure switch has closed above 80 psig, and a new call for cooling exists. The crankcase heaters on the scroll compressors provide additional protection for the compressors due to the additional refrigerant charge in the subcooler.

When the humidistat is satisfied, the humidistat internal switch opens, cutting power to and deenergizing the LLSVs. The refrigerant is routed back through the evaporators and the subcooler coils are removed from the refrigerant loops. When the thermostat is satisfied, C1 and C2 are deenergized and the compressors, IFM, and OFMs shut off. If the thermostat fan selector switch is in the ON position, the IFM will run continuously.

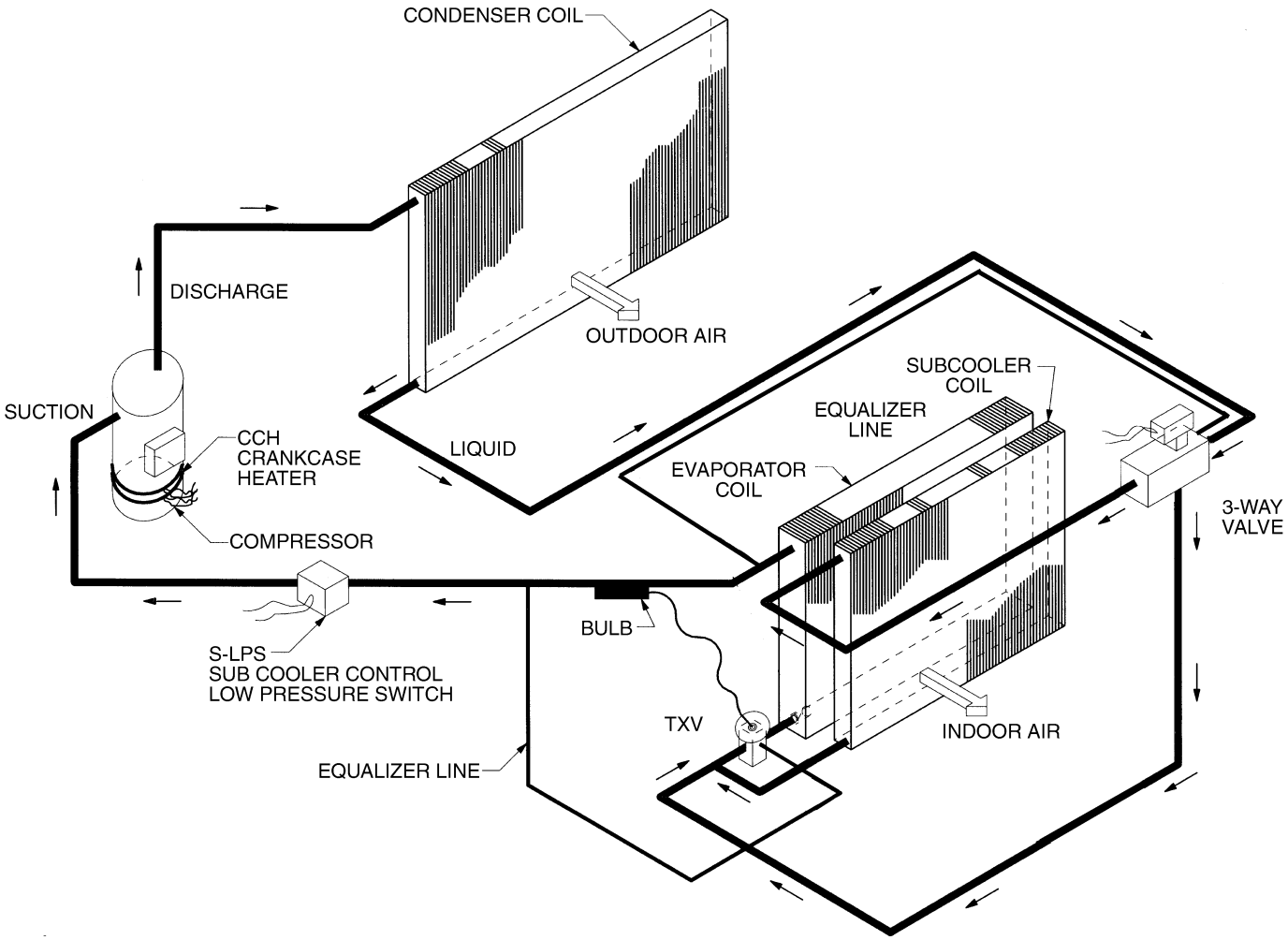


Fig. 35 — MoistureMi$er™ Operation Diagram

SERVICE

⚠ WARNING

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

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

MAIN BURNER — At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames. Refer to Main Burners section on page 35.

FLUE GAS PASSAGEWAYS — The flue collector box and heat exchanger cells may be inspected by removing heat exchanger access panel (Fig. 4-6), flue box cover, and main burner assembly (Fig. 34). Refer to Main Burners section on page 35 for burner removal sequence. If cleaning is required, remove heat exchanger baffles and clean tubes with a wire brush.

Use caution with ceramic heat exchanger baffles. When installing retaining clip, be sure the center leg of the clip extends inward toward baffle. See Fig. 36.

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. 34). The motor and wheel assembly will slide up and out of the fan housing. Remove the blower wheel from the motor shaft and clean with a detergent or solvent. Replace motor and wheel assembly.

EVAPORATOR COIL — Clean as required with a 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 48TM028 unit requires industrial grade throwaway filters capable of withstanding face velocities up to 625 fpm. Ensure that replacement filters for the 48TM028 units are rated for 625 fpm.

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

Lubrication

COMPRESSORS — Each compressor is charged with the correct amount of oil at the factory. Conventional white oil (Sontext 200LT) is used. White oil is compatible with 3GS oil, and 3GS oil may be used if the addition of oil is required. See compressor nameplate for original oil charge. A complete recharge should be four ounces less than the original oil charge. When a compressor is exchanged in the field it is possible that a major portion of the oil from the replaced compressor may still be in the system. While this will not affect the reliability of the replacement compressor, the extra oil will add rotor drag and increase power usage. To remove this excess oil, an access valve may be added to the lower portion of the suction line at the inlet of the compressor. The compressor should then be run for 10 minutes, shut down, and the access valve opened until no oil flows. This should be repeated twice to make sure the proper oil level has been achieved.

FAN SHAFT BEARINGS — Lubricate bearings at least every 6 months with suitable bearing grease. Extended grease line is provided for far side fan bearing (opposite drive side). 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.

Evaporator Fan Performance Adjustment (Fig. 37 and 38) — Fan motor pulleys are factory set for speed shown in Table 1.

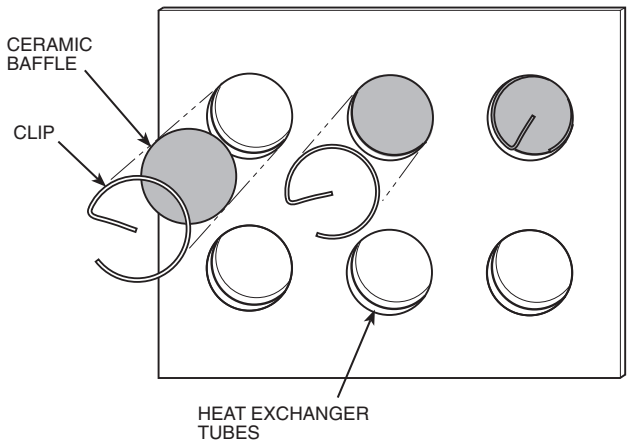
To change fan speeds:

1. Shut off unit power supply.
2. Loosen nuts on the 2 carriage bolts in the motor mounting base. Install jacking bolt and plate under motor base (bolt and plate are shipped in installer's packet). Using bolt and plate, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
3. Loosen movable-pulley flange setscrew (see Fig. 37).
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Table 1.

   See Table 14 for air quantity limits.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table 1 for speed change for each full turn of pulley flange.)
6. Replace and tighten belts. See Belt Tension Adjustment section on page 33.

To align fan and motor pulleys:

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



NOTE: One baffle and clip will be in each upper tube of the heat exchanger.

Fig. 36 — Removing Heat Exchanger Ceramic Baffles and Clips

Evaporator Fan Service and Replacement

The 48TM units use a fan motor mounting system that features a slide-out motor mounting plate. See Fig. 38. To replace or service the motor, slide out the bracket.

1. Remove the evaporator-fan access panel and the heating control access panel.
2. Remove the center post (located between the evaporator fan and heating control access panels) and all screws securing it.
3. Loosen nuts on the 2 carriage bolts in the motor mounting base.
4. Using jacking bolt under motor base, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
5. Remove the belt drive.
6. Remove jacking bolt and tapped jacking bolt plate.
7. Remove the 2 screws that secure the motor mounting plate to the motor support channel.
8. Remove the 3 screws from the end of the motor support channel that interfere with the motor slide path.
9. Slide out the motor and motor mounting plate.
10. Disconnect wiring connections and remove the 4 mounting bolts.
11. Remove the motor.
12. To install the new motor, reverse Steps 1-11.

Belt Tension Adjustment — To adjust belt tension:

1. Loosen fan motor bolts.
2. Turn motor jacking bolt to move motor mounting plate up or down for proper belt tension ($^3/_8$ in. deflection at midspan with one finger [9 lb force]).
3. Tighten nuts.
4. Adjust bolts and nut on mounting plate to secure motor in fixed position.

Condenser-Fan Adjustment

48TM016,020,028 UNITS (Fig. 39)

1. Shut off unit power supply.
2. Remove access panel(s) closest to the fan to be adjusted.
3. Loosen fan hub setscrews.
4. Adjust fan height on shaft using a straightedge placed across the fan orifice.
5. Tighten setscrews and replace panel(s).
6. Turn on unit power.

48TM025 UNITS (Fig. 40)

1. Shut off unit power supply.
2. Remove fan top-grille assembly and loosen fan hub screws.
3. Adjust fan height on unit, using a straightedge placed across the fan orifice.
4. Tighten setscrews and replace rubber hubcap to prevent hub from rusting to motor shaft.
5. Fill hub recess with permagum if rubber hubcap is missing.

EconoMi$er Adjustment

LED INDICATION — The EconoMi$er controller features an onboard diagnostic LED (light-emitting diode) that flashes to indicate its status. See Table 20 for flash codes. The controller also has terminal connections (REM LED) for remotely mounting an LED, if desired. The flash code priorities are as follows:

1. On/Off or continuous flash
2. Critical fault
3. Non-critical fault

If any sensors are opened, shorted, or removed, the EconoMi$er determines whether the failure is critical or non-critical and flashes the appropriate code. If a non-critical sensor fault occurs (i.e., outdoor air humidity), the EconoMi$er automatically reconfigures its control strategy to a more appropriate mode. If a critical sensor fault occurs (i.e., supply air sensor), the EconoMi$er reverts to a safe mode of operation until the sensor problem is resolved.

MANUAL CONFIGURATION PUSHBUTTON — The EconoMi$er controller also features an onboard button (CONFIG) to help troubleshoot the system. See Fig. 20. The CONFIG button has 3 functions.

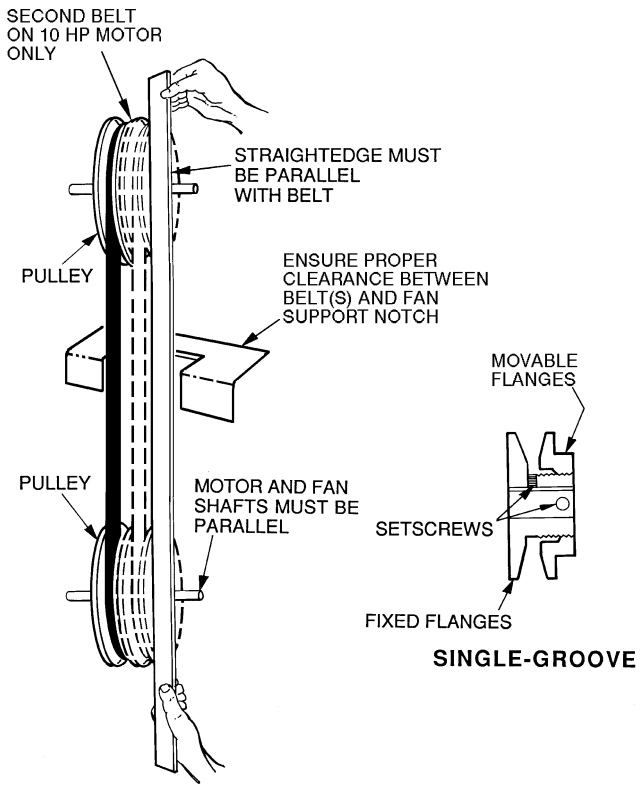
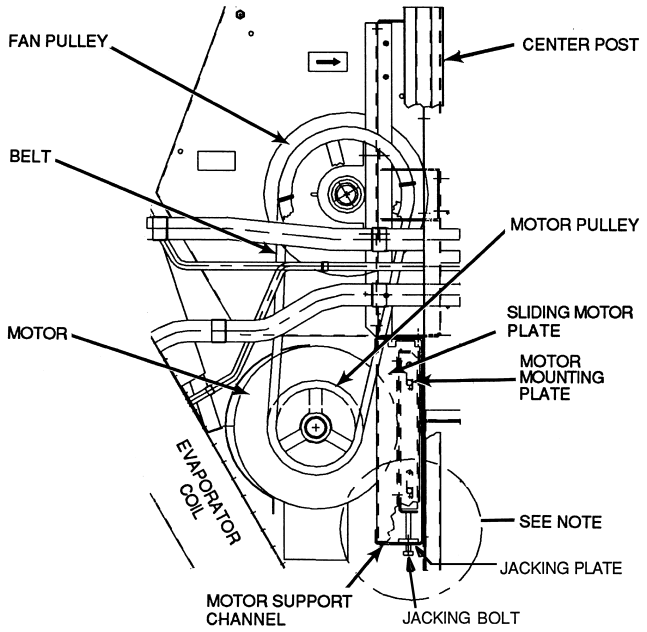
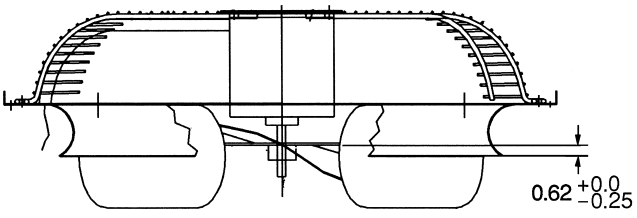


Fig. 37 — Evaporator-Fan Pulley and Adjustment



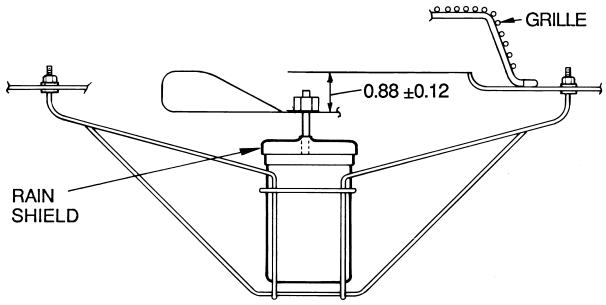
NOTE: A $3^1/_2$-in. bolt and threaded plate are included in the installer's packet. They should be added to the motor support channel below the motor mounting plate to aid in raising the motor. The plate part number is 50DP503842. The adjustment bolt is $^3/_8$-16 x $1^3/_4$ in. LG.

Fig. 38 — Evaporator-Fan Motor Section



NOTE: Dimensions are in inches.

Fig. 39 — Condenser Fan Adjustment, 48TM016,020,028



NOTE: Dimensions are in inches.

Fig. 40 — Condenser-Fan Adjustment, 48TM025

Pressing the CONFIG button for more than three seconds, but less than ten seconds, and then releasing will start the automatic test procedure. The damper will modulate fully open, wait, and modulate closed. This process takes three minutes to complete. Use this feature to determine if the actuator can be commanded.

If the CONFIG button is pressed and held for ten seconds and less than 30 seconds then released, the EconoMi$er controller reconfigures its mode of operation based on the sensors that are connected and functioning normally, and cancels the automatic test procedure.

If the EconoMi$er controller recognized a non-critical sensor fault, and flashed a code (i.e., FLASH 6, outdoor air humidity sensor fault) the FLASH CODE will be cleared, and normal operation begins. Ensure faulty sensor is removed before clearing faults.

If the EconoMi$er controller recognizes a critical sensor fault, and flashes a code (i.e., FLASH 4, discharge air thermistor fault) the FLASH code will not be cleared, and the EconoMi$er will remain in the safe operation mode. The sensor fault must be corrected to enable EconoMi$er to revert to normal operation.

If the CONFIG button is pressed and held for more than 30 seconds and released, the EconoMi$er controller will enable the enthalpy comparison strategy (with the outdoor air enthalpy and return air enthalpy sensors installed).

Power Failure — Dampers have a spring return. In event of power failure, dampers will return to fully closed position until power is restored. *Do not manually operate economizer motor.*

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 cooling charging chart (see Fig. 41), add or remove refrigerant until conditions of the chart are met. Note that charging chart is different from those normally used. An accurate pressure gage and temperature-sensing device is required. Charging is accomplished by ensuring the proper amount of liquid subcooling. 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.

TO USE THE COOLING CHARGING CHART — Use the above temperature and pressure readings, and find the intersection point on the cooling charging chart. If intersection point on chart is above line, add refrigerant. If intersection point on chart is below line, carefully recover 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.

The TXV (thermostatic expansion valve) is set to maintain between 15 and 20 degrees of superheat at the compressors. The valves are factory set and should not require re-adjustment.

Table 20 — EconoMi$er Control Module Flash Code Identification

	FLASH CODE	CAUSE	ACTION TAKEN BY ECONOMI$ER
	Constant On	Normal operation	Normal operation.
	Constant Off	No power	No operation.
	Continuous Flash	CONFIG button pushed and held between 3 and 9 seconds	Outdoor air damper is stroked fully open, then closed (automatic test procedure takes 3 minutes to complete).
Critical Fault	**Flash One**	Control board fault	System shutdown.
	Flash Two	Thermostat fault (i.e., Y2 without Y1)	System shutdown until corrected.
	Flash Three	Actuator fault	Revert to mechanical cooling only.
	Flash Four	Discharge air thermistor fault	Continue operation with damper at minimum position. Revert to mechanical cooling only.
	Flash Five	Outdoor air temperature sensor fault	Continue operation with damper at minimum position. Disable mechanical cooling lockout.
Non-Critical Fault	**Flash Six**	Outdoor air humidity sensor fault	Continue operation with dry bulb or dry bulb differential switchover.
	Flash Seven	Return air temperature sensor fault	Continue operation with single enthalpy EconoMi$er switchover or dry bulb EconoMi$er switchover (without humidity sensor).
	Flash Eight	Return air humidity sensor fault	Continue operation with single enthalpy, differential dry bulb, or dry bulb EconoMi$er switchover.
	Flash Nine	Carbon Dioxide (CO_2) sensor fault	Continue operation without ventilation control.
	Flash Ten	Onboard adjustment potentiometer fault	Continue operation with default potentiometer settings.

MOISTUREMI$ER™ SYSTEM CHARGING — The system charge for units with the MoistureMi$er option is greater than that of the standard unit alone. The charge for units with this option is indicated on the unit nameplate drawing. To charge systems using the MoistureMi$er Dehumidification package, fully evacuate, recover, and re-charge the system to the nameplate specified charge level. To check or adjust refrigerant charge on systems using the MoistureMi$er Dehumidification package, charge per the standard subcooling charts. The subcooler MUST be deenergized to use the charging charts. The charts reference a liquid pressure (psig) and temperature at a point between the condenser coil and the subcooler coil. A tap is provided on the unit to measure liquid pressure entering the subcooler (leaving the condenser).

Gas Valve Adjustment

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

When power is supplied to valve terminals D1 and C2, the main valve opens to its preset position.

The regular factory setting is stamped on the valve body (3.3 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 $^1/_8$-in. pipe plug from manifold or gas valve pressure tap connection. Install a suitable 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. 42).
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 $^1/_8$-in. pipe plug and screw cap.

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

MAIN BURNER REMOVAL

1. Shut off (field-supplied) manual main gas valve.
2. Shut off power to unit.
3. Remove unit control box access panel, burner section access panel, and center post (Fig. 4-6).
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 2 screws that hold the burner support plate flange to the vestibule plate.
10. Lift burner assembly out of unit.

CLEANING AND ADJUSTMENT

1. Remove burner rack from unit as described in Main Burner Removal section above.
2. Inspect burners, and if dirty, remove burners from rack.
3. Using a soft brush, clean burners and crossover port as required.
4. Adjust spark gap. See Fig. 43.
5. Reinstall burners on rack.
6. Reinstall burner rack as described above.

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

Protective Devices

COMPRESSOR PROTECTION

Overcurrent — Each compressor has internal line break motor protection.

Crankcase Heater — All units are equipped with a 70-watt crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. The crankcase heater is energized whenever there is a main power to the unit and the compressor is not energized.

> IMPORTANT: After a prolonged shutdown or servicing, energize the crankcase heaters for 24 hours before starting the compressors.

Compressor Lockout — If any of the safeties (high-pressure, low-pressure, freeze protection thermostat, compressor internal thermostat) trip, or if there is loss of power to the compressors, the cooling lockout (CLO) will lock the compressors off. To reset, manually move the thermostat setting.

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.

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 locked out by the CLO. To reset, manually move the thermostat setting.

FREEZE PROTECTION THERMOSTAT (FPT) — An FPT is located on the top and bottom of the evaporator coil. They detect frost build-up and turn off the compressor, allowing the coil to clear. Once the frost has melted, the compressor can be reenergized by resetting the compressor lockout.

Relief Devices — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side.

Control Circuit, 24-V — This control circuit is protected against overcurrent by a 3.2 amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting. See Fig. 44 and 45 for typical wiring diagrams.

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

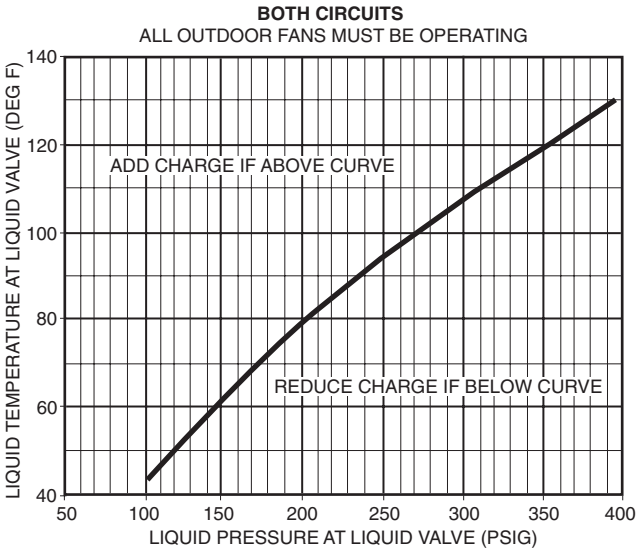


Fig. 41 — Cooling Charging Chart

Diagnostic LEDs — The unit control boards have LEDs for diagnostic purposes. The IGC error codes are shown in Table 19.

**EconoMi$er LED —** The EconoMi$er control module has an LED for diagnostic purposes. The flash code identification codes are shown in Table 20.

Optional Hinged Access Doors — When the optional service package is ordered or the if the hinged access doors option is ordered, the unit will be provided with external and internal hinged access doors to facilitate service.

Four external hinged access doors are provided on size 016-025 units. Two external hinged doors are provided on size 028 units. All external doors are provided with 2 large $^1/_4$ turn latches with folding bail-type handles. (Compressor access doors have one latch.) A single door is provided for filter and drive access. One door is provided for control box access. The control box access door is interlocked with the non-fused disconnect which must be in the OFF position to open the door. Two doors are provided on 48TM016-025 units for access to the compressor compartment.

Two internal access doors are provided inside the filter/drive access door. The filter access door (on the left) is secured by 2 small $^1/_4$ turn latches with folding bail-type handles. This door must be opened prior to opening the drive access door. The drive access door is shipped with 2 sheet metal screws holding the door closed. Upon initial opening of the door, these screws may be removed and discarded. The door is then held shut by the filter access door, which closes over it.

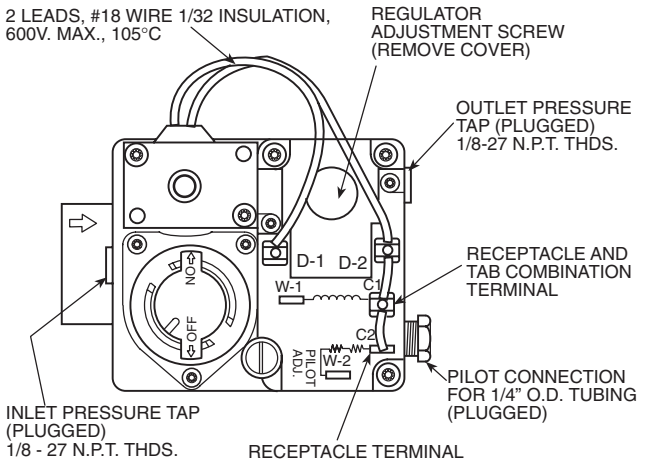
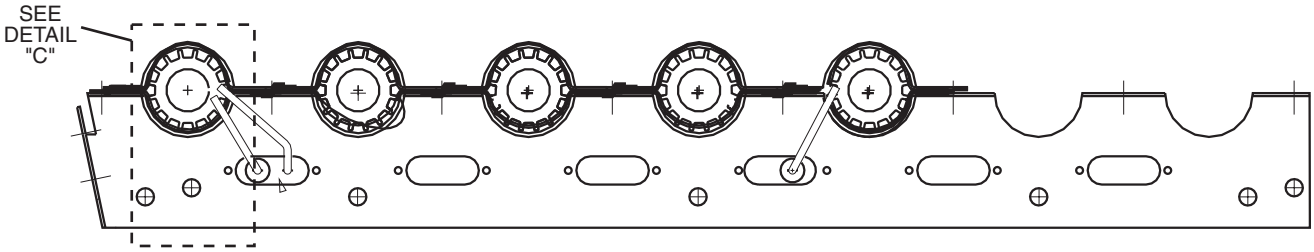
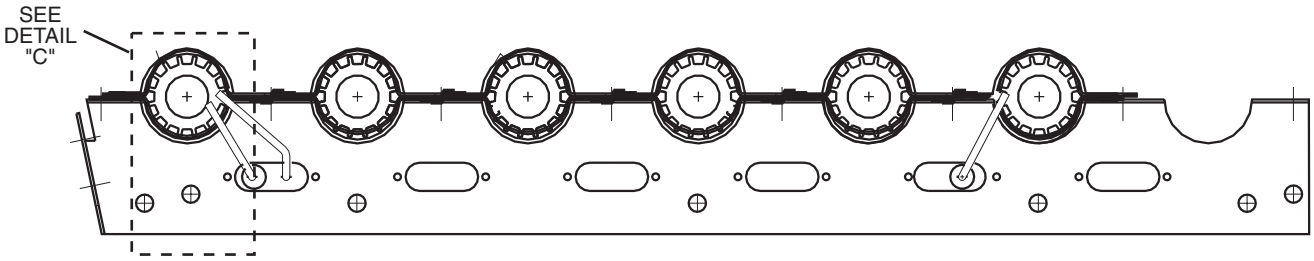


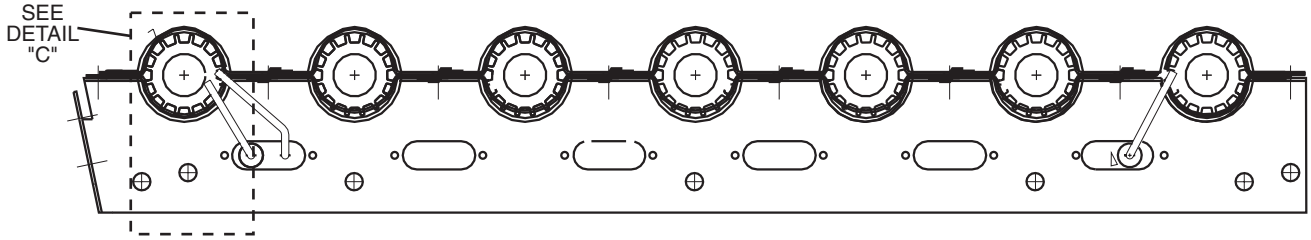
Fig. 42 — Gas Valve



48TMD016



48TMD020-028 AND 48TMF016



48TMF020-028

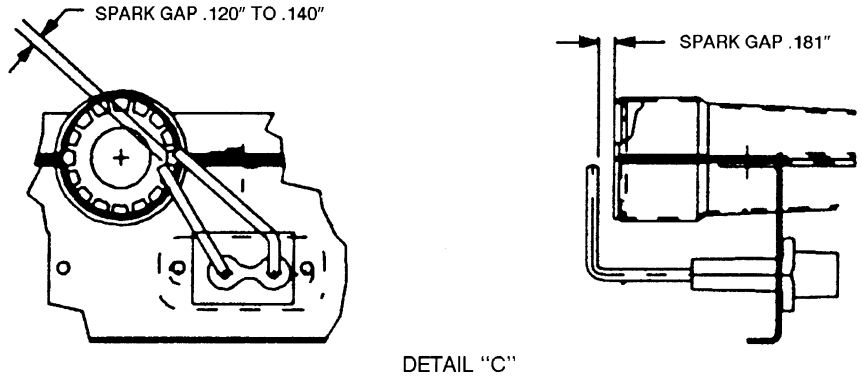


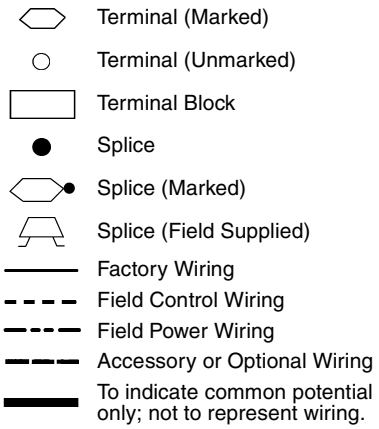
Fig. 43 — Spark Gap Adjustment

LEGEND AND NOTES

Fig. 44 — Typical Wiring Schematic and Fig. 45 — Typical Component Arrangement

LEGEND

AHA — Adjustable Heat Anticipator
BKR W/AT — Breaker with Amp Turns
C — Contactor, Compressor
CB — Circuit Breaker
CC — Cooling Compensator
CLO — Compressor Lockout
COMP — Compressor Motor
CR — Control Relay
CT — Control Transformer
DAT — Discharge Air Thermistor
DM — Damper Motor
DU — Dummy Terminal
EC — Enthalpy Control
EQUIP — Equipment
FPT — Freeze Protection Thermostat
FU — Fuse
GND — Ground
HPS — High-Pressure Switch
HS — Hall Effect Sensor
HV — High Voltage
I — Ignitor
IDM — Induced-Draft Motor
IFC — Indoor-Fan Contactor
IFCB — Indoor-Fan Circuit Breaker
IFM — Indoor-Fan Motor
IGC — Integrated Gas Unit Controller
L — Light
LED — Light-Emitting Diode
LOR — Lockout Relay
LPS — Low-Pressure Switch
LS — Limit Switch
MGV — Main Gas Valve
NEC — National Electrical Code
OAT — Outdoor-Air Thermostat
OFC — Outdoor-Fan Contactor
OFM — Outdoor-Fan Motor
PL — Plug Assembly
PRI — Primary
RS — Rollout Switch
SN — Sensor
SR — Solenoid Relay
SW — Switch
TB — Terminal Block
TC — Thermostat Cooling
TH — Thermostat Heating
TRAN — Transformer



NOTES:
1. Compressor and fan motors thermally protected; 3-phase motors protected against primary single-phasing conditions.
2. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
3. Jumpers are omitted when unit is equipped with EconoMi$er.
4. IFCB must trip amps is equal to or less than 140% full load amps.
5. On 208/230-v unit, TRAN1 is factory wired to ORN lead for 230-v power supply. If unit is to run on 208-v power supply, TRAN1 must be rewired. Disconnect the BLK wire on TRAN1 and connect wire to 208-v RED wire. Insulate 230-v ORN wire.
6. The CLO locks out the compressor to prevent short cycling on compressor overload and safety devices. Before replacing CLO, check these devices.
7. Number(s) indicates the line location of used contacts. A bracket over (2) numbers signifies a single-pole, double-throw contact. An underlined number signifies a normally-closed contact. A plain (no line) number signifies a normally-open contact.

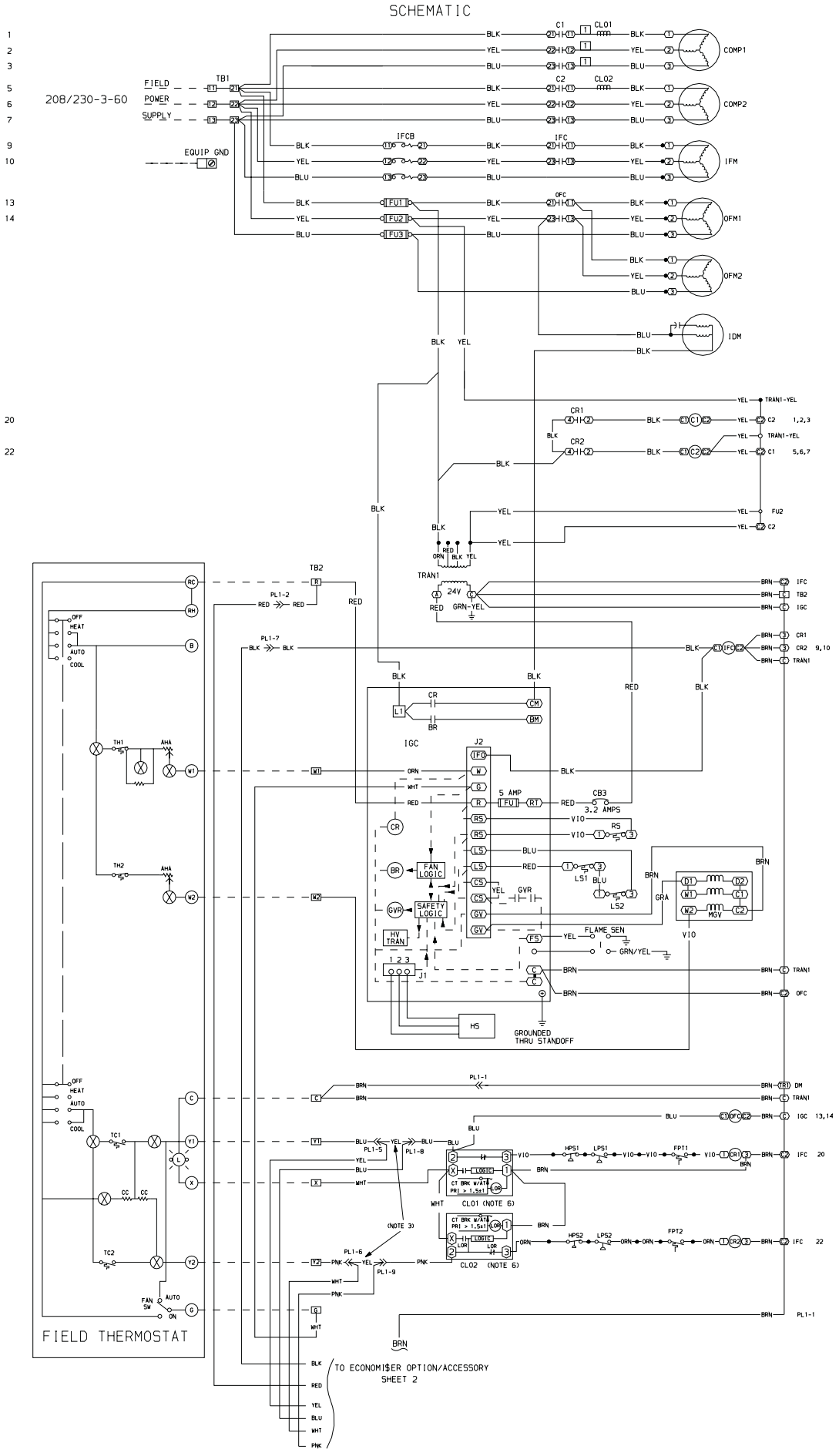


Fig. 44 — Typical Wiring Schematic (48TM025, 208/230-v Shown)

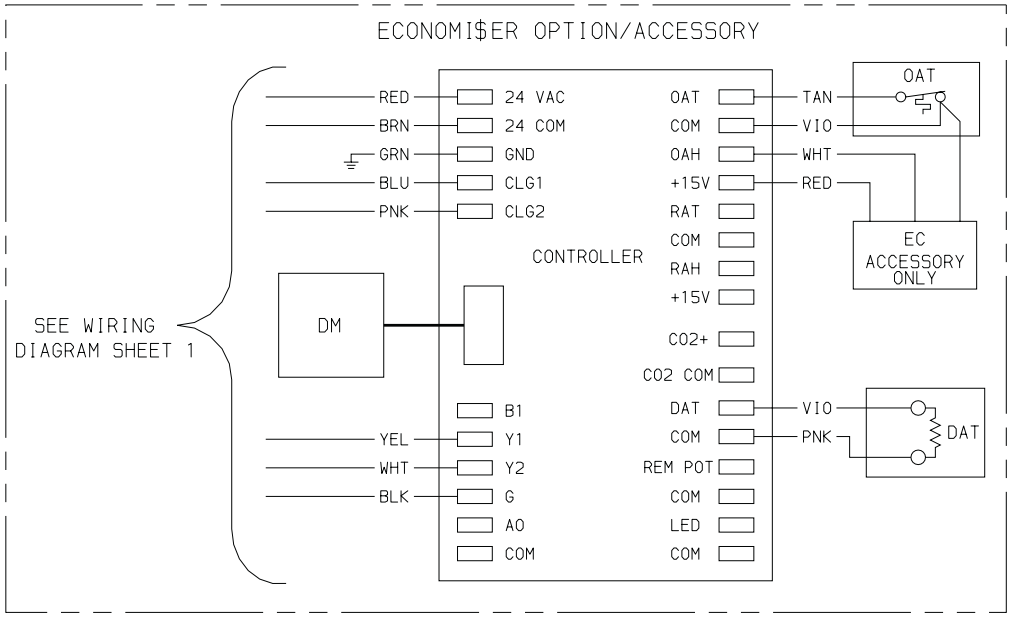


Fig. 44 — Typical Wiring Schematic (48TM025, 208/230-v Shown) (cont)

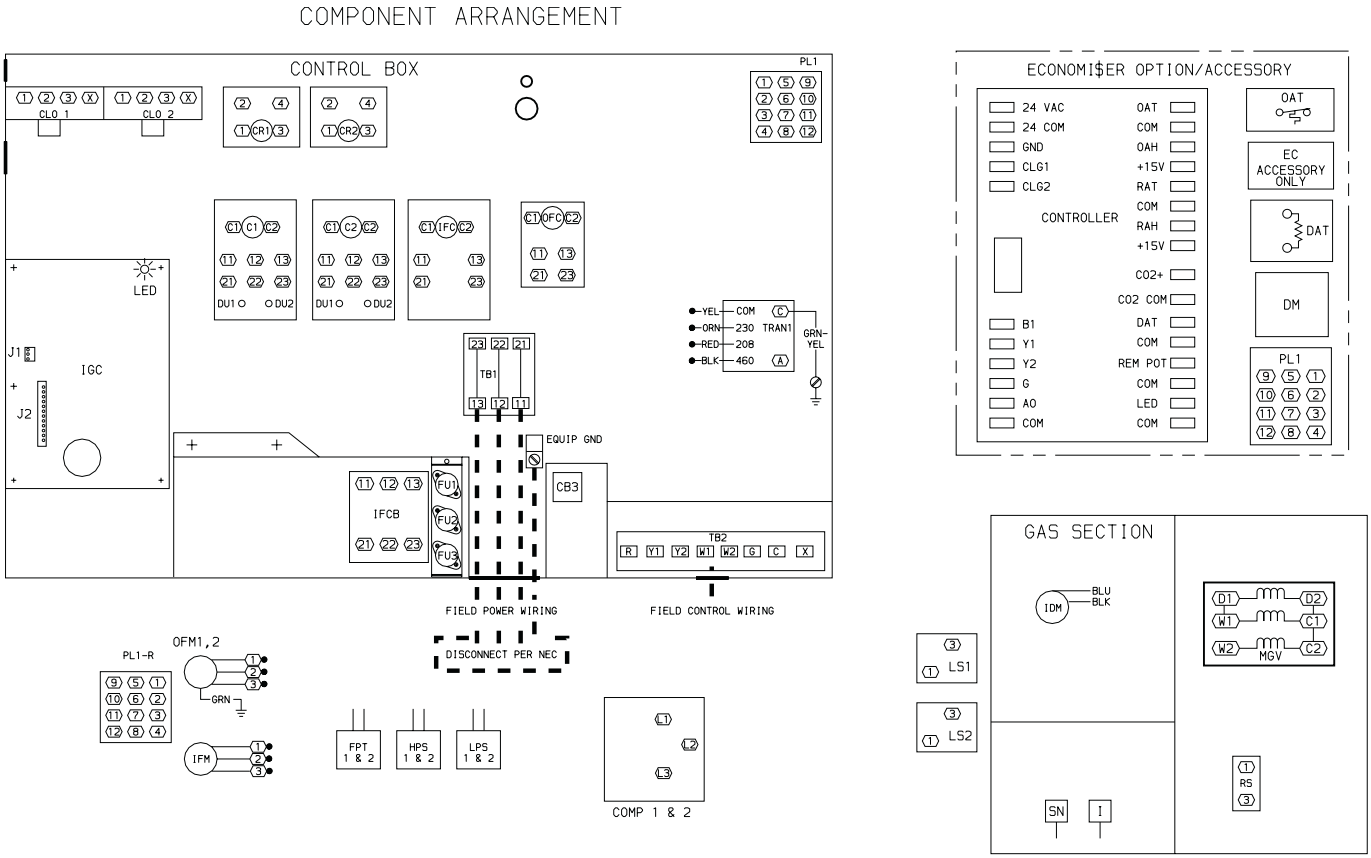


Fig. 45 — Typical Component Arrangement (48TM025 Shown)

TROUBLESHOOTING

Refer to Tables 21-24 for troubleshooting details.

Table 21 — Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and condenser fan will not start.	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer, or control relay.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
Compressor will not start but condenser fan runs.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective overload.	Determine cause and replace.
	Compressor locked out	Determine cause for safety trip and reset lockout.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor.	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective overload.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor operates continuously.	Dirty air filter.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser coil dirty or restricted.	Clean coil or remove restriction.
Excessive head pressure.	Dirty air filter.	Replace filter.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharged.	Recover excess refrigerant.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
Head pressure too low.	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Restriction in liquid tube.	Remove restriction.
Excessive suction pressure.	High heat load.	Check for source and eliminate.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
	Insufficient evaporator airflow.	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.

LEGEND

TXV — Thermostatic Expansion Valve

Table 22 — Heating Service Analysis

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

LEGEND

GR — Ground

Table 23 — EconoMi$er Troubleshooting

PROBLEM	POTENTIAL CAUSE	REMEDY
Damper Does Not Open	Indoor (Evaporator) Fan is Off	Check to ensure that 24 vac is present at Terminal C1 (Common Power) on the IFC (Indoor [Evaporator] Fan Contactor) or that 24 vac is present at the IFO (Indoor [Evaporator] Fan On) terminal. Check whether 24 vac is present at PL6-1 (red wire) and/or PL6-3 (black wire). If 24 vac is not present, check wiring (see unit label diagram). Check proper thermostat connection to G on the connection board.
	No Power to EconoMi$er Controller	Check to ensure that 24 vac is present across Terminals 24 VAC and 24 V COM on the EconoMi$er control. If 24 vac is not present, check wiring (see unit label diagram). If 24 vac is present, STATUS light should be on constantly.
	No Power to G Terminal	If IFM is on, check to ensure 24 vac is present on G Terminal of the EconoMi$er controller. If 24 vac is not present, check wiring (see unit label diagram).
	Controller Fault	If STATUS light is flashing one flash, the EconoMi$er controller is experiencing a fault condition. Cycle power to the controller. If condition continues, replace the EconoMi$er controller.
	Thermostat Fault	If STATUS light is flashing two flashes, the EconoMi$er controller senses that the thermostat is wired incorrectly. Check wiring between the thermostat and the connection board in the electrical panel. The fault condition is caused by Y2 being energized before Y1.
	Actuator Fault	Check the wiring between the EconoMi$er controller and the actuator. Hold CONFIG button between 3 and 10 seconds to verify the actuator's operation. (This process takes 3 minutes to complete.)
EconoMi$er Operation Limited to Minimum Position	Minimum Position Set Incorrectly	Verify that the MIN POS (%) is set greater than zero. Adjust MIN POS (%) to 100% to verify operation, and then set to correct setting.
	EconoMi$er Changeover Set Point Set Too High or Too Low	Set at correct value. See Table 4.
	Discharge Air Thermistor Faulty	If STATUS light is flashing 4 flashes, Discharge Air Thermistor is faulty. Check wiring or replace sensor.
	Outdoor Air Temperature Sensor Faulty	If STATUS light is flashing 5 flashes, Outdoor Air Temperature Sensor is faulty. Check wiring or replace sensor.
Damper Position Less than Minimum Position Set Point	Supply Air Low Limit Strategy Controlling	The supply-air temperature is less than 45 F, causing the minimum position to be decreased. Refer to the Start-Up instructions. Verify correct setting of MIN POS (%). If correct, EconoMi$er is operating correctly.
Damper Does Not Return to Minimum Position	CO_2 Ventilation Strategy Controlling	If a CO_2 sensor is being used, and the damper position is greater than minimum position, the ventilation control strategy is controlling. Refer to the Start-Up instructions. EconoMi$er is operating correctly.
Damper Does Not Close on Power Loss	Damper Travel is Restricted	Check to ensure the damper is not blocked.

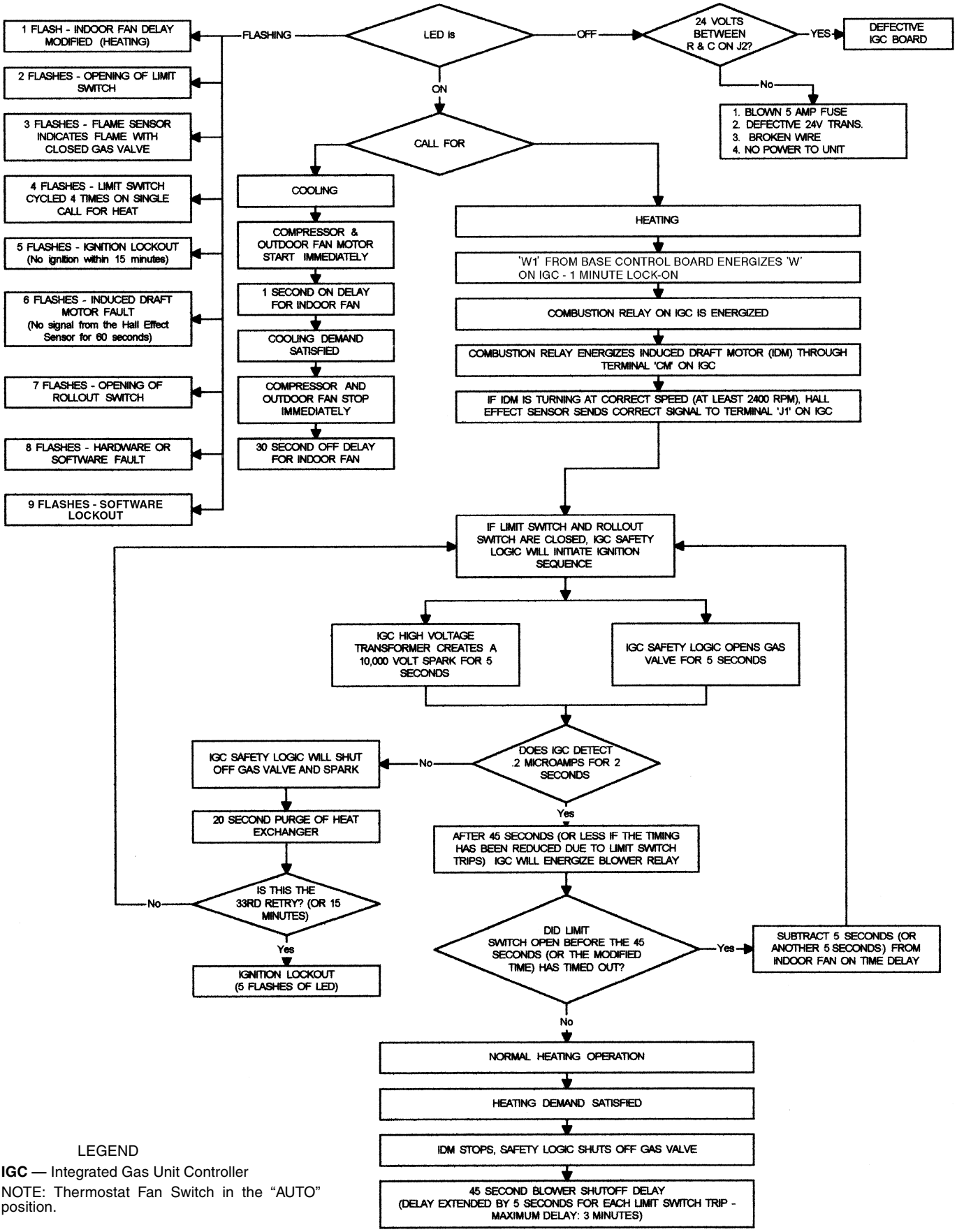
LEGEND

IFM — Indoor Fan Motor
PL — Plug

Table 24 — MoistureMi$er™ Dehumidification Subcooler Service Analysis

PROBLEM	CAUSE	REMEDY
Subcooler will not energize	No power to subcooler control transformer.	Check power source. Ensure all wire connections are tight.
	No power from subcooler control transformer to liquid line three-way valve.	1. Fuse open; check fuse. Ensure continuity of wiring. 2. Subcooler control low-pressure switch open. Cycle unit off and allow low-pressure switch to reset. Replace switch if it will not close. 3. Transformer bad; check transformer.
	Liquid line three-way valve will not operate.	1. Solenoid coil defective; replace. 2. Solenoid valve stuck closed; replace.
Subcooler will not deenergize	Liquid Line three-way valve will not close.	Valve is stuck open; replace.
Low system capacity	Low refrigerant charge or frosted coil.	1. Check charge amount. See system charging section. 2. Evaporator coil frosted; check and replace subcooler control low-pressure switch if necessary.

Refer to Fig. 46 for IGC troubleshooting information.



LEGEND

IGC — Integrated Gas Unit Controller

NOTE: Thermostat Fan Switch in the "AUTO" position.

Fig. 46 — IGC Control (Heating and Cooling)

INDEX

START-UP CHECKLIST

MODEL NO.: _____ SERIAL NO.: _____

DATE: _____ TECHNICIAN: _____

PRE-START-UP

- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ VERIFY INSTALLATION OF INDOOR FAN MOTOR ADJUSTMENT BOLT AND PLATE
- ☐ VERIFY INSTALLATION OF ECONOMI$ER HOOD
- ☐ VERIFY INSTALLATION OF FLUE HOOD AND WIND BAFFLE
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ CHECK GAS PIPING FOR LEAKS
- ☐ CHECK THAT FILTERS AND SCREENS ARE CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SETSCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ VERIFY THAT SCROLL COMPRESSOR IS ROTATING IN THE CORRECT DIRECTION
- ☐ VERIFY THAT CRANKCASE HEATER HAS BEEN ENERGIZED FOR 24 HOURS

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 _____ EXHAUST FAN AMPS _____

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 CHART ON PAGE 36.

GENERAL

☐ ECONOMI$ER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE