48TJ016-028
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. 1 and 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 ± 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.

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. 2. 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.

POSITIONING — Maintain clearance, per Fig. 4 and 5, around and above unit to provide minimum distance from combustible materials, proper airflow, and service access.

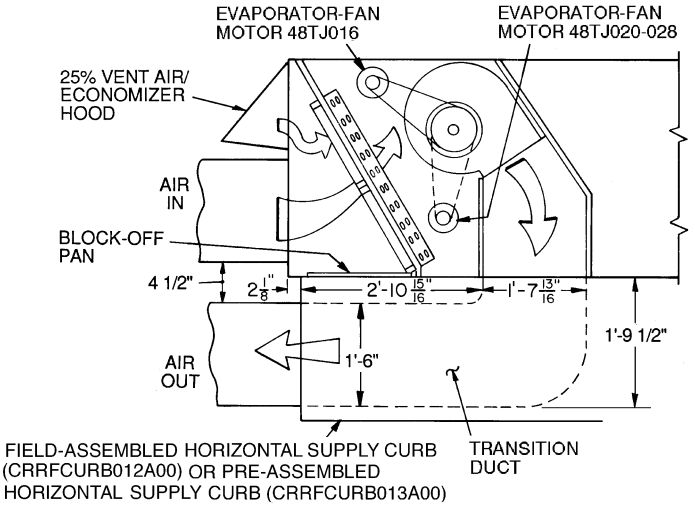
Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air. For proper unit operation, adequate combustion and ventilation air must be provided in accordance with Section 5.3 (Air for Combustion and Ventilation) of the National Fuel 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 9.

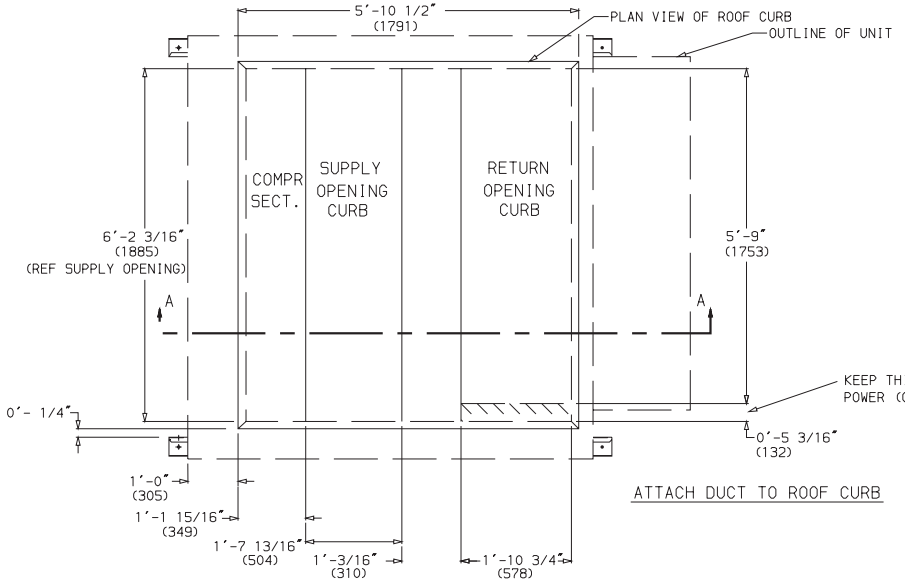


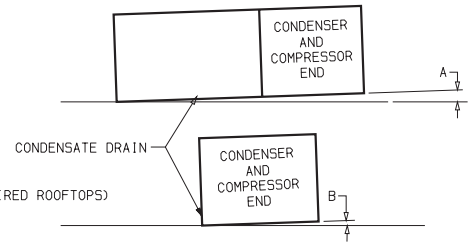
NOTE: For preassembled horizontal adapter roof curb part no. CRRFCURB013A00, the accessory kit includes a factory-designed transition duct. For horizontal curb part no. CRRFCURB012A00, a field-supplied transition duct is required.

Fig. 1 — Horizontal Adapter Roof Curbs and Roof Curbs

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)	Field-Assembled Horizontal Supply Curb
CRRFCURB013A00	2′-0″ (610)	Pre-Assembled Horizontal Supply Curb

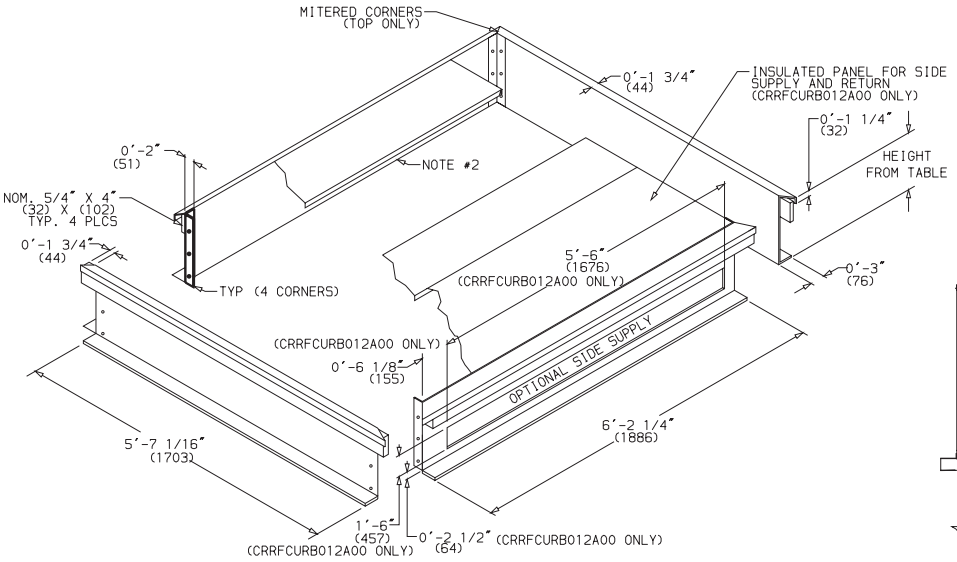
NOTES:
1. Roof curb accessory is shipped disassembled.
2. Insulated panels: 1″ thick neoprene coated 1 1/2 lb density.
3. Dimensions in ( ) are in millimeters.
4. ⇨ Direction of airflow.
5. Roof curb: 16 ga. (VA03-56) stl.
6. To prevent the hazard of stagnant water build-up in the drain pan of the indoor section, unit can only be pitched as shown.

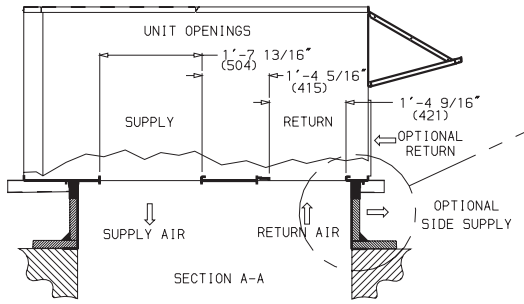




DIMENSIONS (degrees and inches)

UNIT	A		B	
	Deg.	in.	Deg.	in.
ALL	.28	.45	.28	.43





UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.

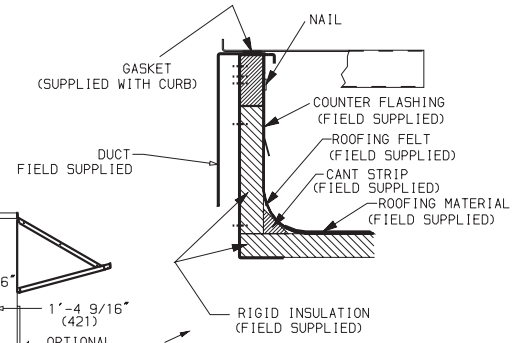
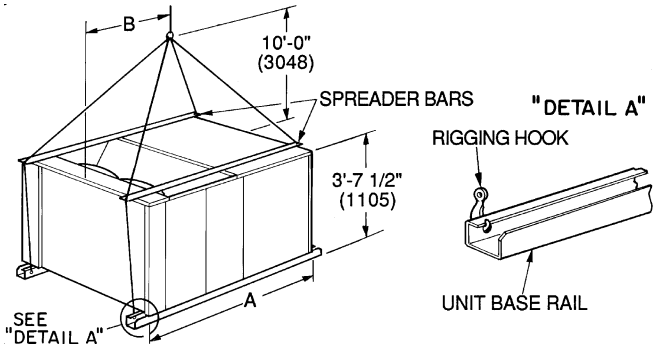


Fig. 2 — Roof Curb Details



NOTES:
1. Dimensions in ( ) are in millimeters.
2. Refer to Fig. 4 and 5 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 economizer. See Fig. 4 and 5 for economizer weight.
6. Weights given are for aluminum evaporator and condenser coil plate fins.

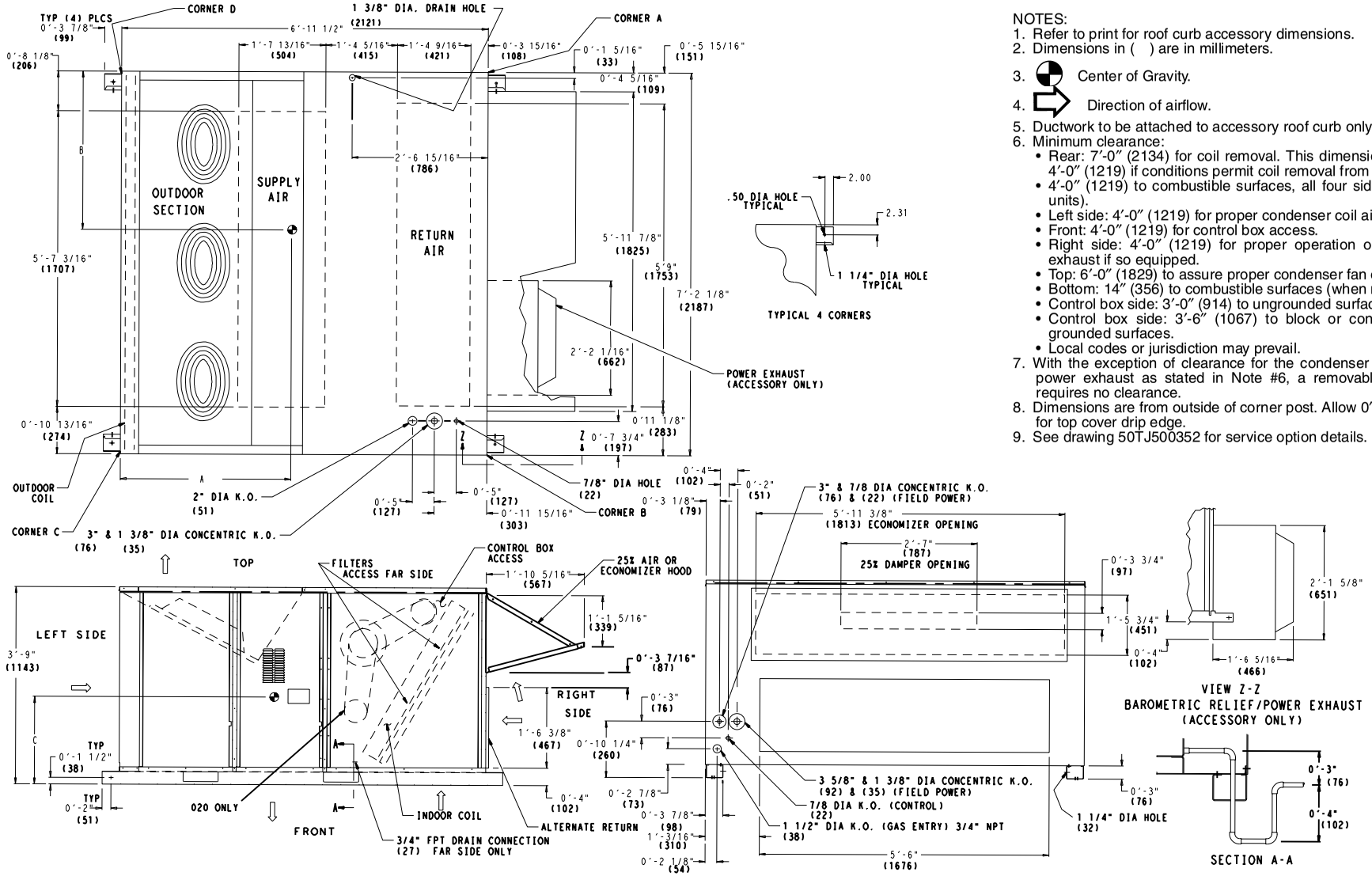
⚠ CAUTION

All panels must be in place when rigging.

UNIT 48TJ	MAXIMUM SHIPPING WEIGHT		DIMENSIONS			
			A		B	
	Lb	Kg	Ft-in.	mm	Ft-in.	mm
016	1775	805	6-11 1/2	2121	3-5	1041
020	1875	850	6-11 1/2	2121	3-3	991
024	1985	900	6-11 1/2	2121	3-2	965
028	2135	968	6-11 1/2	2121	3-2	965

Fig. 3 — Rigging Details

UNIT	STD UNIT WEIGHT		ECONOMIZER WEIGHT		CORNER A		CORNER B		CORNER C		CORNER D		DIM A		DIM B		DIM C	
	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	ft-in.	mm	ft-in.	mm	ft-in.	mm
48TJD, TJF016	1650	748	90	41	423	192	386	175	403	183	438	199	3-5	1041	3-5	1041	1-10	559
48TJD, TJF020	1800	816	90	41	432	196	410	186	461	209	472	214	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.
3. Center of Gravity.
4. Direction of airflow.
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 airflow.
   - 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; 48TJ016,020

UNIT	STD UNIT WEIGHT		ECONOMIZER WEIGHT		CORNER A		CORNER B		CORNER C		CORNER D		DIM A		DIM B		DIM C	
	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	ft-in.	mm	ft-in.	mm	ft-in.	mm
48TJD, TJF024	1850	839	90	41	443	201	406	184	476	216	525	238	3-2	965	3-5	1041	1-8	508
48TJD, TJF028	2000	907	90	41	471	214	428	194	526	239	574	260	3-2	965	3-5	1041	1-8	508

NOTES:
1. Refer to print for roof curb accessory dimensions.
2. Dimensions in ( ) are in millimeters.
3. Center of Gravity.
4. Direction of airflow.
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).
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   - Bottom: 14″ (356) to combustible surfaces (when not using curb).
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   - 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 50TJ500353 for service option details.

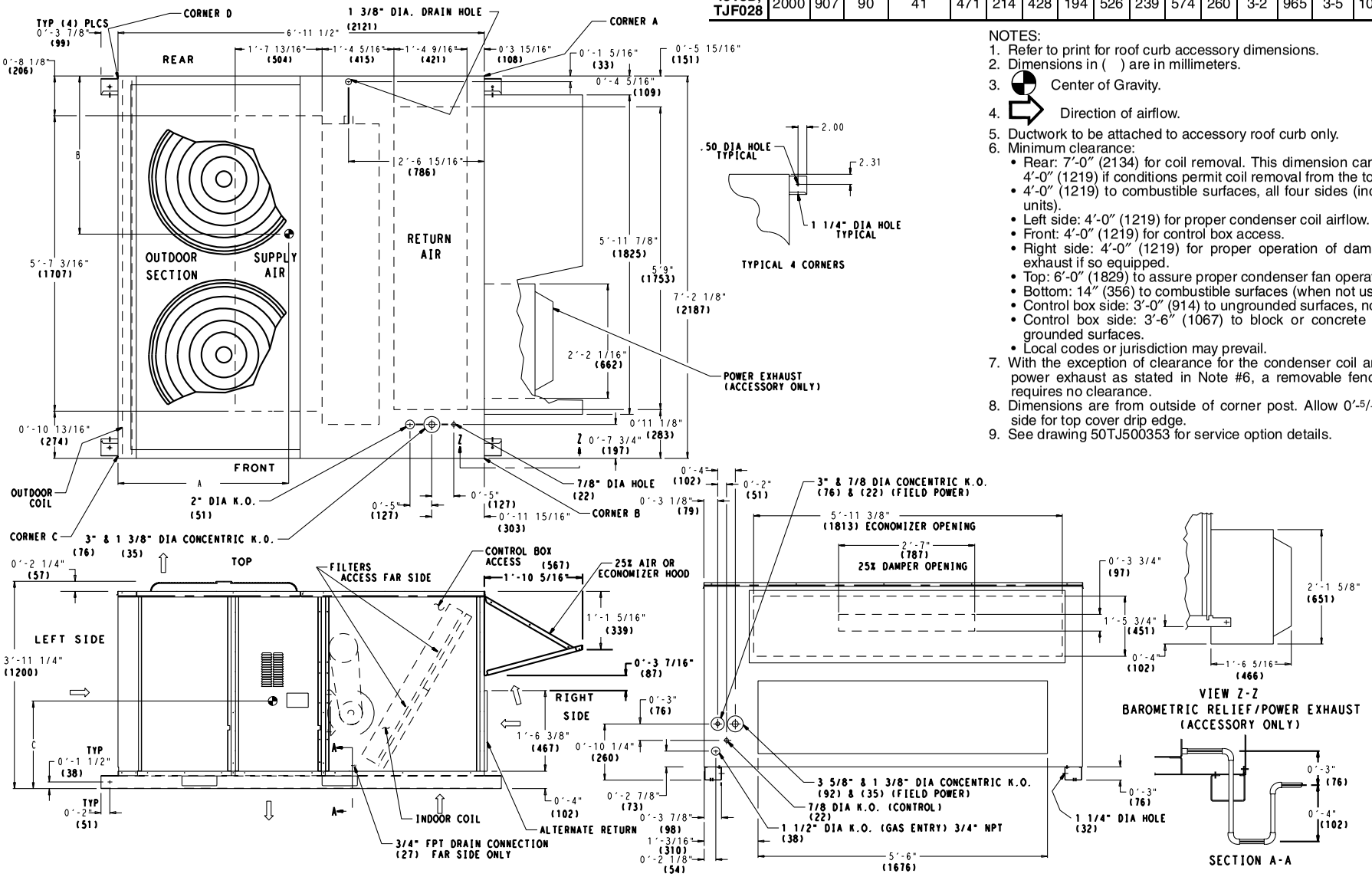


Fig. 5 — Base Unit Dimensions; 48TJ024,028

Table 1 — Physical Data

UNIT 48TJ		016D/F 208/230, 460 v	016D/F 575 v	020D/F	024D/F	028D/F
NOMINAL CAPACITY (tons)		15		18	20	25
OPERATING WEIGHT (lb)		1650		1800	1850	2000
Economizer		90		90	90	90
Roof Curb		200		200	200	200
COMPRESSOR		Scroll				
Quantity...Model (Ckt 1, Ckt 2)		2...SR*942AE		1...SM120, 1...SR*782AE	1...SM120, 1...SM110	1...SM161, 1...SM120
Number of Refrigerant Circuits		2		2	2	2
Oil (oz) (Ckt 1, Ckt 2)		90, 90		110, 72	110,110	112, 110
Stages of Capacity Control (%)		50/50		60/40	52/48	56/44
REFRIGERANT TYPE		R-22				
Expansion Device		TXV				
Operating Charge (lb-oz)						
Circuit 1*		10-13		15-2	16-3	21-0
Circuit 2		10-5		11-5	14-8	15-4
CONDENSER COIL		Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins				
Rows...Fins/in.		2...17		3...15	3...15	4...15
Total Face Area (sq ft)		21.7		21.7	21.7	21.7
CONDENSER FAN		Propeller Type				
Nominal Cfm		10,400		9300	13,700	12,500
Quantity...Diameter (in.)		3...22		3...22	2...30	2...30
Motor Hp...Rpm		1/2...1050		1/2...1050	1...1075	1...1075
Watts Input (Total)		1100		1100	3400	3400
EVAPORATOR COIL		Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced or Copper Plate Fins, Face Split				
Rows...Fins/in.		2...17		3...15	3...15	4...15
Total Face Area (sq ft)		17.5		17.5	17.5	17.5
EVAPORATOR FAN		Centrifugal Type				
Quantity...Size (in.)		2...10 x 10	2...10 x 10	2...12 x 12	2...12 x 12	2...12 x 12
Type Drive		Belt	Belt	Belt	Belt	Belt
Nominal Cfm		6000	6000	7200	8000	10,000
Motor Hp		3.7	3.0	5	7.5	10
Motor Nominal Rpm		1725	1725	1745	1745	1740
Maximum Continuous Bhp		4.25	3.45	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		56H	56H	184T	213T	215T
Nominal Rpm High/Low		—	—	—	—	—
Fan r/s Range	**Low-Medium Static**	891-1179	1159-1429	910-1095	1002-1225	1066-1283
	High Static	1227-1550	—	1069-1287	1193-1458	1332-1550
Motor Bearing Type		Ball	Ball	Ball	Ball	Ball
Maximum Allowable Rpm		1550	1550	1550	1550	1550
Motor Pulley Pitch Diameter	**Low-Medium Static**	3.1/4.1	4.3/5.3	4.9/5.9	5.4/6.6	4.9/5.9
Min/Max (in.)	**High Static**	3.7/4.7	—	4.9/5.9	5.4/6.6	4.9/5.9
Nominal Motor Shaft Diameter (in.)		7/8	7/8	1 1/8	1 3/8	1 3/8
Fan Pulley Pitch Diameter (in.)	**Low-Medium Static**	6.0	6.4	9.4	9.4	8.0
	High Static	5.2	—	8.0	7.9	6.4
Nominal Fan Shaft Diameter (in.)		1 3/16	1 3/16	1 7/16	1 7/16	1 7/16
Belt, Quantity...Type...Length (in.)	**Low-Medium Static**	1...BX...42	1...BX...45	1...BX...50	1...BX...54	2...BX...50
	High Static	1...BX...42	—	1...BX...48	1...BX...50	2...BX...47
Pulley Center Line Distance (in.)		13.5-15.5	13.5-15.5	13.3-14.8	14.6-15.4	14.6-15.4
Speed Change per Full Turn of	**Low-Medium Static**	48	44	37	37	36
Movable Pulley Flange (rpm)	**High Static**	55	—	34	44	45
Movable Pulley Maximum Full Turns From Closed Position		5	5	5	5	5
Factory Speed		3.5	3.5	3.5	3.5	3.5
Factory Speed Setting (rpm)	**Low-Medium Static**	1035	1296	1002	1120	1182
	High Static	1389	—	1178	1328	1470
Fan Shaft Diameter at Pulley (in.)		1 3/16	1 3/16	1 7/16	1 7/16	1 7/16

LEGEND

Bhp — Brake Horsepower
TXV — Thermostatic Expansion Valve

*Circuit 1 uses the lower portion of condenser coil and lower portion of evaporator coils; and Circuit 2 uses the upper portion of both coils.
†Rollout switch is manual reset.

**The 48TJ028 units requires 2-in. industrial-grade filters capable of handling face velocities of up to 625 ft/min (such as American Air Filter no. 5700 or equivalent).

NOTE: The 48TJ016-028 units have a low-pressure switch (standard) located on the suction side.

Table 1 — Physical Data (cont)

UNIT 48TJ		016D/F	020D/F	024D/F	028D/F
FURNACE SECTION					
Rollout Switch Cutout Temp (F)†		190	190	190	190
Burner Orifice Diameter (in. ...drill size)					
Natural Gas		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	**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		3.3	3.3	3.3	3.3
Gas Valve Quantity		1	1	1	1
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 x 20 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

*Circuit 1 uses the lower portion of condenser coil and lower portion of evaporator coils; and Circuit 2 uses the upper portion of both coils.
†Rollout switch is manual reset.

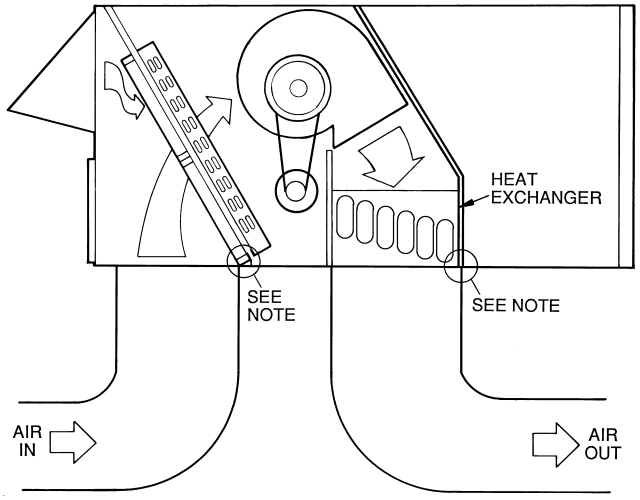
**The 48TJ028 units requires 2-in. industrial-grade filters capable of handling face velocities of up to 625 ft/min (such as American Air Filter no. 5700 or equivalent).

NOTE: The 48TJ016-028 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.

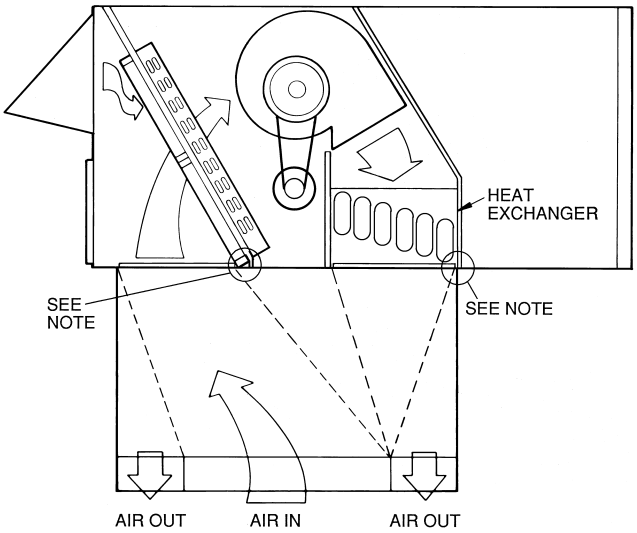
Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

Step 4 — Make Unit Duct Connections — Unit is shipped for thru-the-bottom duct connections. Ductwork openings are shown in Fig. 1, 4, and 5. Duct connections are shown in Fig. 6. Field-fabricated concentric ductwork may be connected as shown in Fig. 7 and 8. 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. 6 — Air Distribution — Thru-the-Bottom



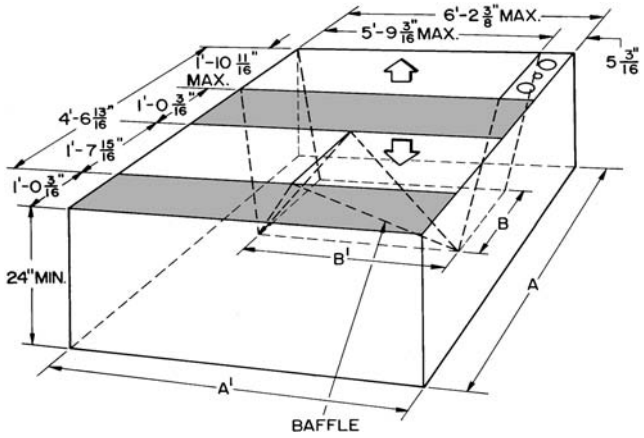
NOTE: Do not drill in this area; damage to basepan may result in water leak.

Fig. 7 — 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. 9. 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. 10.

Step 6 — Trap Condensate Drain — See Fig. 11 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. 12). A trap at least 4-in. deep must be used.



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

Shaded area indicates block-off panels.

Fig. 8 — Concentric Duct Details

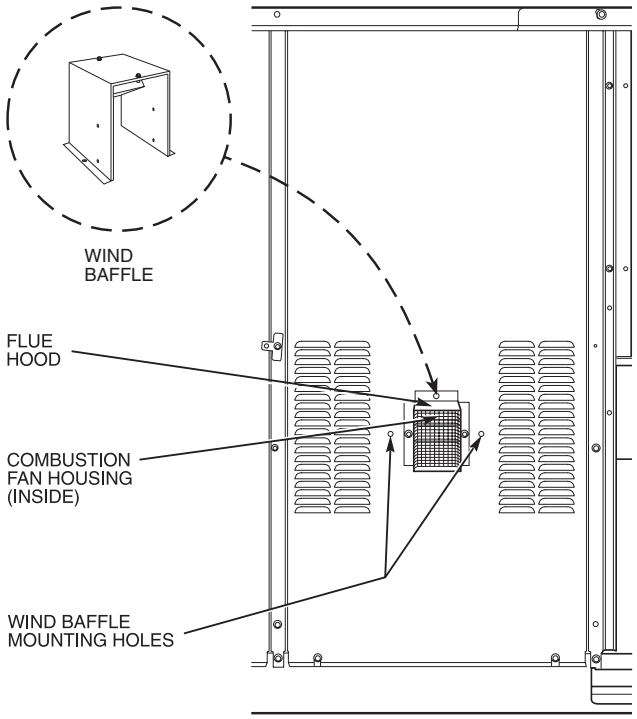


Fig. 9 — Flue Hood Location

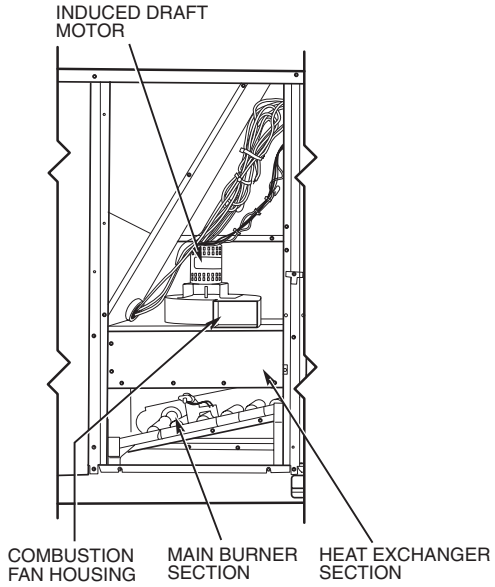


Fig. 10 — Combustion Fan Housing Location

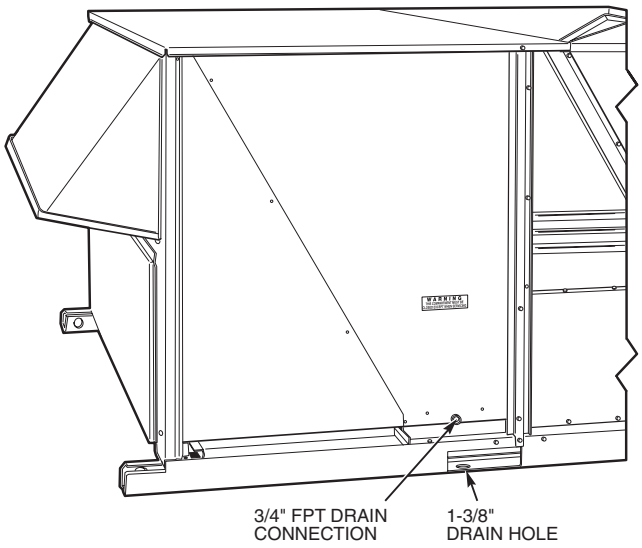


Fig. 11 — Condensate Drain Details (48TJ016 Shown)

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. 13.

⚠ WARNING

Do not pressure test gas supply while connected to unit. Always disconnect union before servicing. Exceeding maximum manifold pressure may cause explosion and injury.

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 and 5) to connections as shown on unit wiring diagram and Fig. 14.

⚠ 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.

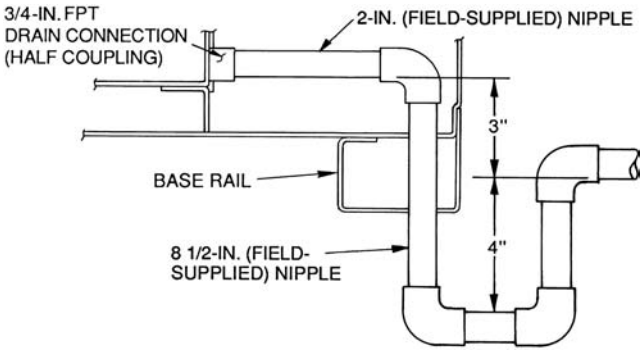


Fig. 12 — Condensate Drain Piping Details

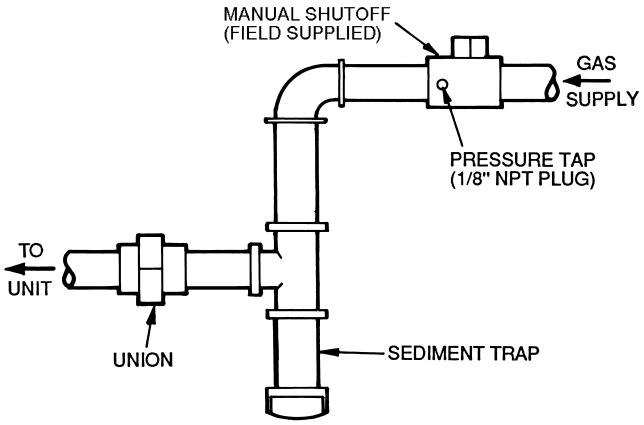


Fig. 13 — Field Gas Piping

⚠ WARNING

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

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:

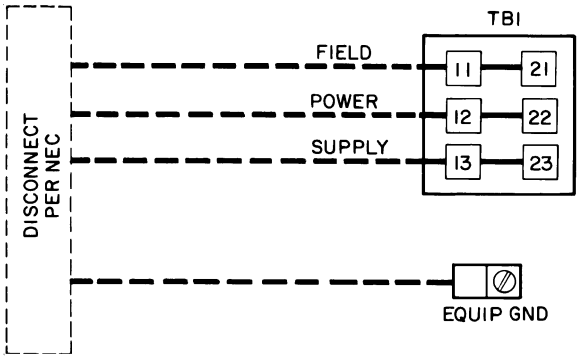
1. Remove cap from red (208 v) wire.
2. Remove cap from orange (230 v) spliced wire.
3. Replace orange wire with red wire.
4. Recap both wires.

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. 14 — 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. 15.

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. 16 for wiring for 100 and 200 amp disconnect switches. Units with an MOCP 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.

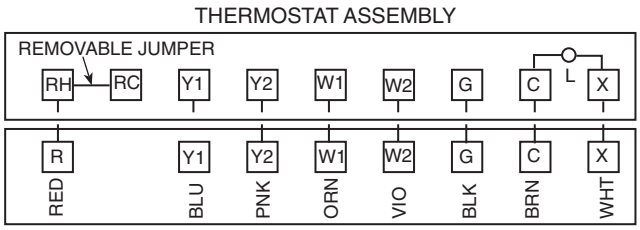
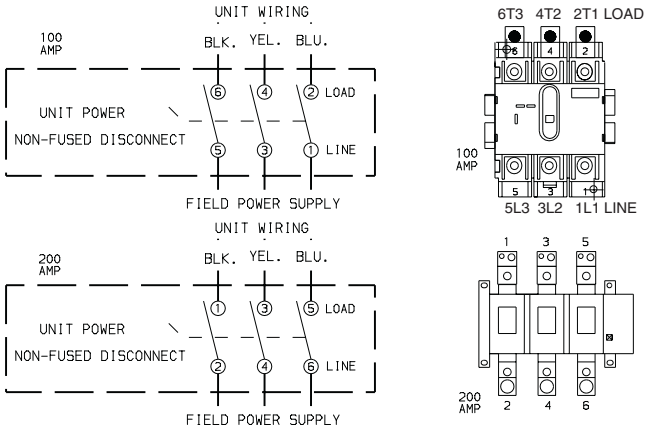


Fig. 15 — Field Control Thermostat Wiring



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

Fig. 16 — Optional Non-Fused Disconnect Wiring

Table 2 — Electrical Data

UNIT 48TJ	NOMINAL VOLTAGE (3 Ph, 60 Hz)	VOLTAGE RANGE		COMPRESSOR No. 1		COMPRESSOR No. 2		OFM			IFM		POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY	
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	FLA	MCA	MOCP*
016 (15 Tons)	208/230	187	253	25.6	190	25.6	190	3	0.5	1.7	3.7	10.5/11.0	—	—	0.57	74/74	90/90
													4.6	18.8	0.57	79/79	100/100
	460	414	508	13.5	95	13.5	95	3	0.5	0.8	3.7	4.8	—	—	0.30	38	50
													2.3	6.0	0.30	40	50
	575	518	632	10.2	75	10.2	75	3	0.5	0.8	3.0	3.9	—	—	0.57	30	35
													2.1	4.8	0.57	32	40
020 (18 Tons)	208/230	187	253	33	237	23	184	3	0.5	1.7	5.0	15.8/15.8	—	—	0.57	85/85	110/110
													4.6	18.8	0.57	90/90	110/110
	460	414	508	16.2	130	10.2	90	3	0.5	0.8	5.0	7.9	—	—	0.30	41	50
													2.3	6.0	0.30	43	50
	575	518	632	12.7	85	9	73	3	0.5	0.8	5.0	6.0	—	—	0.57	33	45
													2.1	4.8	0.57	35	45
024 (20 Tons)	208/230	187	253	33	237	29.5	237	2	1	6.6	7.5	25.0/25.0	—	—	0.57	109/109	125/125
													4.6	18.8	0.57	114/114	125/125
	460	414	508	16.2	130	14.1	130	2	1	3.3	7.5	13.0	—	—	0.30	54	70
													2.3	6.0	0.30	56	70
	575	518	632	12.7	85	11.3	85	2	1	3.4	7.5	10.0	—	—	0.57	44	50
													2.1	4.8	0.57	46	50
028 (25 Tons)	208/230	187	253	47.5	265	33	237	2	1	6.6	10.0	28.0/28.0	—	—	0.57	134/134	175/175
													4.6	18.8	0.57	138/138	175/175
	460	414	508	22.9	145	16.2	130	2	1	3.3	10.0	14.6	—	—	0.30	66	80
													2.3	6.0	0.30	68	90
	575	518	632	17.9	102	12.7	85	2	1	3.4	10.0	13.0	—	—	0.57	55	70
													2.1	4.8	0.57	57	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

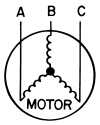
*Fuse or HACR circuit breaker.

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 of voltage imbalance.

   % Voltage Imbalance

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

Example: Supply voltage is 460-3-60.



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

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

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

$$= 457$$

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

Maximum deviation is 7 v.

Determine percent of voltage imbalance.

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

$$= 1.53\%$$

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

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

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 (see Fig. 17).

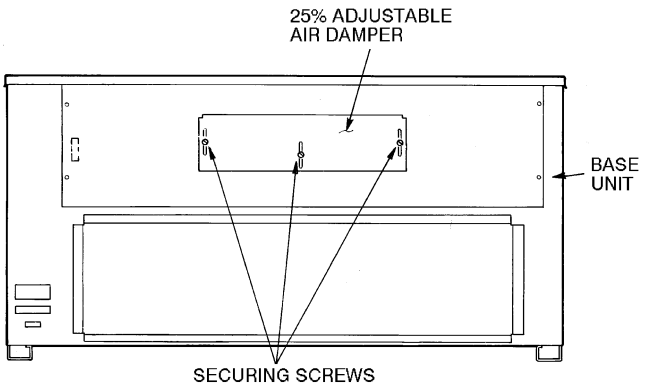


Fig. 17 — Standard 25% Outdoor-Air Section Details

Step 10 — Install Outdoor-Air Hood — The outdoor-air hood is common to 25% air ventilation and economizer. 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 (size 024 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. 18).

1. Attach seal strip to upper filter retainer. See Fig. 19.
2. Assemble hood top panel, side panels, upper filter retainer, and drain pan (see Fig. 20).
3. Secure lower filter retainer and support bracket to unit. See Fig. 20. Leave screws loose on size 024 and 028 units.
4. Slide baffle (size 024 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.

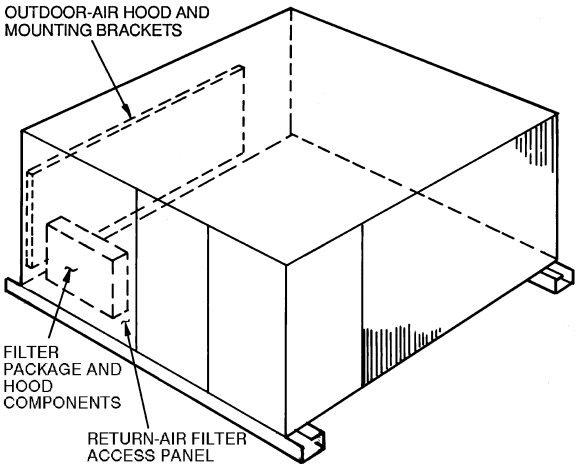


Fig. 18 — Outdoor-Air Hood Component Location

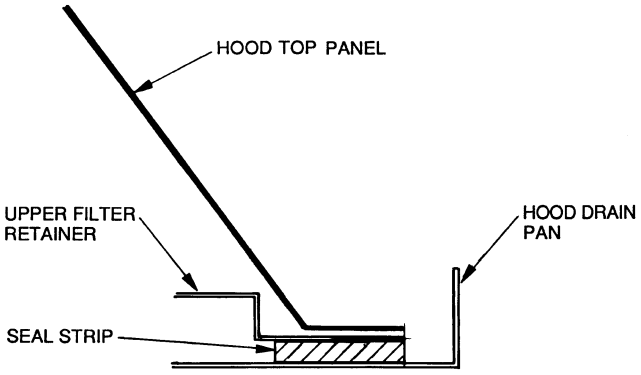


Fig. 19 — Seal Strip Location

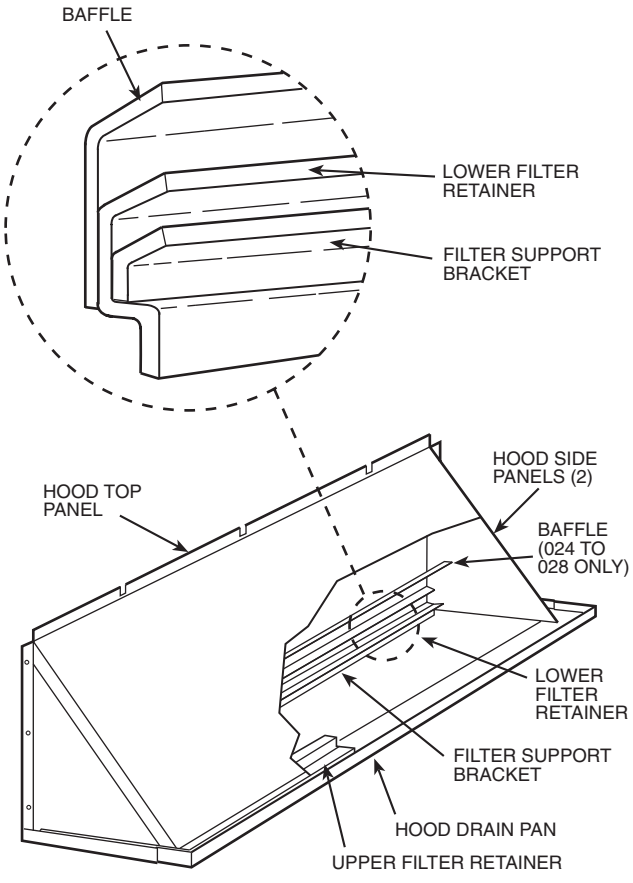


Fig. 20 — Outdoor-Air Hood Details

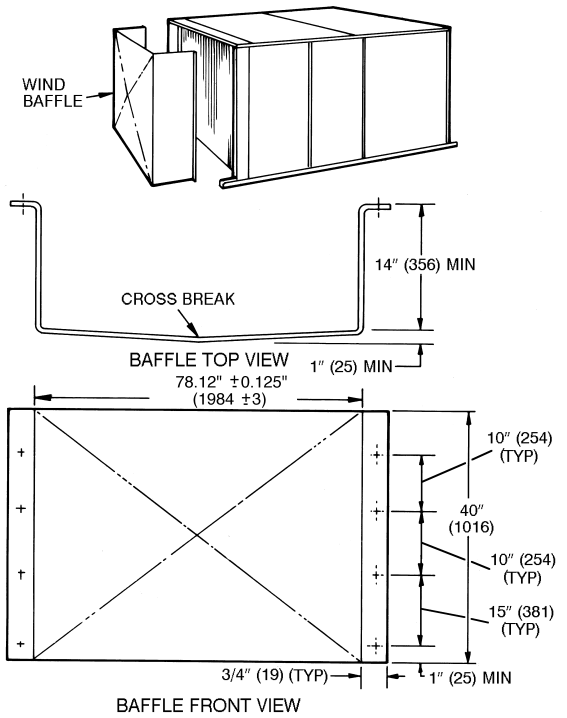
Step 11 — Install All Accessories — Install all field-installed accessories. Refer to the accessory installation instructions included with each accessory.

MOTORMASTER® I CONTROL INSTALLATION (48TJ016,020 UNITS)

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. 21 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.



NOTE: Dimensions in ( ) are in mm.

Fig. 21 — Wind Baffle Details

Install Motormaster I Controls — Only one Motormaster I control is required per unit. 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 while outdoor fans no. 2 and 3 are sequenced off by the Accessory 0° F Low Ambient Kit.

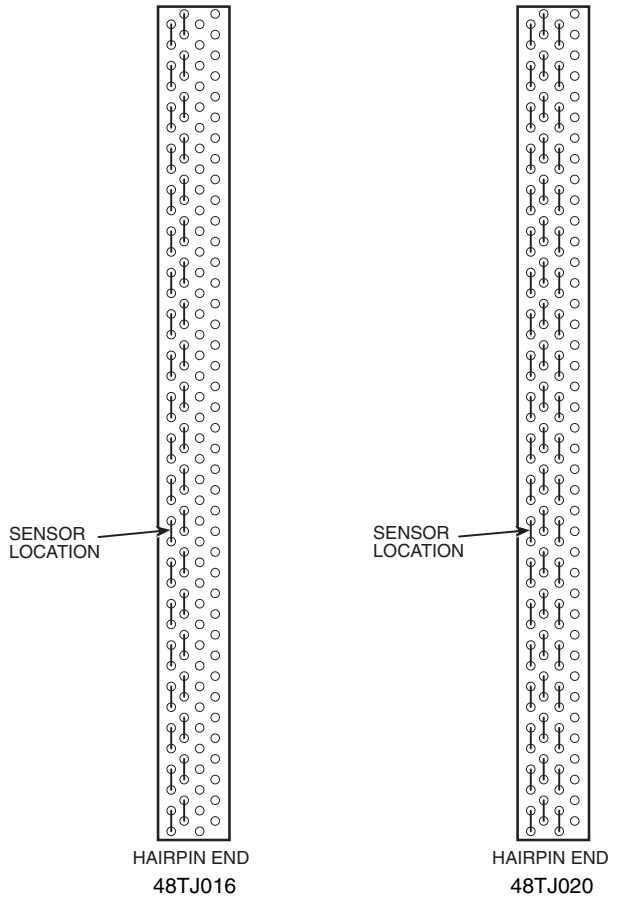
Accessory 0° F Low Ambient Kit — Install the Accessory 0° F Low Ambient Kit per instruction supplied with accessory.

Sensor Assembly — Install the sensor assembly in the location shown in Fig. 22.

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

Fig. 22 — Motormaster® I Sensor Locations

MOTORMASTER® V CONTROL INSTALLATION (48TJ024,028 UNITS)

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. 21 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 V Controls — The Motormaster V (MMV) control is a motor speed control device which adjusts condenser fan motor speed in response to declining liquid refrigerant pressure. A properly applied Motormaster V control extends the operating range of air-conditioning systems and permits operation at lower outdoor ambient temperatures.

The minimum ambient temperatures at which the unit will operate are:

TEMPERATURE OPERATING LIMITS — F°		
Standard Unit	Unit with Low Ambient Kit	Unit with MMV Control
40	25	–20

To operate down to the ambient temperatures listed, Motormaster V controls (Fig. 23) must be added. Field-fabricated and installed wind baffles are also required for all units (see Fig. 21). The Motormaster V control permits operation of the unit to an ambient temperature of –20 F. The control regulates the speed of 3-phase fan motors that are compatible with the control. These motors are factory installed.

See Table 3 for the Motormaster V control accessory package usage. Table 4 shows applicable voltages and motors. Replacement of motor or fan blade **IS NOT REQUIRED ON CURRENT PRODUCTION UNITS** since the control is compatible with the factory-installed fan motors. Only field wiring control is required.

Install the Motormaster V control per instructions supplied with accessory.

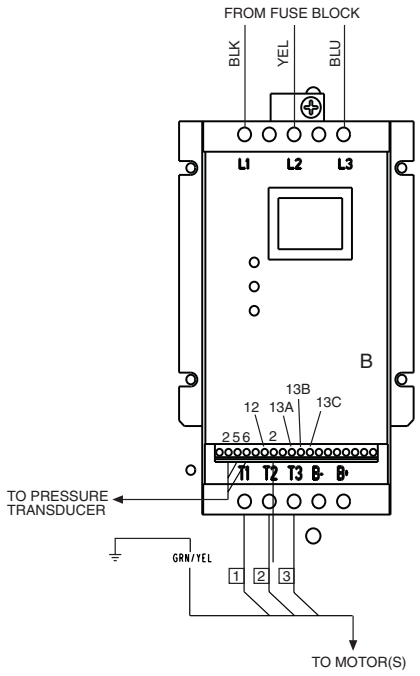


Fig. 23 — Motormaster® V Control

Table 3 — Motormaster V Control Package Usage

UNIT	VOLTAGE	ITEM DESCRIPTION
48TJ016-028	208/230	CRLOWAMB015A00
	460	CRLOWAMB016A00
	575	CRLOWAMB017A00

Table 4 — Applicable Voltages and Motors

VOLTAGE	COMPATIBLE MOTOR*
208/230-3-60	HD52AK654
460-3-60	HD52AK654
575-3-60	HD52GE576

*Motormaster V compatible motors, P/N HD52AK654 for 208/230, 460 v and P/N HD52GE576 for 575 v, are installed in units with serial numbers 2801F and later. For units with serial numbers before 2801F, motor changeout is required prior to installing the Motormaster V control package.

Step 12 — Adjust Factory-Installed Options

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

The PremierLink controller (see Fig. 24) requires the use of a Carrier electronic thermostat or a CCN connection for time broadcast to initiate its internal timeclock. This is necessary for broadcast of time of day functions (occupied/unoccupied). No sensors are supplied with the field-mounted PremierLink control. The factory-installed PremierLink control includes only the supply-air temperature (SAT) sensor and the outdoor air temperature (OAT) sensor as standard. An indoor air quality (CO_2) sensor can be added as an option. Refer to Table 5 for sensor usage. Refer to Fig. 25 for PremierLink controller wiring. The PremierLink control may be mounted in the control panel or an area below the control panel.

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

Install the Supply Air Temperature (SAT) Sensor — When the unit is supplied with a factory-mounted PremierLink control, the supply-air temperature (SAT) sensor (33ZCSENSAT) is factory-supplied and wired. The wiring is routed from the PremierLink control over the control box, through a grommet, into the fan section, down along the back side of the fan, and along the fan deck over to the supply-air opening.

The SAT probe is wire-tied to the supply-air opening (on the horizontal opening end) in its shipping position. Remove the sensor for installation. Re-position the sensor in the flange of the supply-air opening or in the supply air duct (as required by local codes). Drill or punch a $^1/_2$-in. hole in the flange or duct. Use two field-supplied, self-drilling screws to secure the sensor probe in a horizontal orientation.

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

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

Install the Indoor Air Quality (CO_2) Sensor — Mount the optional indoor air quality (CO_2) sensor according to manufacturer specifications.

A separate field-supplied transformer must be used to power the CO_2 sensor.

Wire the CO_2 sensor to the COM and IAQI terminals of J5 on the PremierLink controller. Refer to the PremierLink Installation, Start-up, and Configuration Instructions for detailed wiring and configuration information.

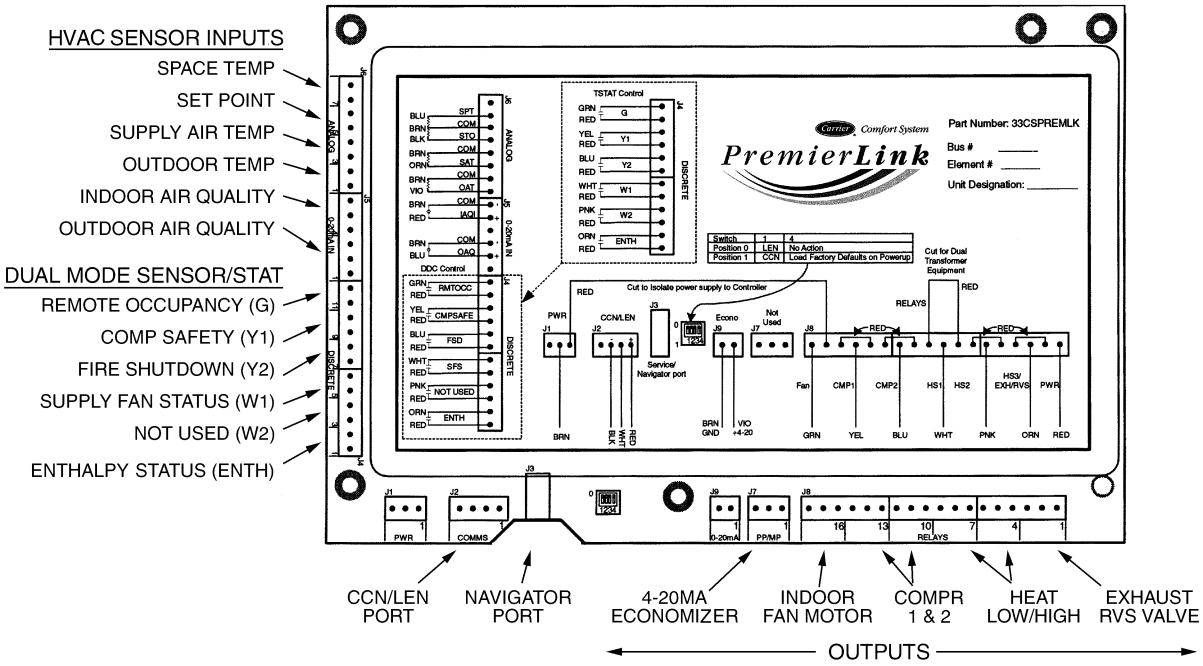
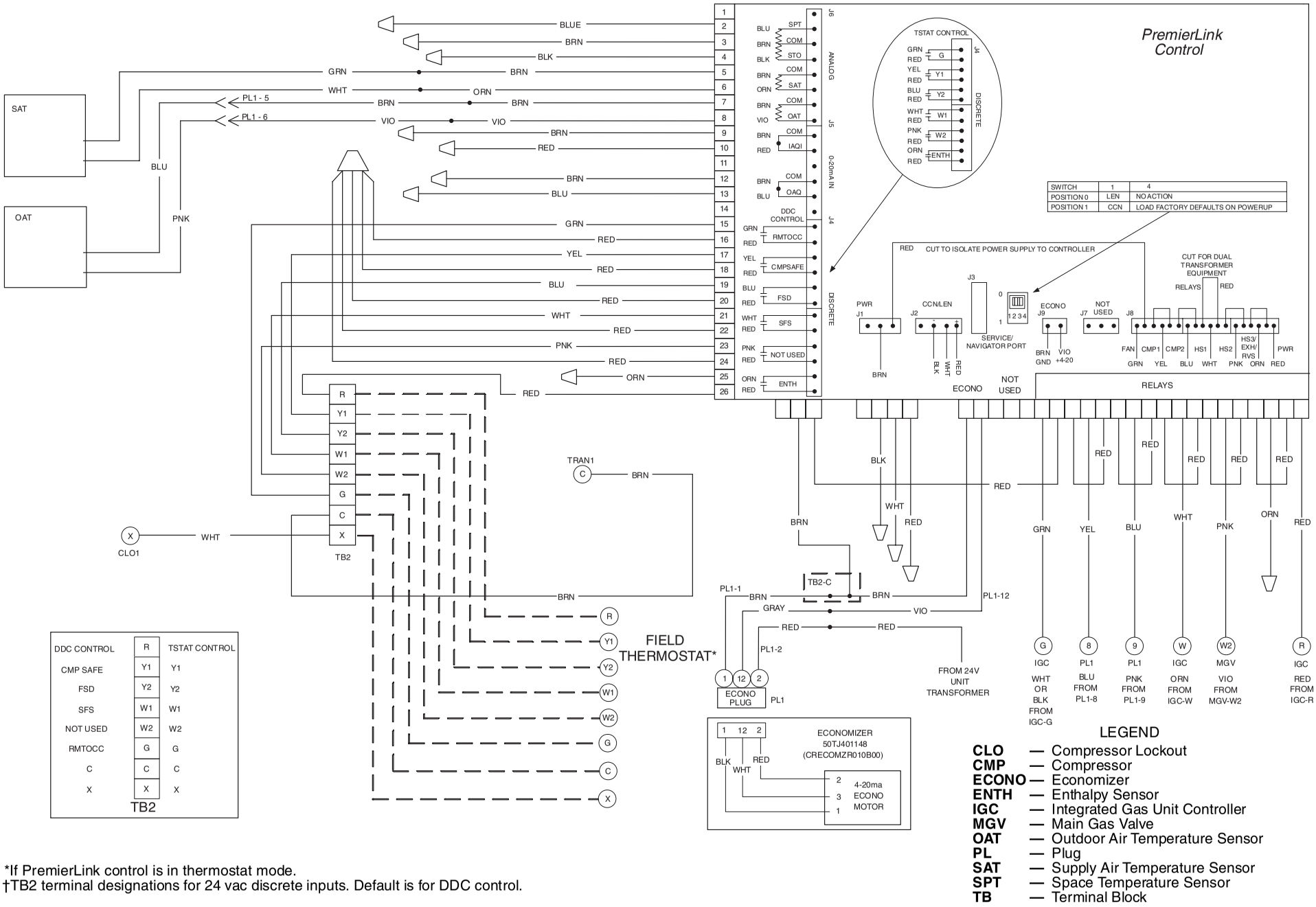


Fig. 24 — PremierLink Controller



LEGEND

CLO	— Compressor Lockout
CMP	— Compressor
ECONO	— Economizer
ENTH	— Enthalpy Sensor
IGC	— Integrated Gas Unit Controller
MGV	— Main Gas Valve
OAT	— Outdoor Air Temperature Sensor
PL	— Plug
SAT	— Supply Air Temperature Sensor
SPT	— Space Temperature Sensor
TB	— Terminal Block

*If PremierLink control is in thermostat mode.
†TB2 terminal designations for 24 vac discrete inputs. Default is for DDC control.

Fig. 25 — PremierLink™ Controls Wiring

Table 5 — PremierLink™ Sensor Usage

APPLICATION	OUTDOOR AIR TEMPERATURE SENSOR	RETURN AIR TEMPERATURE SENSOR	OUTDOOR AIR ENTHALPY SENSOR	RETURN AIR ENTHALPY SENSOR
Differential Dry Bulb Temperature with PremierLink* (PremierLink requires 4-20 mA Actuator)	Included — HH79NZ039	Required — 33ZCT55SPT or Equivalent	—	—
Single Enthalpy with PremierLink* (PremierLink requires 4-20 mA Actuator)	Included — Not Used	—	Required — 33CSENTHSW (HH57ZC003) or HH57AC077	—
Differential Enthalpy with PremierLink* (PremierLink requires 4-20 mA Actuator)	Included — Not Used	—	Required — 33CSENTHSW (HH57ZC003) or HH57AC077	Required — 33CSENTSEN or HH57AC078

*PremierLink control requires Supply Air Temperature sensor 33ZCSENSAT and Outdoor Air Temperature sensor HH79NZ039 — Included with factory-installed PremierLink control; field-supplied and field-installed with field-installed PremierLink control.

NOTES:
1. CO_2 Sensors (Optional):
   33ZCSENCO2 — Room sensor (adjustable). Aspirator box is required for duct mounting of the sensor.
   33ZCASPCO2 — Aspirator box used for duct-mounted CO_2 room sensor.
   33ZCT55CO2 — Space temperature and CO_2 room sensor with override.
   33ZCT56CO2 — Space temperature and CO_2 room sensor with override and setpoint.
2. All units include the following Standard Sensors:
   Outdoor-Air Sensor — 50HJ540569 — Opens at 67 F, closes at 52 F, not adjustable.
   Mixed-Air Sensor — HH97AZ001 — (PremierLink control requires Supply Air Temperature sensor 33ZCSENSAT and Outdoor Air Temperature Sensor HH79NZ039)
   Compressor Lockout Sensor — 50HJ540570 — Opens at 35 F, closes at 50 F.

ENTHALPY SWITCH/RECEIVER — The accessory enthalpy switch/receiver (33CSENTHSW) senses temperature and humidity of the air surrounding the device and calculates the enthalpy when used without an enthalpy sensor. The relay is energized when enthalpy is high and deenergized when enthalpy is low (based on ASHRAE [American Society of Heating, Refrigeration and Air Conditioning Engineers] 90.1 criteria). If an accessory enthalpy sensor (33CSENTSEN) is attached to the return air sensor input, then differential enthalpy is calculated. The relay is energized when the enthalpy detected by the return air enthalpy sensor is less than the enthalpy at the enthalpy switch/receiver. The relay is deenergized when the enthalpy detected by the return air enthalpy sensor is greater than the enthalpy at the enthalpy switch/receiver (differential enthalpy control). See Fig. 26 and 27.

OUTDOOR ENTHALPY CONTROL (Fig. 28) — Outdoor enthalpy control requires only an enthalpy switch/receiver (33CSENTHSW). The enthalpy switch/receiver is mounted in the outdoor air inlet and calculates outdoor air enthalpy. The enthalpy switch/receiver energizes the relay output when the outdoor enthalpy is above 28 BTU/lb **OR** dry bulb temperature is above 75 F and is deenergized when the outdoor enthalpy is below 27 BTU/lb **AND** dry bulb temperature is below 74.5 F. The relay output is wired to the unit economizer which will open or close depending on the output of the switch.

NOTE: The enthalpy calculation is done using an average altitude of 1000 ft above sea level.

Mounting — Mount the enthalpy switch/receiver in a location where the outdoor air can be sampled (such as the outdoor air intake). The enthalpy switch/receiver is not a NEMA 4 (National Electrical Manufacturers Association) enclosure and should be mounted in a location that is not exposed to outdoor elements such as rain or snow. Use two field-supplied no. 8 x $^3/_4$-in. TEK screws. Insert the screws through the holes in the sides of the enthalpy switch/receiver.

Wiring — Carrier recommends the use of 18 to 22 AWG (American Wire Gage) twisted pair or shielded cable for all wiring. All connections must be made with $^1/_4$-in. female spade connectors.

A 24-vac transformer is required to power the enthalpy switch/receiver; as shown in Fig. 29, the PremierLink™ board provides 24 vac. Connect the GND and 24 VAC terminals on the enthalpy switch/receiver to the terminals on the transformer. On some applications, the power from the economizer harness can be used to power the enthalpy switch/receiver. To power the enthalpy switch/receiver from the economizer harness, connect power of the enthalpy switch/receiver to the red and brown wires (1 and 4) on the economizer harness.

For connection to rooftop units with PremierLink™ control, connect the LOW Enthalpy terminal on the enthalpy switch/receiver to J4 — pin 2 of the PremierLink control on the HVAC unit. The switch can be powered through the PremierLink control board if desired. Wire the 24 VAC terminal on the enthalpy switch/receiver to J4 — pin 1 on the PremierLink control. Wire the GND terminal on the enthalpy switch/receiver to J1 — pin 2 on the PremierLink control. The HI Enthalpy terminal is not used. See Fig. 28.

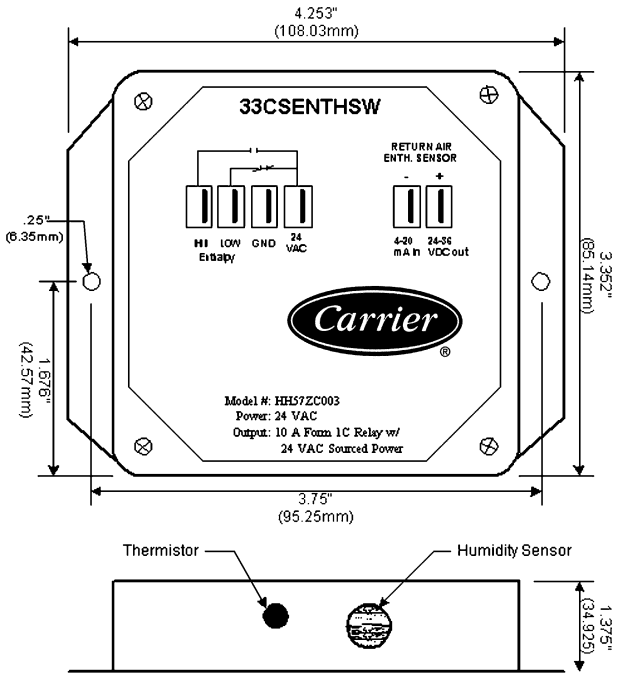


Fig. 26 — Enthalpy Switch/Receiver Dimensions (33CSENTHSW)

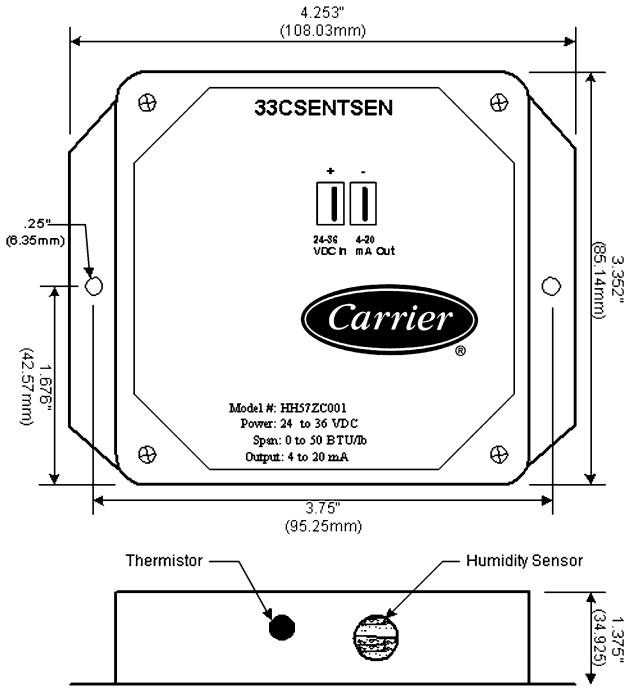
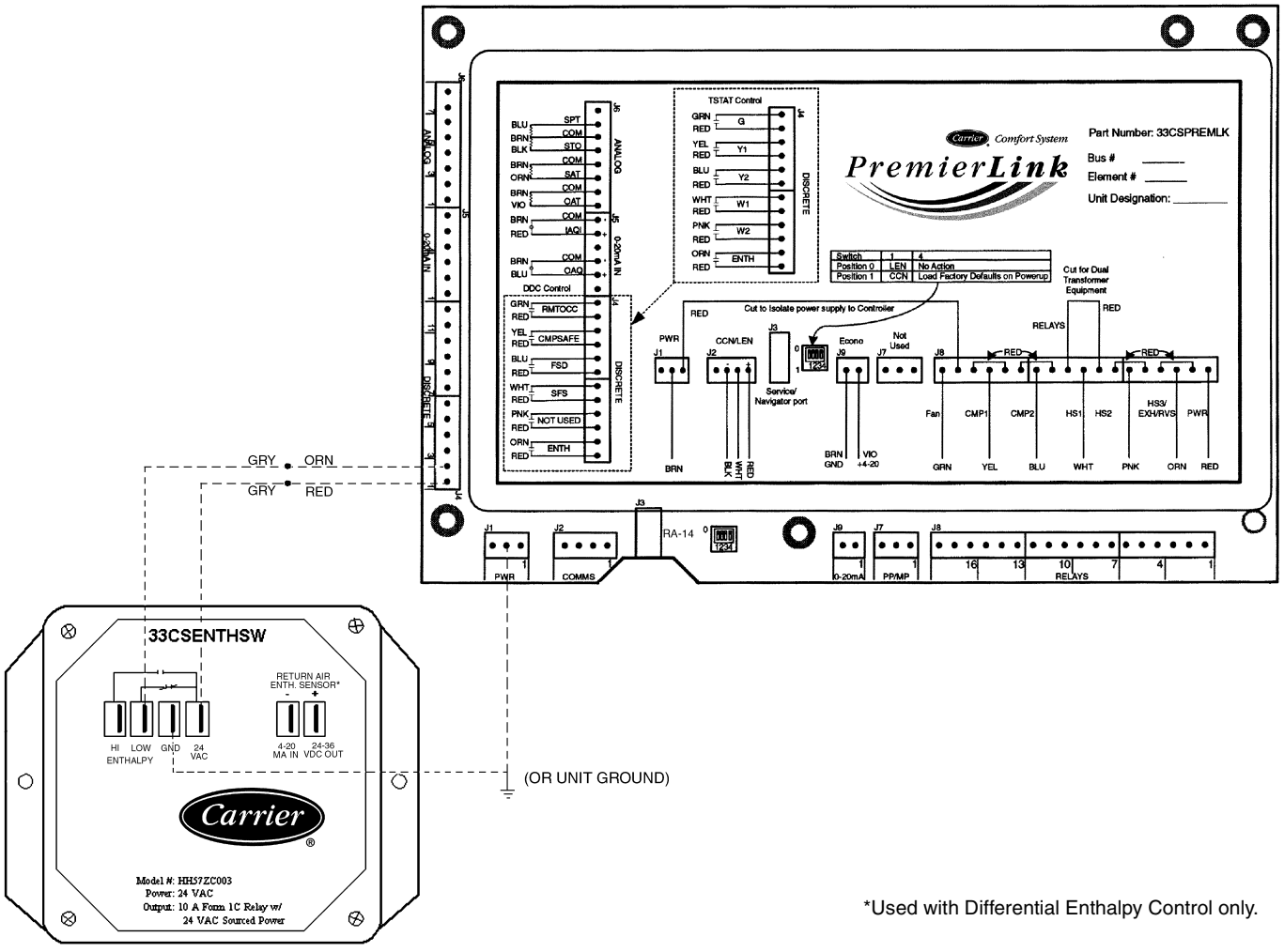


Fig. 27 — Enthalpy Sensor Dimensions (33CSENTSEN)



*Used with Differential Enthalpy Control only.

Fig. 28 — Typical Wiring Schematic — Carrier Rooftop Unit with PremierLink™ Controls

DIFFERENTIAL ENTHALPY CONTROL (Fig. 29) — Differential enthalpy control requires both an enthalpy switch/receiver (33CSENTHSW) and an enthalpy sensor (33CSENTSEN). The enthalpy switch/receiver is mounted in the outdoor air inlet and calculates outdoor air enthalpy. The enthalpy sensor is mounted in the return airstream and calculates the enthalpy of the indoor air.

The enthalpy switch/receiver energizes the HI Enthalpy relay output when the outdoor enthalpy is greater than the indoor enthalpy. The LOW Enthalpy terminal is energized when the outdoor enthalpy is lower than the indoor enthalpy. The relay output is wired to the unit economizer which will open or close depending on the output of the switch.

NOTE: The enthalpy calculation is done using an average altitude of 1000 ft above sea level.

Mounting — Mount the enthalpy switch/receiver in a location where the outdoor air can be sampled (such as the outdoor air intake). The enthalpy switch/receiver is not a NEMA 4 enclosure and should be mounted in a location that is not exposed to outdoor elements such as rain, snow, or direct sunlight. Use two field-supplied no. 8 x 3/4-in. TEK screws. Insert the screws through the holes in the sides of the enthalpy switch/receiver.

Mount the enthalpy sensor in a location where the indoor air can be sampled (such as the return air duct). The enthalpy sensor is not a NEMA 4 enclosure and should be mounted in a location that is not exposed to outdoor elements such as rain or snow. Use two field-supplied no. 8 x 3/4-in. TEK screws. Insert the screws through the holes in the sides of the enthalpy sensor.

Wiring — Carrier recommends the use of 18 to 22 AWG twisted pair or shielded cable for all wiring. All connections must be made with 1/4-in. female spade connectors.

The PremierLink™ board provides 24-vac to power the enthalpy switch/receiver. Connect the GND and 24 VAC terminals on the enthalpy switch/receiver to the terminals on the transformer. On some applications, the power from the economizer harness can be used to power the enthalpy switch/receiver. To power the enthalpy switch/receiver from the economizer harness, connect power of the enthalpy switch/receiver to the red and brown wires (1 and 4) on the economizer harness.

Connect the LOW Enthalpy terminal on the enthalpy switch/receiver to J4 — pin 2 of the PremierLink control on the HVAC unit. The switch can be powered through the PremierLink control board if desired. Wire the 24VAC terminal on the enthalpy switch/receiver to J4 — pin 1 on the PremierLink control. Wire the GND terminal on the enthalpy switch/receiver to J1 — pin 2 on the PremierLink control. The HI Enthalpy terminal is not used. See Fig. 28.

Connect the 4-20 mA IN terminal on the enthalpy switch/receiver to the 4-20 mA OUT terminal on the return air enthalpy sensor. Connect the 24-36 VDC OUT terminal on the enthalpy switch/receiver to the 24-36 VDC IN terminal on the return air enthalpy sensor. See Fig. 29.

Enthalpy Switch/Receiver Jumper Settings — There are two jumpers. One jumper determines the mode of the enthalpy switch/receiver. The other jumper is not used. To access the jumpers, remove the 4 screws holding the cover on the enthalpy switch/receiver and then remove the cover. The factory settings for the jumpers are M1 and OFF.

The mode jumper should be set to M2 for differential enthalpy control. The factory test jumper should remain on OFF or the enthalpy switch/receiver will not calculate enthalpy.

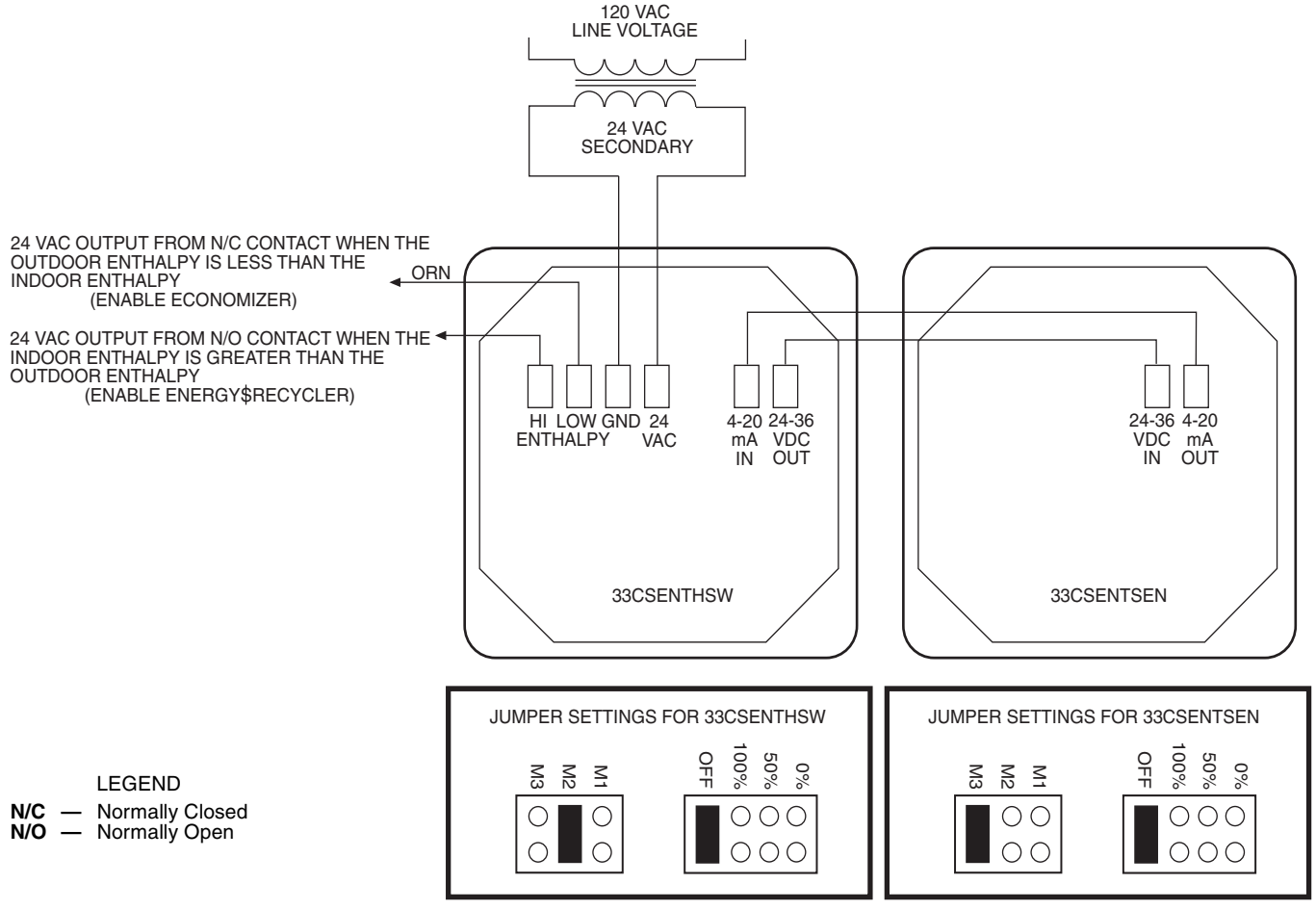


Fig. 29 — Differential Enthalpy Control Wiring

Enthalpy Sensor Jumper Settings — There are two jumpers. One jumper determines the mode of the enthalpy sensor. The other jumper is not used. To access the jumpers, remove the 4 screws holding the cover on the enthalpy sensor and then remove the cover. The factory settings for the jumpers are M3 and OFF.

The mode jumper should be set to M3 for 4 to 20 mA output. The factory test jumper should remain on OFF or the enthalpy sensor will not calculate enthalpy.

ENTHALPY SENSORS AND CONTROL — The enthalpy control (HH57AC077) is supplied as a field-installed accessory to be used with the EconoMi$er2 damper control option. The outdoor air enthalpy sensor is part of the enthalpy control. The separate field-installed accessory return air enthalpy sensor (HH57AC078) is required for differential enthalpy control.

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

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

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

Outdoor Air Enthalpy Sensor/Enthalpy Controller (HH57AC077) — To wire the outdoor air enthalpy sensor, perform the following (see Fig. 30 and 31):

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

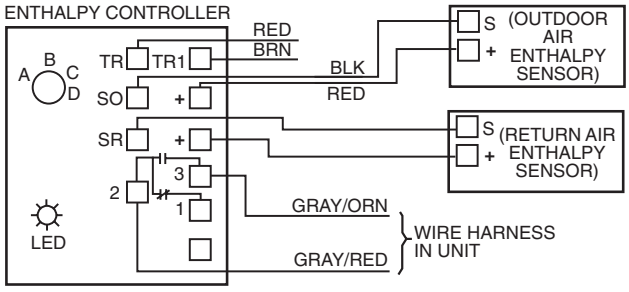
1. Use a 4-conductor, 18 or 20 AWG cable to connect the enthalpy control to the PremierLink controller and power transformer.
2. Connect the following 4 wires from the wire harness located in rooftop unit to the enthalpy controller:
   a. Connect the BRN wire to the 24 vac terminal (TR1) on enthalpy control and to pin 1 on 12-pin harness.
   b. Connect the RED wire to the 24 vac GND terminal (TR) on enthalpy sensor and to pin 4 on 12-pin harness.
   c. Connect the GRAY/ORN wire to J4-2 on PremierLink controller and to terminal (3) on enthalpy sensor.
   d. Connect the GRAY/RED wire to J4-1 on PremierLink controller and to terminal (2) on enthalpy sensor.

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

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

To wire the return air enthalpy sensor, perform the following (see Fig. 30):

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



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

Fig. 30 — Outdoor and Return Air Sensor Wiring Connections for Differential Enthalpy Control

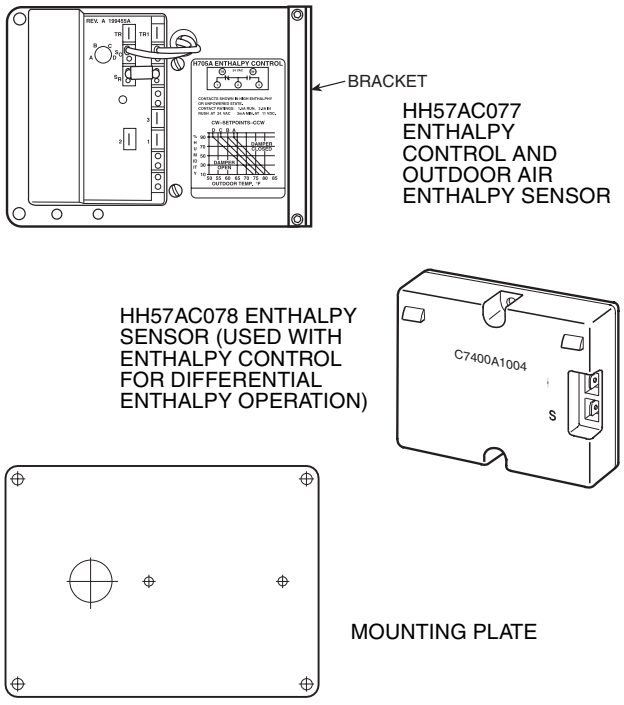


Fig. 31 — Differential Enthalpy Control, Sensor and Mounting Plate (33AMKITENT006)

ECONOMI$ER+ CONTROL MODE — Determine the EconoMi$er+ control mode before installing sensors and accessories. Different sensors are required for different control modes, and a number of accessories are available. Refer to Tables 6 and 7.

Outdoor Dry Bulb Changeover — The standard control mode for the EconoMi$er+ is Outdoor Dry Bulb Changeover. The outdoor air and supply air temperature sensors are also included as standard. EconoMi$er+ control is based on the outdoor temperature relative to a set point in the software. If the outdoor air temperature is above the set point then the EconoMi$er+ should be in minimum position. If the outdoor air temperature is below the set point, the position should be controlled to maintain the leaving air temperature set point. The set point range is 45 to 70 F.

Differential Dry Bulb Changeover — The control supports differential dry bulb changeover control. This requires an accessory return air temperature sensor CRTEMPSN001A00 installed in the return air stream. Refer to the Start-up section for details on how to configure and enable the control mode. The user can check the operation of the sensor using the Read function.

Outside Air Enthalpy Changeover — The control supports outside air enthalpy changeover control. This mode requires a factory-supplied outdoor air temperature (OAT) sensor and an accessory outdoor air humidity (ORH) sensor (part no. CRHUMDSN001B00). Refer to the Start-Up section for details on how to configure and enable the control mode. The user can check the operation of the sensors using the Read function.

Differential Enthalpy Changeover — The control supports differential enthalpy changeover control. This requires the factory-supplied outside air temperature sensor, an accessory outdoor air humidity sensor, an accessory return air temperature sensor, and an accessory indoor air humidity sensor. Refer to the Start-Up section for details on how to configure and enable the control mode. The user can check the operation of the sensors using the Read function.

DAMPER MOVEMENT — When the EconoMi$er+ board receives initial power, it will take the damper up to $2^1/_2$ minutes before it begins to position itself. After the initial positioning, subsequent changes to damper position will take up to 30 seconds to initiate. Damper movement from full open to full closed (or vice versa) takes $2^1/_2$ minutes.

If the damper is in the process of changing positions (for example it is trying to open to 100%) and the fan signal is turned off, the damper will continue to its 100% open position before closing.

NOTE: Occupied minimum position can not be set lower than +1% higher than the value of IAQ minimum economizer position. Refer to the setup examples on page 41.

ECONOMI$ER+ CONTROLLER WIRING — The EconoMi$er+ is supplied from the factory with a supply air temperature sensor and an outdoor air temperature sensor. This allows for operation of the EconoMi$er+ with outside air dry bulb changeover control. Additional accessories can be added to allow for different types of change over control and operation of the EconoMi$er+ and unit.

THERMOSTATS — The EconoMi$er+ control (see Fig. 32) works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The EconoMi$er+ control does not support sensor thermostats like the T56 and T57. Connections are made at the thermostat terminal connection board located in the main control box.

Table 6 — EconoMi$er+ Field-Installed Accessories

DESCRIPTION	PART NUMBER
13-25 Ton Power Exhaust 208/230, 460 v	CRPWREXH008B00
13-25 Ton Power Exhaust 575 v	CRPWREXH010B00
Return Air Temperature Sensor with Harness	CRTEMPSN001A00
Outdoor Air Humidity Sensor with Harness	CRHUMDSN001B00
Indoor Air Humidity Sensor with Harness	CRHUMDSN001B00
Return Air CO_2 Sensor	CRCBDIOX002A00*
CO_2 Room Sensor	33ZCSENCO2*
Aspirator Box for Duct Mount CO_2 Sensor	33ZCASPCO2
Space Temperature and CO_2 Room Sensor with Override	33ZCT55CO2*
Space Temperature and CO_2 Room Sensor with Override and Set Point	33ZCT56CO2*
5-Pin Sensor Wiring Plug	CRE+PLUG001A00*

*5-pin sensor wiring plug accessory (P/N CRE+PLUG001A00) is required to install IAQ sensor and remote potentiometer.

OUTDOOR AIR TEMPERATURE (OAT) SENSOR (Provided) — The outdoor air temperature sensor is a 10K thermistor used to measure the outdoor-air temperature. The sensor controls EconoMi$er+ changeover and compressor lockout. The sensor is factory-installed on the EconoMi$er+ in the outdoor airstream. The operating range of temperature measurement is 0° to158 F. See Tables 8 and 9 for thermistor resistance and resolution values.

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

The user can read the value of the sensor using the Read mode, described in the Start-Up section.

SUPPLY AIR TEMPERATURE (SAT) SENSOR (Provided) — The supply air temperature sensor is a 10K thermistor located at the inlet to the indoor fan. This sensor must be field installed. The operating range of temperature measurement is 0° to158 F. See Tables 8 and 9 for thermistor resistance and resolution values.

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

The user can read the value of the sensor using the Read mode, described in the EconoMi$er+ Controller section.

INDOOR AIR QUALITY (IAQ) SENSOR — Any indoor air quality or CO_2 sensor that provides a 4 to 20 mA output can be used as the IAQ sensor. The controller will modulate the outdoor-air damper to provide ventilation based on the sensor output and the IAQ setting of the controller. The CO_2 sensor will modulate the outdoor-air damper from the minimum position (IAQ minimum damper position set point) to the maximum position (occupied minimum damper position). When there is no CO_2 call, the damper will go to the unoccupied minimum position. When there is a CO_2 call, the damper will be between the IAQ minimum economizer set point position and the occupied minimum damper position.

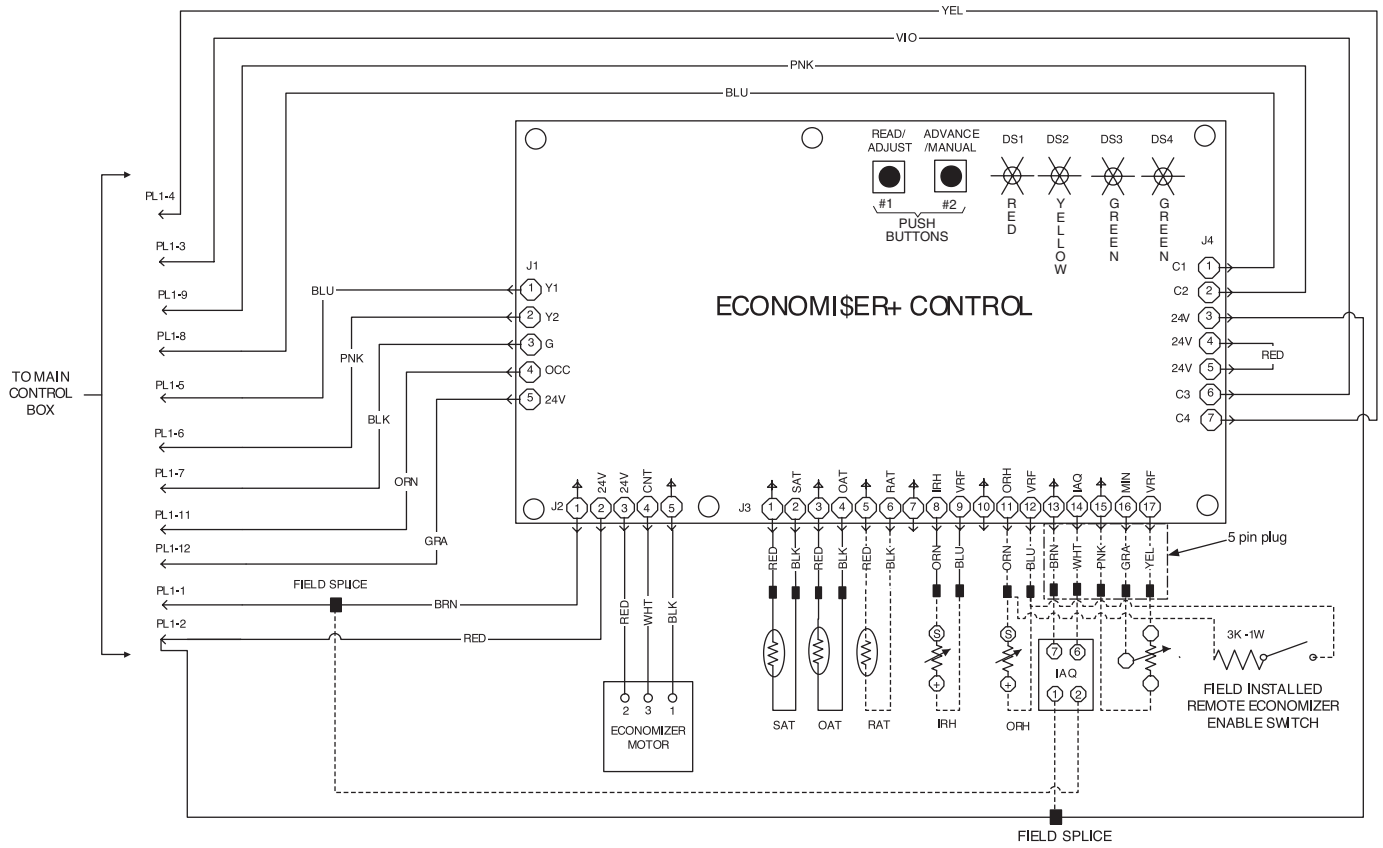
Mount the sensor according to manufacturer specifications. In order to wire this sensor, an accessory 5-pin plug (part number CRE+PLUG001A00) is required.

The IAQ sensor is wired to the ground and IAQ wires in the harness. The accessory 5-pin wiring plug is connected to pins 13-17 of J3 on the EconoMi$er+ controller. Push the plug down onto the pins of the EconoMi$er+ controller to install. Pins 13 and 14 are used for the IAQ sensor. Pins 15-17 are used for the field-installed remote potentiometer. Connect the IAQ sensor to the BRN and WHT wires of the accessory 5-pin plug.

Table 7 — EconoMi$er+ Sensor Usage

APPLICATION	STANDARD OUTDOOR AIR TEMPERATURE SENSOR	ACCESSORY RETURN AIR TEMPERATURE SENSOR	ACCESSORY OUTDOOR AIR HUMIDITY SENSOR	ACCESSORY INDOOR RETURN AIR HUMIDITY SENSOR
Standard Unit	Included — HH79NZ039	—	—	—
Differential Dry Bulb	Included — HH79NZ039	Required — CRTEMPSN001A00	—	—
Outdoor Air Enthalpy	Included — HH79NZ039	—	Required — CRHUMDSN001B00	—
Differential Enthalpy	Included — HH79NZ039	Required — CRTEMPSN001A00	Required — CRHUMDSN001B00	Required — CRHUMDSN001B00

NOTES:
1. CO_2 Sensors (Optional, 5-Pin sensor wiring plug CRE+PLUG001A00 required for installation [see Fig. 32]).
   33ZCSENCO2 — Room sensor (adjustable). Aspirator box is required for duct mounting of the sensor.
   33ZCASPCO2 — Aspirator box used for duct-mounted CO_2 room sensor.
   33ZCT55CO2 — Space temperature and CO_2 room sensor with override.
   33ZCT56CO2 — Space temperature and CO_2 room sensor with override and set point.
   CRCBDIOX002A00 — Return air CO_2 sensor.
2. All units include the following Standard Sensors:
   Outdoor-Air Sensor — set point adjustable from 45 F to 70 F, factory set at 65 F.
   Supply-Air Sensor — set point adjustable from 40 F to 65 F. Factory set at 55 F.
   All temperature adjustments are made at the EconoMi$er+ controller.



LEGEND

IAQ — Indoor Air Quality (4 to 20 mA)
IRH — Indoor Air Relative Humidity
OAT — Outdoor-Air Temperature
ORH — Outdoor Air Relative Humidity
RAT — Return-Air Temperature
SAT — Supply-Air Temperature

NOTE: Terminals 13-17 are wired to 5-pin plug assembly (P/N CRE+PLUG001A00).

Fig. 32 — EconoMi$er+ Wiring

NOTE: Pin numbers are not shown on the controller. They are provided only as reference for the installer. On the EconoMi$er+ board, they numbered 1-17 from left to right, but only the 1 and the 17 are printed on the board.

Sensor wiring should be extended with wire and wire nuts and routed to the IAQ sensor location. Adjust the IAQ setting at the controller to correspond to the IAQ voltage output of the sensor at the user-determined set point. See Fig. 33. Power the sensor with a field-supplied transformer.

RETURN AIR TEMPERATURE (RAT) SENSOR — The EconoMi$er+ controller will accept input from the accessory 10K return air temperature sensor (CRTEMPSN001A00) in addition to the outdoor air temperature sensor shipped with the EconoMi$er+. By using both sensors, the outdoor air and the return air temperatures are compared (differential dry bulb) for optimal energy savings. See Tables 8 and 9 for thermistor resistance and resolution values.

The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the "crimp end" and is sealed from moisture. See Fig. 34 for sensor location.

The user can read the value of the sensor using the Read mode, described in the EconoMi$er+ Controller section.

Mount the return air temperature sensor on the EconoMi$er+, through pre-punched holes. See Fig. 34.

The return air temperature (RAT) sensor is provided with a 2-wire, 42-in. long wiring harness with a 2-pin connector. The plug is installed on pins 5 and 6 on J3 of the EconoMi$er+ controller. The pins are labeled with a ground symbol and RAT on the EconoMi$er+ controller. The red wire of the harness is connected to pin 5 (ground). The black wire of the harness is connected to pin 6 (RAT). The wiring harness should be routed from the EconoMi$er+ controller to the sensor. The controller compares the temperatures of the two airstreams, chooses the best one, and modulates the EconoMi$er+ actuator accordingly.

This 10K thermistor is used to measure the return air temperature vs. resistance curve, per Table 8. The range of temperature measurement is between 0° and 158 F. See Table 9 for resolution.

OUTDOOR AIR HUMIDITY SENSOR — The EconoMi$er+ controller accepts input from the accessory outdoor air humidity sensor in addition to the outdoor air temperature sensor shipped with the EconoMi$er+. By using both sensors, the total enthalpy of the outside air is calculated.

Mount the outdoor-air humidity sensor in to the EconoMi$er+, through the pre-punched holes. See Fig. 35. The outdoor-air humidity sensor is provided with a 2-wire, 42-in. wiring harness with a 2-pin connector. The plug is installed on pins 11 and 12 on J3 of the EconoMi$er+ controller. The pins are labeled ORH and VREF on the EconoMi$er+ controller. The orange wire of the harness is connected to pin 11 (ORH). The blue wire of the harness is connected to pin 12 (VREF). The wiring harness should be routed from the EconoMi$er+ controller to the sensor location.

The outdoor enthalpy changeover curve is set at the EconoMi$er+ controller. The factory default is curve "A." See Fig. 36. See Fig. 37 for Humidity Sensor Current vs. Humidity.

INDOOR RETURN-AIR HUMIDITY SENSOR — For differential enthalpy sensing, the EconoMi$er+ controller uses the standard outdoor air temperature sensor, the outdoor air humidity sensor, and the optional indoor return air humidity sensor, an optional return-air temperature (RAT) sensor. The indoor return-air humidity sensor is provided with a 2-wire, 42-in. wiring harness with a 2-pin connector. The plug is installed on pins 8 and 9 on J3 of the EconoMi$er+ controller. The pins are labeled IRH and VREF on the EconoMi$er+ controller. The orange wire of the harness is connected to pin 8 (IRH). The blue wire of the harness is connected to pin 9 (VREF). The wiring harness should be extended with wires and wire nuts and routed from the EconoMi$er+ controller to the sensor location. The EconoMi$er+ controller compares the outdoor air enthalpy to the return air enthalpy to determine EconoMi$er+ use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air, the EconoMi$er+ controller opens the damper to bring in outdoor air for free cooling.

The outdoor enthalpy changeover curve is set with at the EconoMi$er+ controller. The selectable curves are A, B, C, and D. The factory default is curve "A." See Fig. 36. See Fig. 37 for Humidity Sensor Current vs. Humidity.

Mount the indoor return-air humidity sensor in the return-air section or duct. See Fig. 34 and 38.

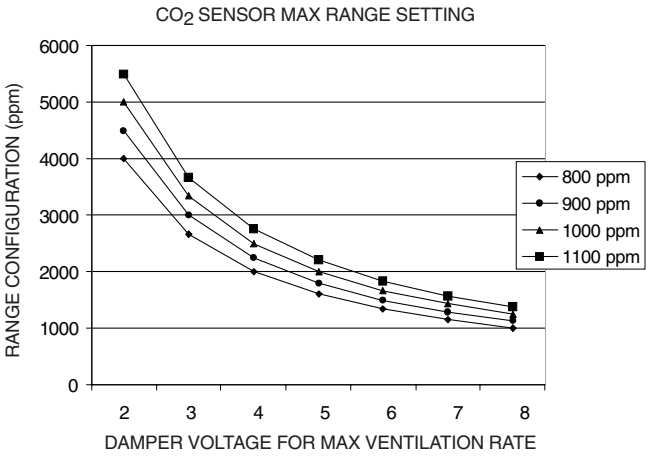
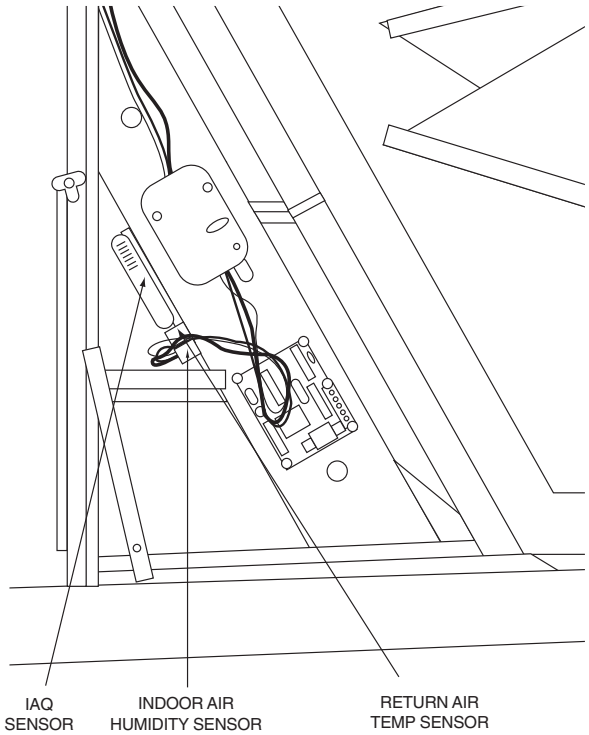


Fig. 33 — Indoor Air Quality Voltage Setting



VERTICAL AND HORIZONTAL ECONOMI$ER+
(13 TO 25 TON UNITS)
(SIDE VIEW)

Fig. 34 — Return Air Temperature Sensor

Table 8 — Outdoor Air, Return Air, and Supply Air Temperature Sensors (CRTEMPSN001A00 or HH79NZ039) — 10K Thermistor Curve

TEMPERATURE		RESISTANCE	TEMPERATURE		RESISTANCE	TEMPERATURE		RESISTANCE
C	F	ohms	C	F	ohms	C	F	ohms
120	248.0	390.0	66	150.8	2,011.0	12	53.6	18,090.0
119	246.2	401.2	65	149.0	2,083.0	11	51.8	18,972.0
118	244.4	412.8	64	147.2	2,157.0	10	50.0	19,903.0
117	242.6	424.8	63	145.4	2,235.0	9	48.2	20,883.0
116	240.8	437.2	62	143.6	2,315.0	8	46.4	21,918.0
115	239.0	450.0	61	141.8	2,400.0	7	44.6	23,013.0
114	237.2	462.5	60	140.0	2,488.0	6	42.8	24,117.0
113	235.4	475.5	59	138.2	2,579.0	5	41.0	25,396.0
112	233.6	488.9	58	136.4	2,675.0	4	39.2	26,686.0
111	231.8	502.7	57	134.6	2,774.0	3	37.4	28,052.0
110	230.0	517.0	56	132.8	2,878.0	2	35.6	29,498.0
109	228.2	531.0	55	131.0	2,986.0	1	33.8	31,030.0
108	226.4	545.6	54	129.2	3,099.0	0	32.0	32,654.0
107	224.6	560.5	53	127.4	3,217.0	–1	30.2	34,367.0
106	222.8	576.0	52	125.6	3,340.0	–2	28.4	36,182.0
105	221.0	592.0	51	123.8	3,469.0	–3	26.6	38,109.0
104	219.2	608.5	50	122.0	3,603.0	–4	24.8	40,153.0
103	217.4	625.5	49	120.2	3,743.0	–5	23.0	42,324.0
102	215.6	643.0	48	118.4	3,889.0	–6	21.2	44,617.0
101	213.8	661.2	47	116.6	4,042.0	–7	19.4	47,052.0
100	212.0	680.0	46	114.8	4,203.0	–8	17.6	49,640.0
99	210.2	700.0	45	113.0	4,370.0	–9	15.8	52,392.0
98	208.4	720.6	44	111.2	4,544.0	–10	14.0	55,319.0
97	206.6	742.0	43	109.4	4,727.0	–11	12.2	58,415.0
96	204.8	764.1	42	107.6	4,918.0	–12	10.4	61,711.0
95	203.0	787.0	41	105.8	5,117.0	–13	8.6	65,219.0
94	201.2	810.8	40	104.0	5,327.0	–14	6.8	68,957.0
93	199.4	835.5	39	102.2	5,546.0	–15	5.0	72,940.0
92	197.6	861.0	38	100.4	5,774.0	–16	3.2	77,162.0
91	195.8	888.5	37	98.6	6,014.0	–17	1.4	81,662.0
90	194.0	915.0	36	96.8	6,266.0	–18	–0.4	86,463.0
89	192.2	944.0	35	95.0	6,530.0	–19	–2.2	91,588.0
88	190.4	974.0	34	93.2	6,806.0	–20	–4.0	97,060.0
87	188.6	1005.0	33	91.4	7,096.0	–21	–5.8	102,868.0
86	186.8	1037.0	32	89.6	7,401.0	–22	–7.6	109,075.0
85	185.0	1070.0	31	87.8	7,720.0	–23	–9.4	115,710.0
84	183.2	1104.0	30	86.0	8,056.0	–24	–11.2	122,807.0
83	181.4	1140.0	29	84.2	8,407.0	–25	–13.0	130,402.0
82	179.6	1177.0	28	82.4	8,776.0	–26	–14.8	138,482.0
81	177.8	1215.0	27	80.6	9,164.0	–27	–16.6	147,134.0
80	176.0	1255.0	26	78.8	9,571.0	–28	–18.4	156,404.0
79	174.2	1297.0	25	77.0	10,000.0	–29	–20.2	166,342.0
78	172.4	1340.0	24	75.2	10,449.0	–30	–22.0	177,000.0
77	170.6	1385.0	23	73.4	10,921.0	–31	–23.8	188,340.0
76	168.8	1431.0	22	71.6	11,418.0	–32	–25.6	200,510.0
75	167.0	1480.0	21	69.8	11,942.0	–33	–27.4	213,570.0
74	165.2	1530.0	20	68.0	12,493.0	–34	–29.2	227,610.0
73	163.4	1582.0	19	66.2	13,071.0	–35	–31.0	242,700.0
72	161.6	1637.0	18	64.4	13,681.0	–36	–32.8	258,730.0
71	159.8	1693.0	17	62.6	14,323.0	–37	–34.6	275,970.0
70	158.0	1752.0	16	60.8	15,000.0	–38	–36.4	294,520.0
69	156.2	1813.0	15	59.0	15,714.0	–39	–38.2	314,490.0
68	154.4	1876.0	14	57.2	16,464.0	–40	–40.0	336,000.0
67	152.6	1943.0	13	55.4	17,255.0			

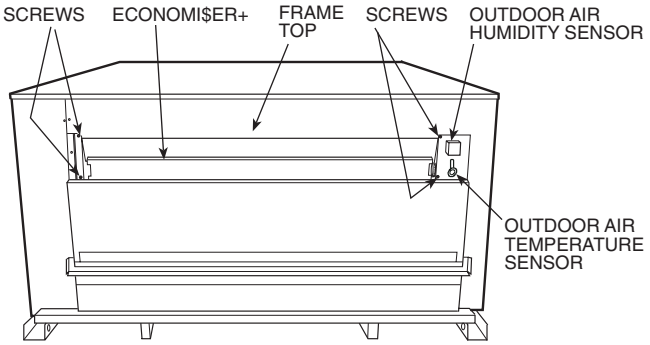


Fig. 35 — Outdoor-Air Humidity Sensor

Table 9 — Outdoor Air, Return Air, and Supply Air Temperature Sensors (CRTEMPSN001A00 or HH79NZ039) — Thermistor Resolution

RANGE		RESOLUTION
Low	High	
F	F	F
–41	–18	4.0
–17	14	2.0
15	28	1.0
29	47	0.8
48	86	0.7
87	108	0.8
109	126	1.0
127	171	2.0
127	195	4.0

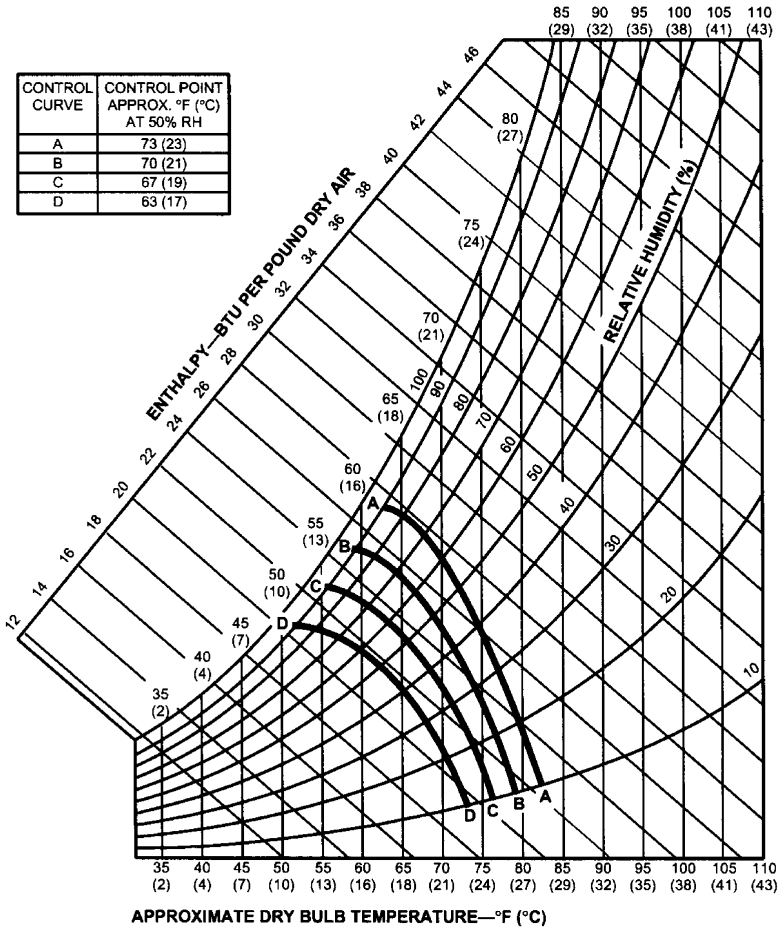
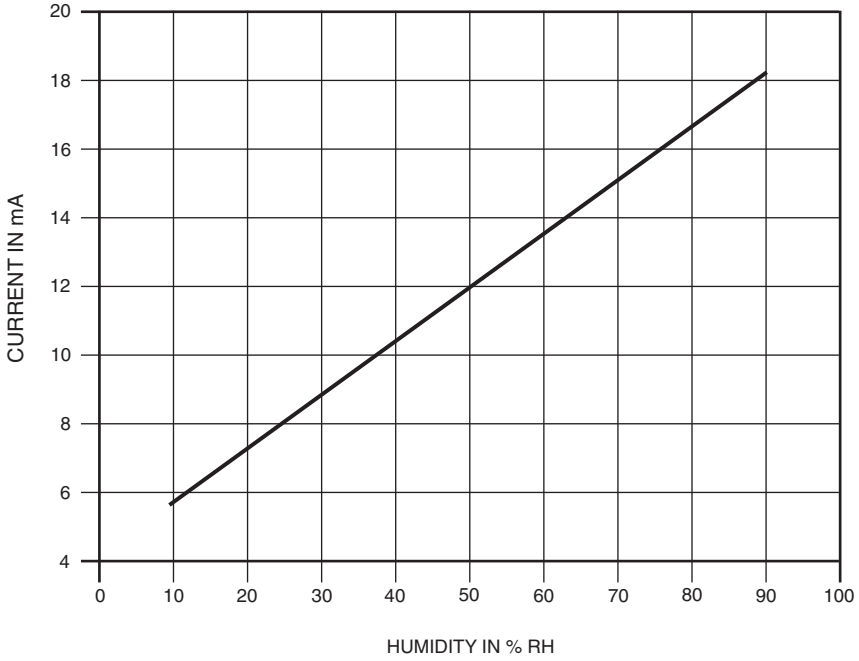


Fig. 36 — Enthalpy Changeover Settings



RH (%)	CURRENT (mA)
10	5.6
20	7.2
30	8.8
40	10.4
50	12.0
60	13.6
70	15.2
80	16.8
90	18.4

RH — Relative Humidity

Fig. 37 — Humidity Sensor Current vs. Humidity

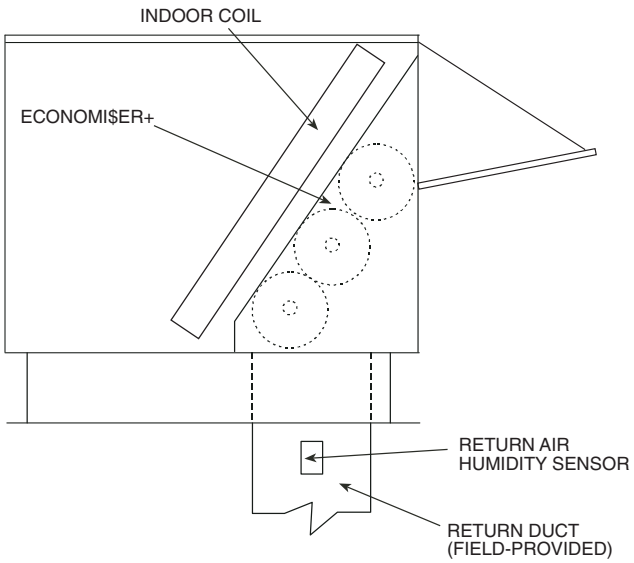


Fig. 38 — Return Air Humidity Sensor

OCCUPIED/UNOCCUPIED SWITCH — The EconoMi$er+ supports the use of a field-supplied occupied/unoccupied switch. When the switch is closed it provides a 24-vac signal to the unit for occupied mode and when open, there is no signal to indicate unoccupied mode. The control can be configured to allow different minimum economizer damper positions and to control how mechanical cooling will and will not be used in the occupied mode.

NOTE: The remote potentiometer (see below) will override the occupied minimum position if the potentiometer setting is greater than the occupied minimum position.

For 13 to 25 ton units, a jumper wire is installed across the last 2 positions (labeled OCCUP) of the unit thermostat terminal board.

An occupied/unoccupied switch can be field-installed in place of the jumper to allow the user to force the control into occupied or unoccupied mode of operation for EconoMi$er+ damper position. The occupied/unoccupied switch is required if the user wants to use unoccupied free cooling or different EconoMi$er+ damper vent positions in the unoccupied mode.

POWER EXHAUST — Refer to the Accessory Power Exhaust installation instructions for information on installing the power exhaust accessory.

REMOTE ECONOMI$ER+ ENABLE CONTROL — When the control is used with energy management systems that enable and disable the EconoMi$er+, the user can install a field-supplied enable/disable switch. The switch must be wired in series with a 3K ohm, 1 watt or greater resistor. The switch is wired to terminals ORH (pin 11) and VREF (pin 12) on J3. Refer to the Start-Up section for details on how to configure the control.

REMOTE POTENTIOMETER OCCUPIED MINIMUM POSITION — The occupied minimum position set point remote 0 to 10K, 3-wire linear potentiometer (field-supplied) is used when requiring additional temporary ventilation. The remote potentiometer (0K ohm - closed damper, 10K ohm - open damper) will only control the occupied minimum position.

The accessory 5-in wiring plug, CRE+PLUG001A00 is required to connect the potentiometer.

The plug is installed on pins 15, 16 and 17 on J3 of the EconoMi$er+ controller. The pins are labeled with the ground symbol, MIN and VREF on the EconoMi$er+ controller. The pink wire from the harness is connected to pin 15 (ground symbol). The gray wire from the harness is connected to pin 16 (MIN). The yellow wire from the harness is connected to pin 16 (VREF). The wiring harness should be extended with wires and wire nuts and routed from the EconoMi$er+ controller to the remote potentiometer location.

NOTE: Pins 13 (ground symbol) and 14 (IAQ), which are wired to the accessory 5-pin plug, are not used for the remote potentiometer installation. They are used for an accessory IAQ sensor (if required).

The unoccupied minimum position can only be set at the controller. The occupied minimum position set point configured at the EconoMi$er+ controller should be set to 0 when using a remote potentiometer. The occupied minimum position will also be used as part of the IAQ routing; it will be the maximum position the damper moves to when there is an IAQ call.

If the remote potentiometer (occupied) position is greater than the EconoMi$er+ controller unoccupied minimum position, then the remote potentiometer setting will be used. The remote potentiometer is field supplied and must be a 3-wire, linear potentiometer with a resistance between 10K ohm and 100K ohm (such as the Honeywell S963B1128).

DEMAND VENTILATION CONTROL — Demand ventilation control uses an IAQ sensor (CRE+PLUG001A00 required) to control the amount of outside air admitted into the system. Normally, the minimum position of the EconoMi$er+ damper is established based on the demand occupancy of the space. The IAQ sensor will be used to modulate the EconoMi$er+ minimum damper position below the normal minimum position based on full occupancy. The lower limit is called the base ventilation rate. See Fig. 39.

If there is no IAQ signal the damper will be in the unoccupied minimum position (configuration item number 3). If there is an IAQ signal the damper will be in the occupied minimum position (configuration item number 15), unless the remote potentiometer is used to override it.

For the demand ventilation control logic, the user configures the lower and upper actuator position to establish the base ventilation rate (IAQMIN_SP) and the design ventilation rate (ECONOMIN_SP) for full occupancy. When the EconoMi$er+ damper is being modulated for demand ventilation control, the damper position will be between IAQMIN_SP and ECONOMIN_SP. The upper IAQ differential set point is DAQHI. The lower IAQ differential set point is DAQLO.

The differential set points represent the differential CO_2 level (in ppm) above the outdoor reference IAQ levels. Normally, the outdoor reference IAQ levels are around 400 ppm, but the value should be configured based on the reference levels taken at the job site.

The following equation is used to determine EconoMi$er+ damper position (ECONOMIN_POS):

$$= \text{IAQMIN\_SP} + \frac{(\text{ECONOMIN\_SP} - \text{IAQMIN\_SP}) * (\text{IAQ} - \text{OAQ} - \text{DAQLO})}{(\text{DAQHI} - \text{DAQLO})}$$

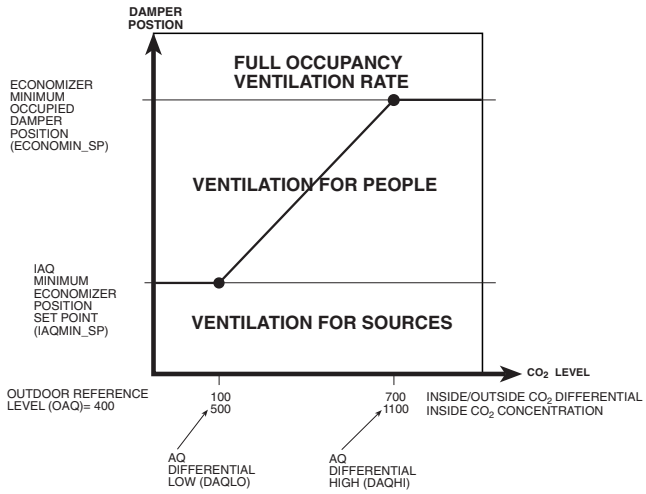


Fig. 39 — Demand Ventilation Control

CO_2 SENSOR CONFIGURATION — The CO_2 sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. See Table 10.

NOTE: Use setting 1 or 2 for Carrier equipment.

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode 2 times. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. See Table 10.
4. Press Enter to lock in the selection.

Press Mode to exit and resume normal operation. The custom settings of the CO_2 sensor can be changed any time after the sensor is energized. Follow the steps below to change the non-standard settings:

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

DEHUMIDIFICATION OF FRESH AIR WITH DEMAND CONTROL VENTILATION (DCV) — Information from ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, a device such as a energy recovery unit is added to reduce the moisture content of the fresh air being brought into the building when the enthalpy is high. In most cases, the normal heating and cooling processes are more than adequate to remove the humidity loads for most commercial applications.

This makes the control of the dehumidification device simple when using the enthalpy or differential enthalpy sensor. The enthalpy sensor or differential enthalpy sensor is installed on the equipment to determine economizer operation. The high enthalpy signal from the temperature and humidity sensors or differential temperature and humidity sensors can be used to turn on the outdoor air moisture removal device any time fresh air is required for the space.

The energy recovery device should be sized for maximum latent and sensible conditioning at maximum ventilation on a design day.

A calculation for leaving-air temperature on a low ambient, low ventilation day should also be done to determine the supply-air temperature of the return and pre-conditioned outside air. The design should produce air temperature somewhat near room conditions to prevent reheat of the air mixture. The energy recovery device should be interlocked with the heat to turn off the device when in the heat mode.

If more moisture removal is required, a humidity sensor in the space can be used to activate a moisture removal device (such as the MoistureMi$er™ dehumidification device). The MoistureMi$er dehumidification device improves the latent capacity of the compressor cooling while the cooling is active. This will remove any moisture introduced from the conditioned space (such as from kitchen equipment).

ECONOMI$ER2 — The EconoMi$er2 design does not include a controller (see Fig. 40). The PremierLink™ control can be factory wired to the EconoMi$er2 (see Fig. 41) to control all economizer functions. Refer to the PremierLink Control section on page 16. The EconoMi$er2 can also be controlled by a field-supplied 4 to 20 mA signal.

Refer to the accessory EconoMi$er2 installation instructions when field installing an EconoMi$er2 accessory.

Table 10 — CO_2 Sensor* Standard Settings

SETTING	EQUIPMENT	OUTPUT	VENTILATION RATE (cfm/Person)	ANALOG OUTPUT	CO_2 CONTROL RANGE (ppm)	OPTIONAL RELAY SETPOINT (ppm)	RELAY HYSTERESIS (ppm)
1	Interface with Standard Building Control System	Proportional	Any	4-20 mA	0-2000	1000	50
2		Proportional	Any	7-20 mA	0-2000	1000	50
3		Exponential	Any	4-20 mA	0-2000	1100	50
4	Economizer	Proportional	15	4-20 mA	0-1100	1100	50
5		Proportional	20	4-20 mA	0- 900	900	50
6		Exponential	15	4-20 mA	0-1100	1100	50
7		Exponential	20	4-20 mA	0- 900	900	50
8	Health & Safety	Proportional	—	4-20 mA	0-9999	5000	500
9	Parking/Air Intakes/ Loading Docks	Proportional	—	4-20 mA	0-2000	700	50

LEGEND

ppm — Parts Per Million

*Available sensor part numbers are listed in Table 6.

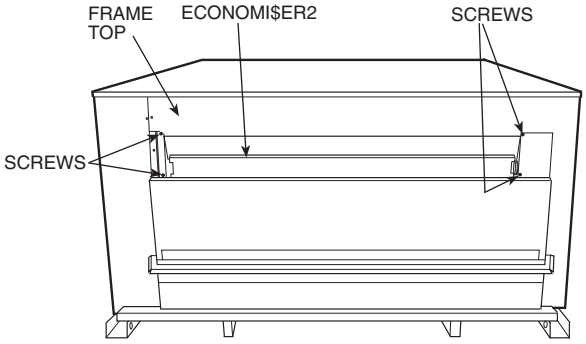
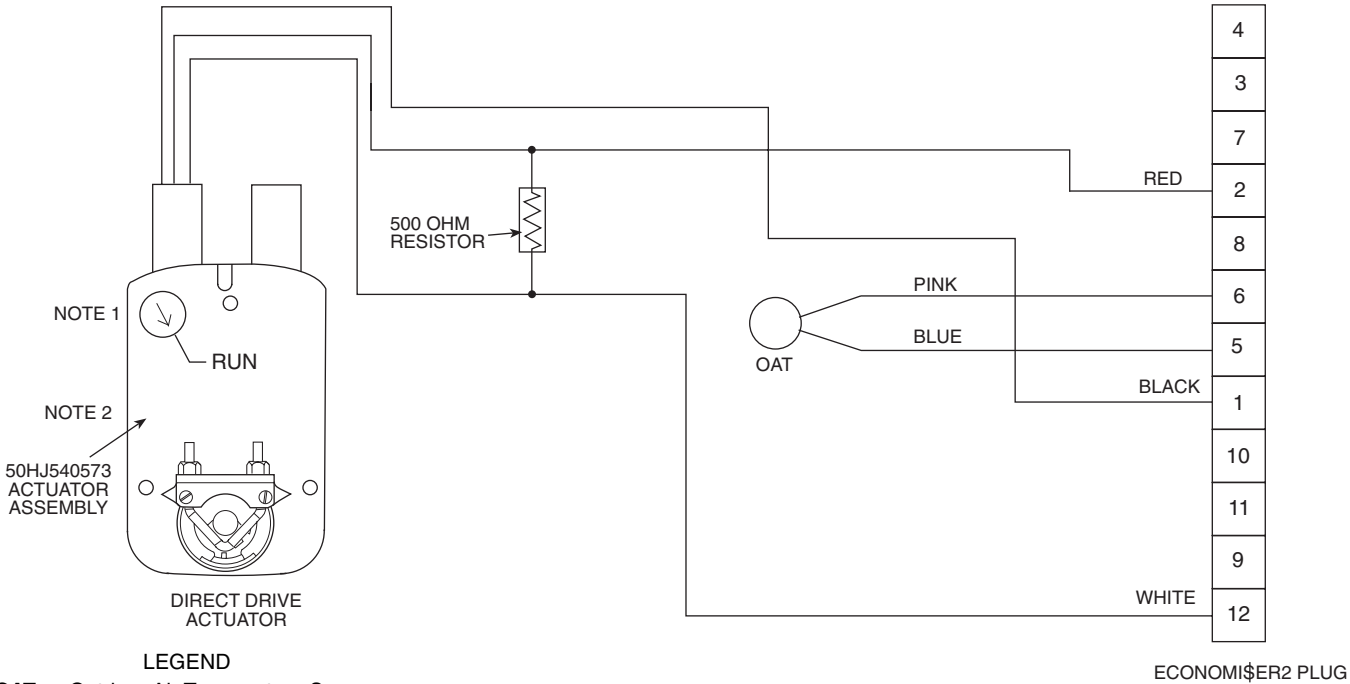


Fig. 40 — EconoMi$er2 Component Locations



LEGEND

OAT — Outdoor Air Temperature Sensor

NOTES:
1. Switch on actuator must be in run position for economizer to operate.
2. 50HJ540573 actuator consists of the 50HJ540567 actuator and a harness with 500-ohm resistor.

Fig. 41 — EconoMi$er2 Wiring

**Step 13 — Install Humidistat for Optional MoistureMi$er™ Package —** MoistureMi$er dehumidification package operation can be controlled by field installation of a Carrier-approved humidistat. 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. 42 and Fig. 43. See Fig. 44 for operational diagram.

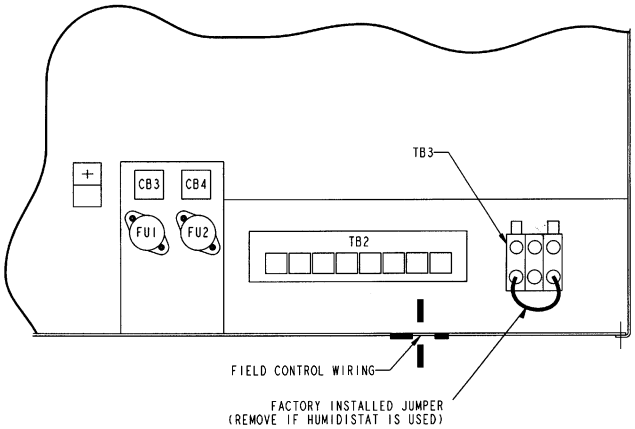


Fig. 43 — Typical MoistureMi$er Dehumidification Package Control Box

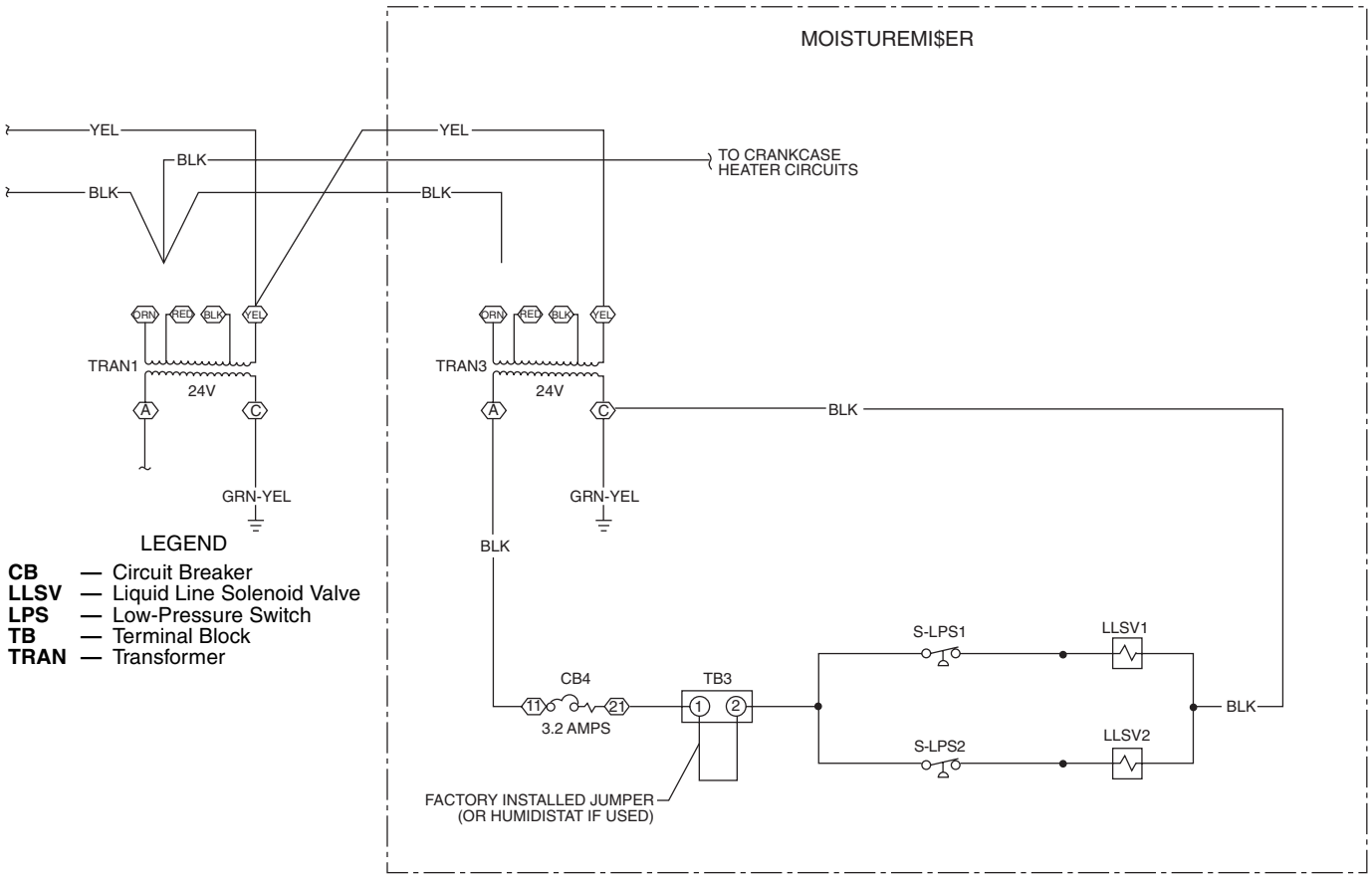
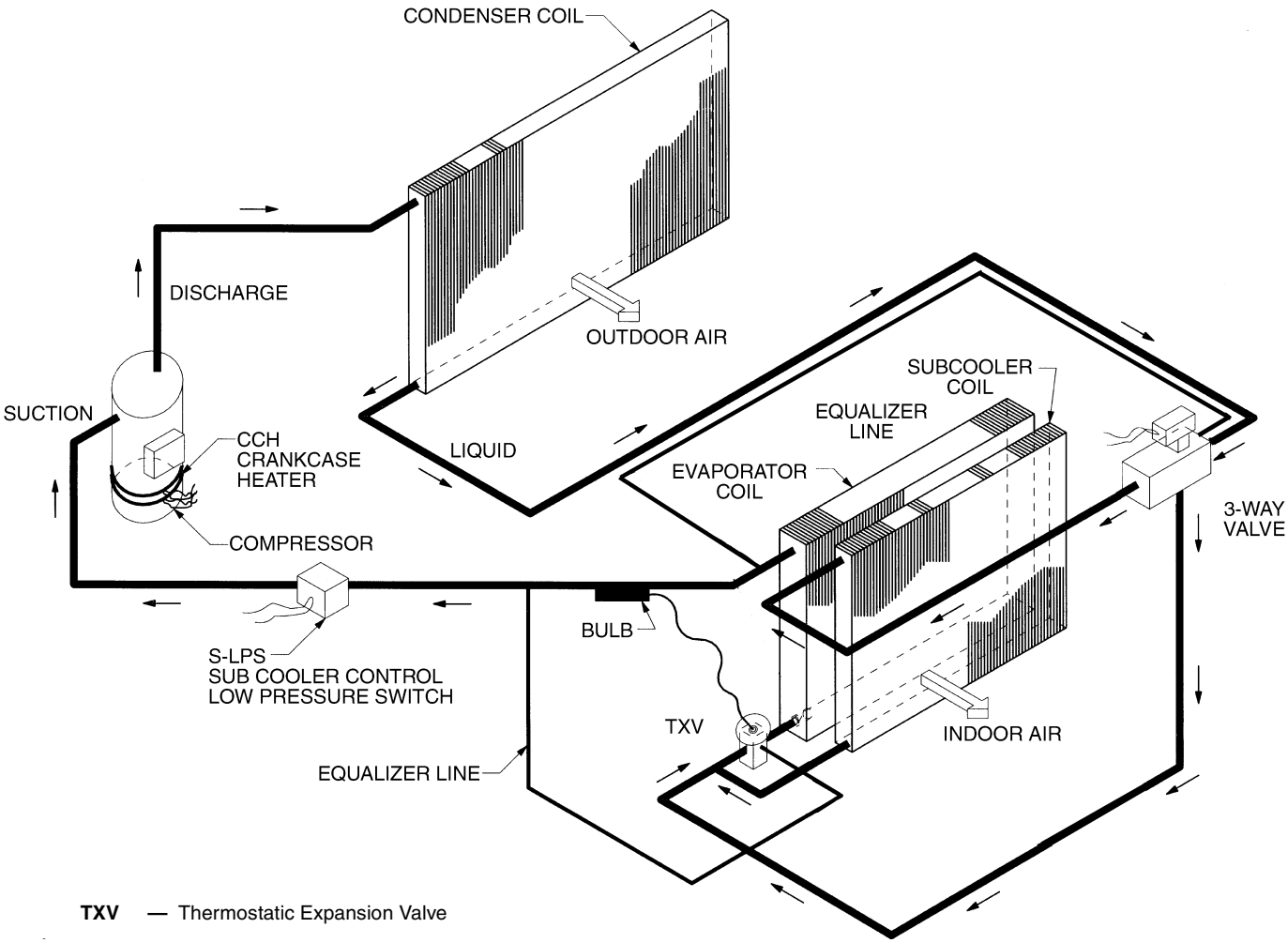


Fig. 42 — Typical MoistureMi$er Dehumidification Package Humidistat Wiring Schematic (460 V Unit Shown)



TXV — Thermostatic Expansion Valve

Fig. 44 — MoistureMi$er™ Dehumidification Package Operation Diagram

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.

CRANKCASE HEATER (SIZE 028 AND UNITS WITH MOISTUREMI$ER DEHUMIDIFICATION PACKAGE ONLY) — 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. Remove tape from the fan pulley. See Tables 11-16 for Fan Performance Data. Be sure that fans rotate in the proper direction. See Table 17 for air quantity limits. See Tables 18-20 for static pressure information for accessories and options. See Table 21 for Fan Rpm at Motor Pulley Settings. See Tables 22 and 23 for Evaporator-Fan Motor Data and Evaporator-Fan Motor Efficiency. To alter fan performance, see Evaporator Fan Performance Adjustment section on page 48.

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 (page 50) 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.

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. 13).
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 51.
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 11 — Fan Performance — 48TJD016 (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
4500	809	1.53	1317	906	1.74	1502	994	1.96	1690	1078	2.18	1882	1156	2.41	2077	1230	2.64	2275
4800	850	1.76	1516	942	1.98	1706	1027	2.20	1899	1107	2.43	2094	1183	2.66	2293	1255	2.89	2495
5100	892	2.01	1733	979	2.24	1928	1061	2.46	2125	1138	2.70	2325	1211	2.93	2528	1281	3.17	2733
5400	934	2.28	1970	1017	2.52	2169	1096	2.75	2371	1170	2.99	2575	1241	3.22	2781	1309	3.47	2990
5700	976	2.58	2225	1058	2.82	2429	1132	3.06	2635	1204	3.30	2843	1272	3.54	3053	1338	3.79	3266
6000	1019	2.90	2500	1096	3.14	2709	1168	3.38	2919	1238	3.63	3131	1304	3.88	3345	1368	4.13	3562
6300	1063	3.24	2795	1136	3.49	3008	1206	3.74	3223	1273	3.99	3439	1337	4.24	3657	—	—	—
6600	1106	3.61	3111	1177	3.86	3329	1244	4.11	3547	1309	4.37	3767	—	—	—	—	—	—
6900	1150	4.00	3448	1218	4.26	3670	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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
4500	1301	2.87	2477	1369	3.11	2683	1434	3.35	2891	1497	3.47	2997	1497	3.60	3103
4800	1324	3.13	2700	1390	3.37	2909	1454	3.62	3120	1515	3.74	3226	1515	3.87	3334
5100	1349	3.41	2942	1413	3.66	3153	1475	3.90	3367	1535	4.03	3475	1535	4.16	3584
5400	1374	3.71	3202	1437	3.96	3416	1498	4.21	3633	—	—	—	—	—	—
5700	1402	4.04	3481	1463	4.29	3699	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
FIOP — Factory-Installed Option
Watts — Input Watts to Motor

NOTES:
1. Standard low-medium static drive range is 891 to 1179 rpm (for 208/230 and 460-v units) or 1159 to 1429 rpm (for 575-v units). Alternate high-static drive range is 1227 to 1550 (for 208/230 and 460-v units). The alternate high-static drive is not available for 48TJ016 575-v units. Other rpms require a field-supplied drive.
2. Maximum continuous bhp is 4.25 (208/230 and 460 v) or 3.45 (575 v) and the maximum continuous watts are 3775 (208/230 and 460 v) or 3065 (575 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.
3. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
4. Interpolation is permissible. Do not extrapolate.
5. Fan performance is based on wet coils, clean filters, and casing losses. See Tables 18 and 20 for accessory/FIOP static pressure information.
6. 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.
7. Use of a field-supplied motor may affect wiring size. Contact your Carrier representative for details.

Table 12 — Fan Performance — 48TJD020 and 024 (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	1459	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
FIOP — Factory-Installed Option
Watts — Input Watts to Motor

NOTES:
1. Standard low-medium static drive range for the 020 size is 910 to 1095 rpm. Standard low-medium static drive range for the 024 size is 1002 to 1225 rpm. Alternate high-static drive range for the 020 size is 1069 to 1287. Alternate high-static drive range for the 024 size is 1193 to 1458 rpm. Other rpms require a field-supplied drive.
2. Maximum continuous bhp for the 020 size is 5.90. Maximum continuous bhp for the 024 size is 8.7 (208/230, 575 v) or 9.5 (460 v). The maximum continuous watts for the 020 size is 5180. The maximum continuous watts for the 024 size is 7915 (208/230, 575 v) or 8640 (460 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.
3. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
4. Interpolation is permissible. Do not extrapolate.
5. Fan performance is based on wet coils, clean filters, and casing losses. See Tables 19 and 20 for accessory/FIOP static pressure information.
6. 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.
7. Use of a field-supplied motor may affect wiring size. Contact your Carrier representative for details.

Table 13 — Fan Performance — 48TJD028 (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	2769	1002	3.80	3140	1061	4.27	3528	1117	4.76	3934	1171	5.27	4356	1224	5.80	4794
7,500	999	4.05	3348	1057	4.53	3742	1112	5.02	4152	1166	5.54	4579	1218	6.07	5020	1268	6.63	5478
8,000	1058	4.85	4007	1113	5.35	4424	1165	5.87	4856	1216	6.41	5304	1266	6.97	5766	1314	7.55	6243
8,500	1117	5.74	4750	1169	6.28	5190	1219	6.83	5645	1268	7.40	6114	1315	7.98	6597	1361	8.58	7094
9,000	1177	6.75	5583	1226	7.31	6047	1274	7.89	6524	1320	8.48	7015	1365	9.09	7520	1410	9.72	8037
9,500	1237	7.98	6511	1284	8.46	6999	1329	9.07	7499	1374	9.69	8012	1417	10.33	8538	1459	10.98	9076
10,000	1297	9.12	7450	1342	9.74	8051	1385	10.37	8574	1428	11.02	9110	1469	11.68	9657	1510	12.36	10217
10,500	1358	10.49	8674	1400	11.14	9209	1442	11.80	9755	1483	12.47	10314	1523	13.16	10883	—	—	—
11,000	1418	12.00	9919	1459	12.67	10478	—	—	—	—	—	—	—	—	—	—	—	—
11,250	1449	12.80	10585	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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	5718	1371	5.54	6204
7,500	1316	7.20	6960	1364	7.79	6437	1410	6.41	6939
8,000	1360	8.14	6734	1406	8.76	7239	1450	7.40	7759
8,500	1406	9.20	7605	1449	9.83	8129	1492	8.48	8666
9,000	1453	10.36	8568	1495	11.02	9111	1536	9.69	9667
9,500	1501	11.64	9627	1541	12.32	10190	—	—	—
10,000	—	—	—	—	—	—	—	—	—
10,500	—	—	—	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
FIOP — Factory-Installed Option
Watts — Input Watts to Motor

NOTES:
1. 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.
2. Maximum continuous bhp is 10.2 (208/230, 575 v) or 11.8 (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.
3. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
4. Interpolation is permissible. Do not extrapolate.
5. Fan performance is based on wet coils, clean filters, and casing losses. See Tables 19 and 20 for accessory/FIOP static pressure information.
6. 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.
7. Use of a field-supplied motor may affect wiring size. Contact your Carrier representative for details.

Table 14 — Fan Performance — 48TJF016 (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
4500	819	1.55	1335	914	1.76	1518	1001	1.98	1705	1083	2.20	1894	1160	2.42	2088	1234	2.65	2284
4800	861	1.78	1538	951	2.00	1726	1035	2.22	1916	1113	2.45	2110	1188	2.68	2307	1259	2.91	2507
5100	904	2.04	1759	989	2.26	1952	1069	2.49	2147	1145	2.72	2345	1218	2.95	2545	1287	3.17	2749
5400	947	2.32	1999	1028	2.55	2197	1105	2.78	2396	1179	3.01	2598	1248	3.25	2802	1315	3.49	3009
5700	990	2.62	2259	1068	2.85	2461	1142	3.09	2665	1213	3.33	2871	1280	3.57	3079	1345	3.81	3289
6000	1034	2.94	2539	1109	3.18	2745	1180	3.42	2953	1248	3.67	3163	1313	3.91	3375	1376	4.16	3589
6300	1078	3.29	2840	1150	3.54	3050	1218	3.78	3262	1284	4.03	3476	1348	4.28	3692	—	—	—
6600	1123	3.67	3161	1192	3.91	3376	1258	4.16	3592	—	—	—	—	—	—	—	—	—
6900	1167	4.06	3504	1234	4.32	3723	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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
4500	1304	2.88	2484	1371	3.12	2688	1435	3.36	2895	1467	3.48	2999	1497	3.60	3104
4800	1327	3.14	2711	1393	3.38	2917	1456	3.62	3126	1486	3.75	3232	1517	3.87	3338
5100	1353	3.43	2955	1417	3.67	3165	1478	3.92	3377	1508	4.04	3484	1537	4.16	3592
5400	1380	3.73	3219	1442	3.98	3432	1502	4.23	3646	1531	4.35	3755	—	—	—
5700	1408	4.06	3503	1468	4.31	3718	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6600	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
FIOP — Factory-Installed Option
Watts — Input Watts to Motor

NOTES:
1. Standard low-medium static drive range is 891 to 1179 rpm (for 208/230 and 460-v units) or 1159 to 1429 rpm (for 575-v units). Alternate high-static drive range is 1227 to 1550 (for 208/230 and 460-v units). The alternate high-static drive is not available for 48TJ016 575-v units. Other rpms require a field-supplied drive.
2. Maximum continuous bhp is 4.25 (208/230 and 460 v) or 3.45 (575 v) and the maximum continuous watts are 3775 (208/230 and 460 v) or 3065 (575 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.
3. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
4. Interpolation is permissible. Do not extrapolate.
5. Fan performance is based on wet coils, clean filters, and casing losses. See Tables 18 and 20 for accessory/FIOP static pressure information.
6. 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.
7. Use of a field-supplied motor may affect wiring size. Contact your Carrier representative for details.

Table 15 — Fan Performance — 48TJF020 and 024 (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
FIOP — Factory-Installed Option
Watts — Input Watts to Motor

NOTES:
1. Standard low-medium static drive range for the 020 size is 910 to 1095 rpm. Standard low-medium static drive range for the 024 size is 1002 to 1225 rpm. Alternate high-static drive range for the 020 size is 1069 to 1287. Alternate high-static drive range for the 024 size is 1193 to 1458 rpm. Other rpms require a field-supplied drive.
2. Maximum continuous bhp for the 020 size is 5.90. Maximum continuous bhp for the 024 size is 8.7 (208/230, 575 v) or 9.5 (460 v). The maximum continuous watts for the 020 size is 5180. The maximum continuous watts for the 024 size is 7915 (208/230, 575 v) or 8640 (460 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.
3. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
4. Interpolation is permissible. Do not extrapolate.
5. Fan performance is based on wet coils, clean filters, and casing losses. See Tables 19 and 20 for accessory/FIOP static pressure information.
6. 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.
7. Use of a field-supplied motor may affect wiring size. Contact your Carrier representative for details.

Table 16 — Fan Performance — 48TJD028 (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
FIOP — Factory-Installed Option
Watts — Input Watts to Motor

NOTES:
1. 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.
2. Maximum continuous bhp is 10.2 (208/230, 575 v) or 11.8 (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.
3. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
4. Interpolation is permissible. Do not extrapolate.
5. Fan performance is based on wet coils, clean filters, and casing losses. See Tables 19 and 20 for accessory/FIOP static pressure information.
6. 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.
7. Use of a field-supplied motor may affect wiring size. Contact your Carrier representative for details.

Table 17 — Air Quantity Limits

UNIT 48TJ	MINIMUM COOLING CFM	MINIMUM HEATING CFM		MAXIMUM CFM
		Low Heat	High Heat	
016	4500	3800	3800	7,500
020	5400	4750	5450	9,000
024	6000	4750	5450	10,000
028	7000	4750	5450	11,250

Table 18 — Accessory/FIOP Static Pressure* (in. wg) — 48TJ016

COMPONENT	CFM				
	4500	5000	6000	7200	7500
Economizer	0.04	0.05	0.07	0.09	0.10

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 19 — Accessory/FIOP Static Pressure* (in. wg) — 48TJ020-028

COMPONENT	CFM					
	5000	6000	7200	9000	10,000	11,250
Economizer	0.06	0.07	0.09	0.11	0.12	0.14

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 20 — MoistureMi$er™ Dehumidification Package Static Pressure Drop (in. wg)

UNIT SIZE	UNIT NOMINAL TONS	CFM PER TON		
		300	400	500
48TJ016	15	.040	.071	.111
48TJ020	18	.058	.102	.160
48TJ024	20	.071	.126	.197
48TJ028	25	.111	.197	.308

Table 21 — Fan Rpm at Motor Pulley Settings*

UNIT 48TJ	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 (208/230, 460 v)†	††	††	1179	1150	1121	1093	1064	1035	1006	978	949	920	891
016 (208/230, 460 v)**	††	††	1559	1522	1488	1455	1422	1389	1356	1323	1289	1256	1227
016 (575 v)†	††	††	1429	1403	1376	1349	1323	1296	1269	1242	1215	1188	1159
020†	††	††	1095	1077	1058	1040	1021	1002	984	965	947	928	910
020**	††	††	1287	1265	1243	1222	1200	1178	1156	1134	1112	1091	1069
024†	††	††	1225	1209	1187	1165	1143	1120	1098	1076	1053	1031	1002
024**	††	††	1458	1434	1407	1381	1354	1328	1301	1275	1248	1222	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.

NOTE: For speeds not listed above, field-supplied drives are required.

Table 22 — Evaporator-Fan Motor Data

UNIT 48TJ	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*	MAXIMUM ACCEPTABLE CONTINUOUS BkW*	MAXIMUM ACCEPTABLE OPERATING WATTS	MAXIMUM AMP DRAW
016	208/230	4.25	3.17	3,775	10.5
	460	4.25	3.17	3,775	4.8
	575	3.45	2.59	3,065	3.9
020	208/230	5.90	4.40	5,180	15.8
	460				7.9
	575				6.0
024	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 23 — Evaporator-Fan Motor Efficiency

UNIT 48TJ	MOTOR EFFICIENCY (%)
016 (3.0 Hp)	81.7
016 (3.7 Hp)	85.8
020 (5 Hp)	87.5
024 (7.5 Hp)	88.5
028 (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.

**EconoMi$er+ Controller —** The EconoMi$er+ controller is mounted to the top of the EconoMi$er+ damper and is accessible by removing the filter access door of the unit.

The EconoMi$er+ controller is protected by a sheet metal enclosure mounted over the controller. Remove the single screw on the front of the enclosure and lift off the top for access to the controller. The primary purpose of the controller is to provide control of the EconoMi$er+ dampers and the cooling compression stages. The status of the indoor fan is monitored through the G input but is not directly controlled by the controller. The heating function is completely independent of the controller.

IMPORTANT: The controller can only be used with conventional thermostats with Y1, Y2 and G input to the controller; it can **NOT** be used with electronic thermostats with a proportional room temperature input, or with Variable Air Volume systems.

There are 4 LEDs on the controller, which are used to read values and display status and configuration information. There are 2 buttons (READ/ADJUST and ADVANCE/ MANUAL), which change modes and configure the controller. See Fig. 45.

The EconoMi$er+ microprocessor based control system provides the following control functions:

- EconoMi$er+ damper control for free cooling
- Minimum position control for ventilation
- Demand Ventilation Control using a CO_2 sensor
- Compressor Cooling Stage Control
- Occupied/Unoccupied Control
- Diagnostics Display and History
- Manual test control

See Table 24 for Inputs and Outputs.

INTEGRATED DISPLAY — The control board includes an integrated display, which is used for the following functions:

- Configuration and setup
- Set point and control adjustment
- Error status and alarm monitoring
- Manual control
- Reading sensor values

There are 5 modes of display operation:

- Startup Mode
- Run Mode
- Read Mode
- Setup Mode
- Manual Mode

External devices are not required to operate and configure the control.

STARTUP MODE — During the first 3 seconds after power is applied to the control, the four LEDs flash as shown in Table 25, indicating that the control is being initialized. The buttons are not operational during Startup mode.

RUN MODE — Run mode indicates status of controller and unit. The mode can be changed to the Read, Setup, or Manual modes by pushing various buttons.

While the control is in Run mode, the DS1 heartbeat indicator LED (red) will flash to indicate the controller is operating properly. The DS2 Econo indicator LED (yellow) will flash whenever economizer is being used for free cooling. The DS3 first stage cooling indicator LED (green) will be on steady to indicate demand for stage 1 cooling. The DS4 second stage cooling indicator LED (green) will be on steady to indicate demand for stage 2 cooling.

If the controller is in a different mode, the controller will return to Run mode after 10 minutes of user inactivity or if the READ/ADJUST (#1) and ADVANCE/MANUAL (#2) buttons are held for at least 3 seconds until all LEDs flash.

READ MODE — Read mode is used to check set points (Table 26) and I/O channel status (Table 27). Enter the Read mode by pushing and releasing the READ/ADJUST (#1) button. A user can only enter Read mode from the Run mode (to get to Run mode, press both the #1 and #2 buttons for at least 3 seconds until all LEDs flash). In Read mode, LEDs are not lit until the READ/ADJUST button (#1) is pushed.

NOTE: If the user pushes and holds the READ/ADJUST button (#1) for more than 3 seconds, then the control will go into the Setup mode, indicated by the yellow LED (on steady).

While in Read mode, push button #1 then the DS1 LED (Red) flashes to indicate setup point number as defined in the setup table. The two green LEDs will then show the value of the display item. The DS3 LED will first display the tens digit and the DS4 LED will then display the ones digit. For example to display 54, the DS3 LED will flash 1 group of 5 at a high flash rate to indicate 50, and then follow with 4 flashes (DS4) at 1-second intervals to complete the display of the number 54.

NOTE: Do not try to count the “5 Fast Flashes” individually, but instead count how many groups of 5 flashes were displayed. In this case, 1 group of 5 flashes, plus the 4 flashes at 1 second results in the value of 54.

To read the display again, push the READ/ADJUST (#1) button and the sequence will repeat as many times as needed.

To advance to the next setup point, push the ADVANCE/ MANUAL (#2) button. The controller will cycle through all the setup channels (Table 26) and then the I/O channels (Table 27) and then back to the first setup channel.

NOTE: The user can only advance forward, not reset to #1 or go backwards. Cycling the EconoMi$er+ power will reset the item number (but not the item value) to item #1.

In the Read mode for setup variables, the LEDs will not turn on steady; the LEDs will always flash. Steady-on indicators are reserved for the configuration modes. No data is modified in the Read mode. The controller will always remain at the last read number even if reset back to normal operation.

NOTE: To enter another mode, the user first must exit the Read mode.

If no button is pushed in 10 minutes, Read mode will automatically be exited. Also, if the READ/ADJUST (#1) and ADVANCE/MANUAL (#2) buttons are pushed and held for more than 3 seconds, then Read mode will be exited to Run mode. While in the Read mode, the controller will continue to operate with normal unit control.

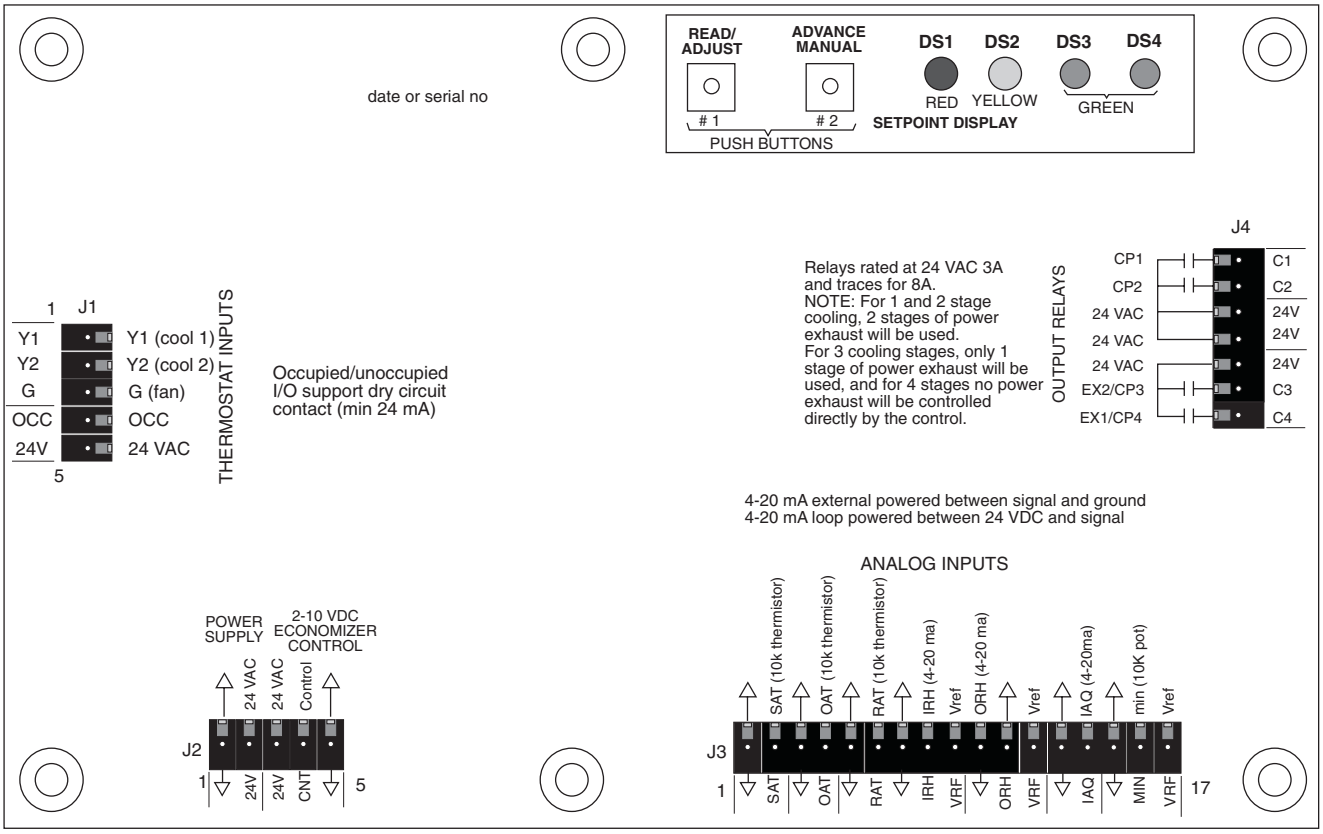


Fig. 45 — EconoMi$er+ Controller Board

Table 24 — EconoMi$er+ Inputs and Outputs

INPUT	NAME	TYPE	USE	INPUT/OUTPUT RANGE	CONVERSION RANGE	CONVERSION RESOLUTION	CONNECTION	PIN NO.
THERMOSTAT INPUTS								
Y1 (Cool/Low Cool)	Y1	Switch	Standard	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	1
Y2 (Cool 2/High Cool)	Y2	Switch	Option	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	2
G (fan)	G	Switch	Standard	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	3
Occupied/Unoccupied	OCC	Switch	Option	18-30 vac 50/60 Hz w/min 24 mA Load	NA	On/Off	J1	4,5
POWER								
Power	24V	Input	Standard	18-30 vac 50/60 Hz	NA	NA	J2	1,2
ECONOMIZER MOTOR								
Control	CNT	2-10 vdc	Standard	2-10 vdc	0-100%	1%	J2	3,4,5
ANALOG INPUTS								
Supply Air Temperature	SAT	10 K Thermistor	Standard	1816 to 86407 Ohms	30 to 125 F	0.8 F	J3	1,2
Outside Air Temperature	OAT	10 K Thermistor	Standard	1816 to 86407 Ohms	30 to 125 F	0.8 F	J3	3,4
Return Air Temperature	RAT	10 K Thermistor	Option	1816 to 86407 Ohms	30 to 125 F	0.8 F	J3	5,6
Indoor Humidity	IRH	4-20 mA, Loop Powered	Option	4-20 mA, 24 vdc	0-100%	.08 mA	J3	7,8,9
Outdoor Humidity	ORH	4-20 mA, Loop Powered	Option	4-20 mA, 24 vdc	0-100%	.08 mA	J3	10,11,12
Indoor CO_2	IAQ	4-20 mA, Ext Sourced	Option	4-20 mA, 24 vdc	0-200 PPM/10	10 PPM	J3	13,14
Remote Minimum Position Pot	MIN	10K	Option	10K to 100K Ohms	0 to 100%	1%	J3	15,16,17
RELAY OUTPUTS								
Cooling Stage 1	CP1	Relay	Standard	24 vac, 2.5 Amps at 24 vac	NA	On/Off	J4	1,3,4
Cooling Stage 2	CP2	Relay	Option	24 vac, 2.5 Amps at 24 vac	NA	On/Off	J4	2,3,4
Power Exhaust 2/ Cooling Stage 3*	CP3/ EX2	Relay	Option	24 vac, 2.5 Amps at 24 vac	NA	On/Off	J4	5,6
Power Exhaust 1/ Cooling Stage 4†	CP4/ EX1	Relay	Option	24 vac, 2.5 Amps at 24 vac	NA	On/Off	J4	5,7
DISPLAY								
Setpoint Switch 1	SP1	Digital	Standard	Open/Closed	Logic	Open/Closed	On Board	NA
Setpoint Switch 2	SP2	Digital	Standard	Open/Closed	Logic	Open/Closed	On Board	NA
LED 1	DS1	LED Output	Standard	Red	Logic	On/Off	On Board	NA
LED 2	DS2	LED Output	Standard	Yellow	Logic	On/Off	On Board	NA
LED 3	DS3	LED Output	Standard	Green	Logic	On/Off	On Board	NA
LED 4	DS4	LED Output	Standard	Green	Logic	On/Off	On Board	NA

*If there are 3 stages then there can only be 1 stage of power exhaust.
†If there are 4 stages then there will be no power exhaust stages that will be directly controlled.

Table 25 — Start-Up Mode Sequence

TIME	LED 1/DS1 (RED)	LED 2/DS2 (YELLOW)	LED 3/DS3 (GREEN)	LED 4/DS4 (GREEN)
0-1.0 SEC	OFF	OFF	OFF	OFF
1-1.5 SEC	FLASH ½ SEC	OFF	OFF	OFF
1.5-2.0 SEC	OFF	FLASH ½ SEC	OFF	OFF
2.0-2.5 SEC	OFF	OFF	FLASH ½ SEC	OFF
2.5-3.0 SEC	OFF	OFF	OFF	FLASH ½ SEC

LED — Light-Emitting Diode

Table 26 — Configuration Variables (Read and Setup Modes)

NO.	SETUP POINTS (viewable and adjustable)	UNITS	MINIMUM VALUE	MAXIMUM VALUE	FACTORY SETTING	INC	COMMENTS
1	Supply Air Temperature Setpoint	F	40 F	65 F	55 F	1 F	Leaving Air Temperature Control Point
2	Occupied Minimum Economizer Position	%	Item 15 +1%	100%	15%	1%	Min Econo Position (occupied mode)
3	Unoccupied Minimum Economizer Position	%	1%	100%	5%	1%	Min Econo Position (unoccupied mode)
4	Economizer Maximum Position	%	1%	100%	100%	1%	Maximum Econo Position
5	Economizer Type	—	1	3	2	1	1 = Vent Only, 2 = Proportional, 3 = 3 Position
6	Economizer Changeover Type	—	1	5	2	1	1 = Switch, 2 = Outdoor Dry Bulb, 3 = Diff Dry Bulb, 4 = Outdoor Enthalpy, 5 = Diff Enthalpy
7	Economizer Changeover Setpoint (mode 2)	F	45 F	70 F	65 F	1 F	For Outdoor Changeover
8	Economizer Changeover Setpoint (mode 3)	—	1	4	1	1	Outdoor Enthalpy Changeover Setpoint 1 = A, 2 = B, 3 = C, 4 = D
9	No. of compressors	—	1	4	2	1	1, 2, 3, or 4
10	Compressor Sequencing	—	1	4	1	1	1 = DC-Sensible, 2 = DC-Latent, 3 = LAT-Sensible, 4 = LAT-Latent
11	Power Exhaust Stage 1 Activation	%	1%	Item 12 -5%	25%	1%	Economizer Position
12	Power Exhaust Stage 2 Activation	%	Item 11 +1%	100%	50%	1%	Economizer Position (> stage 1)
13	Unoccupied Configuration	—	1	3	3	1	1 = No Unoccupied Cooling, 2 = Unoccupied Free Cooling, 3 = Unoccupied Free & Mech Cooling
14	Compressor Lockout Temperature	—	1 F	65 F	45 F	1 F	Compressor Operation
15	IAQ Min Economizer Position Setpoint	%	1%	Item 2 +1%	5%	1%	Min IAQ Position for VOC Emissions
16	IAQ Enable	—	1	2	1	1	1 = Disabled, 2 = Enabled
17	Outdoor IAQ Reference	PPM/10	1 PPM/10	100 PPM/10	40 PPM/10	1 PPM/10	Outdoor Reference IAQ Level
18	IAQ Lower Limit Control Point Differential	PPM/10	1 PPM/10	Item 19 -1 PPM/10	60 PPM/10	1 PPM/10	Differential Lower Limit Indoor IAQ Level
19	IAQ Upper Limit Control Point Differential	PPM/10	Item 18 +1 PPM/10	200 PPM/10	140 PPM/10	1 PPM/10	Differential Upper Limit Indoor IAQ Level
20	1st Most Recent Error/Reset	—	1	8	—	—	Used in Setup Mode to Reset Alarms
21	2nd Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode
22	3rd Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode
23	4th Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode
24	5th Most Recent Error (read only)	—	1	8	—	—	Not Displayed in Setup Mode

LEGEND

DC — Direct Control
IAQ — Indoor Air Quality
LAT — Leaving Air Temperature Compensated Control
VOC — Volatile Organic Compounds

NOTE: The accessibility of these channels will be as follows:
READ MODE — All channels will be accessible.
SETUP MODE — Only channels 1-20 will be accessible and 20 will be used to reset alarms.

Table 27 — Input/Output Channels

NO.	I/O POINTS	UNITS	MINIMUM VALUE	MAXIMUM VALUE	INC	COMMENTS
1	C1 Output	—	Off	On	—	Compressor 1
2	C2 Output	—	Off	On	—	Compressor 2
3	C3 Output	—	Off	On	—	Compressor 3/Power Exhaust 2
4	C4 Output	—	Off	On	—	Compressor 4/Power Exhaust 1
5	Economizer Damper Output	%	1 %	100 %	1%	Damper Commanded Position
6	Supply Air Temperature	F	1 F	150 F	1 F	Supply Air Temperature
7	Outdoor Air Temperature	F	1 F	150 F	1 F	Outdoor Air Temperature
8	Return Air Temperature	F	1 F	150 F	1 F	Return Air Temperature
9	Indoor Relative Humidity	%	1%	100%	1%	Return Air Relative Humidity
10	Outdoor Relative Humidity	%	1%	100%	1%	Outdoor Air Relative Humidity
11	Indoor Air Quality	PPM	1 PPM/10	200 PPM/10	10 PPM	Indoor Air Quality (/10)
12	Remote Minimum Position	%	1%	100%	1%	Remote Minimum Pot Position
13	Y1 Status	—	Open	Close	—	Thermostat Y1 Status
14	Y2 Status	—	Open	Close	—	Thermostat Y2 Status
15	G Status	—	Open	Close	—	Indoor Fan Status
16	Occ Status	—	Open	Close	—	Remote Occupied Status

NOTE: The accessibility of these channels will be as follows:
READ MODE — All channels will be accessible for reading.
ADJUST MODE — Only channels 1-5 will be accessible.
MANUAL MODE — Only channels 1-5 will be accessible.

After advancing through all the configuration variables in the Read mode, the controller will then advance through the status of the I/O channels. As in the Read mode, there will be no LEDs on. Push the READ/ADJUST (#1) button and the yellow LED will flash the "I/O Point" number and the green LEDs will flash the "I/O Values" in the same manner described in the Read mode section. See Table 27. At the first I/O point (Compressor 1 Output), the DS2 LED (Yellow) will flash with the number of the I/O channel and the DS1 LED (red) will stop flashing. This will be followed by the I/O channel status. To read the value again, push the READ/ADJUST (#1) button.

To advance to the next channel, push the ADVANCE/MANUAL (#2) button. If the number of the channel or the status value is greater than 4 the controller will count out the increments of 5 at a high flash rate followed by the remaining digits. The channel number will be counted out through the DS2 LED (yellow). The status value will be counted out through the DS3 and DS4 LEDs (green).

If the status value is an analog value then the numeric value will be displayed by using the DS3 green LED to display the tens digit and the DS4 will be used to display the ones digit.

If the channel is a digital output (relay), the DS3 LED (flashing green) will indicate ON status and the DS4 LED (flashing green) will indicate OFF status. If the output is the economizer control signal then the DS3 LED will be used to indicate the motor is being driven open, and the DS4 LED will be used to indicate it is being closed. If the motor is not being commanded in either direction then both the DS3 and DS4 LEDs will be on. The controller will first go through the output relays, then the economizer motor, and will then follow with the values currently being read for the analog input channels as defined in the configuration table. All values are maintained in memory even during a power loss. To exit Setup mode, push and hold the READ/ADJUST (#1) and ADVANCE/MANUAL (#2) buttons for more than 3 seconds. Setup mode will automatically be exited after 10 minutes of no activity.

SETUP MODE — The Setup mode is used to change set points and configuration values.

Enter the Setup mode by pushing and holding the READ/ADJUST (#1) button 1 for at least 3 seconds until all LEDs flash once. Then, the yellow LED will come on steady. A user can only enter the Setup mode from the Run mode (to get to Run mode, press both buttons #1 and #2 for at least 3 seconds).

In Setup mode, all configurations can be modified even while the unit is running, but the user will not be able to adjust the I/O channels. Only channels 1 through 20 on Table 26 will be accessible in the Setup mode. Channel 20 will be used to reset any alarms that may have occurred. As an option, alarms can also be reset by cycling power to the controller.

NOTE: During the Setup mode, all routines including safety routines will continue to run and control the unit.

While in this mode, the DS1 LED (red) will flash to indicate the number of the configuration item. The DS2 LED (yellow) will be on continuously to indicate that the unit is in configuration mode. Use the ADVANCE/MANUAL button to sequence through the setup channels. If the value of the channel is less than 5 it will count out the value of the channel on the DS1 LED at 1-second intervals. If the channel value is 5 or greater, the DS1 LED will first count out the groups of 5 and then following with the remaining digit.

Verify what Setup Point is being read by pushing the READ/ADJUST button (#1). First the Red LED will flash the set point number, then the Green LEDs will flash the value. Then, the green DS3 and DS4 LEDs will each come on steady for about 2 seconds. While DS3 is on steady, its new value can be entered by pushing READ/ADJUST (#1), and entering the value for the ten's digit. When the DS4 comes on steady, enter the value for the one's digit. After the green LEDs are off, push the READ/ADJUST button (#1) again to verify that the correct value has been entered. If the configuration is a discrete On/off setting, push the READ/ADJUST button (#1) to toggle LED 3 or 4 on or off.

Setup Example 1: Change "Occupied Minimum Position" (configuration item 2) to 53%.

1. Read the General Notes about reading and entering values found on the label on the top of the EconoMi$er+.
2. Push and hold button #1 (READ/ADJUST) for at least 3 seconds until all LEDs flash. The yellow LED will go on steady.
3. Read the current configuration point by pushing button #1. The red LED flashes the configuration point number and the green LEDs flash the current setting for that setup point number.
4. On the label (on top of the EconoMi$er+), read Step 2 and Note 1 for Setup mode operation.
5. Use button #2 (ADVANCE/MANUAL) to advance to configuration point number 2, Occupied Min.

NOTE: ***Before*** performing Step 6, be ready to push button #1; there is a limited time window that can easily be missed when the DS3 green LED comes on, and again when the DS4 green LED comes on.

6. Verify the configuration point by pushing button #1. The red LED should flash twice to indicate point 2, and then the green LEDs will flash the current setting.
7. Next, the green DS3 LED will turn on steady for 2 seconds. During this time, push button #1 five times.
8. The DS3 LED will turn off and the green DS4 LED will go on steady for 2 seconds. During this time, push button #1 three times.
9. The 5 button #1 pushes, followed by the 3 button #1 pushes is the sequence that sets the occupied minimum position to 53%.
10. Wait until the green LEDs turn off then verify the setting by pushing button #1 to read the value. There should be 5 fast blinks of DS3 and 3 slow blinks of DS4.

Setup Example 2: Change the Occupied Minimum Position (item 2) to 2% (lowest value).

1. Read the General Notes about reading and entering values found on the label on the top of the EconoMi$er+.
2. Push and hold button #1 (READ/ADJUST) for at least 3 seconds until all LEDs flash. The yellow LED will go on steady.
3. Read the current configuration point by pushing button #1. The red LED flashes the configuration point number and the green LEDs flash the current setting for that setup point number.
4. On the label (on top of the EconoMi$er+), read Step 2 and Note 1 for Setup mode operation.
5. Use button #2 (ADVANCE/MANUAL) to advance to configuration point number 2, Occupied Min.
6. Verify the configuration point by pushing button #1. The red LED should flash twice to indicate point 2, and then the green LEDs will flash the current setting.

NOTE: Since the occupied minimum position MUST be 1 greater than the IAQ minimum position (item 15), the IAQ minimum position must be changed first. (IAQ min has a default value of 5%, which is higher than the 2% value in this example.)

7. Use button #2 (ADVANCE/MANUAL) to get to configuration point 15 (IAQ Minimum Position).

NOTE: ***Before*** performing Step 8, be ready to push button #1; there is a limited time window that can easily be missed when the DS3 green LED comes on, and again when the DS4 green LED comes on.

8. Verify the configuration point by pushing button #1. The red LED should flash 15 times to indicate point 15, then the green LEDs will flash the current setting.
9. Next, the green DS3 LED will turn on steady for 2 seconds. During this time, do NOT do anything so that the position defaults to 0.
10. The DS3 LED will turn off and the green DS4 LED will go on steady for 2 seconds. During this time, push button #1 once to set the point to 1%.
11. Wait until the green LEDs turn off then verify the setting by pushing button #1 to read the value. DS3 should not blink, and DS4 should blink once.
12. Now configure the Occupied Minimum Position to 2%. Use button #2 (ADVANCE/MANUAL) to get to configuration point 2.

NOTE: ***Before*** performing Step 13, be ready to push button #1; there is a limited time window that can easily be missed when the DS3 green LED comes on, and again when the DS4 green LED comes on.

13. Verify the configuration point by pushing button #1. The red LED should flash 2 times to indicate point 2, then the green LEDs will flash the current setting.
14. Next, the green DS3 LED will turn on steady for 2 seconds. During this time, do NOT do anything so that the position goes to 0.
15. The DS3 LED will turn off and the green DS4 LED will go on steady for 2 seconds. During this time, push button #1 twice to set the point to 2%.
16. Wait until the green LEDs turn off then verify the setting by pushing button #1 to read the value. DS3 should not blink, and DS4 should blink twice.

NOTE: Configuration items 2, 15, 11, 12, 18 and 19 (in Table 26) are dependent upon other items. Before attempting to change one of these items, be sure to check the value of the item it depends upon (as described in Example 2 above).

IMPORTANT: During SETUP MODE, changes are allowed when the DS3 LED and DS4 LED are lit for 2 seconds (as described in Example 1 and 2 above). During this time, if button #1 is pushed to change one position and not the other, the value for that one position will change and the other will *default to zero* (unless a dependency prevents the zero). However, if button #1 is *not pushed at all* during the 2 seconds that the green LEDs are lit, the configuration item will not change.

MANUAL MODE — Manual mode is used to control the status of I/O channels for use in troubleshooting. See Table 27.

Enter the Manual mode by holding down the ADVANCE/MANUAL (#2) button for at least 3 seconds until all LEDs flash and then the red LED comes on steady.

NOTE: A user can only enter the Manual mode from the RUN mode, which is entered by pushing buttons #1 and #2 for at least 3 seconds.

All EconoMi$er+ control outputs are turned off. "I/O Inputs" 1-5 can be adjusted even if the unit is in operation.

In manual mode, the yellow DS2 LED flashes once to indicate the I/O channel. See Table 27. If the value is less than 5, the yellow DS2 LED will count out the value using 1-second flashes. If the value is greater than 4, the yellow DS2 LED will count out groups of 5 at a high flash rate and then follow with the additional value at a flash rate of once per second. For example a flash of 1 indicates Compressor Relay Output 1.

Push READ/ADJUST button (#1) to read the value. The yellow LED will flash the I/O Channel number being viewed.

Once the channel number is displayed it will then turn on the appropriate green LED (DS3 or DS4) to indicate the status of the output. For relay outputs if the DS3 LED is on, then the output is on. If DS4 is on, then the output is off. The green DS3 and DS4 LEDs will remain on for about 2 seconds and if during this time the READ/ADJUST (#1) button is pushed, then the output will toggle to the alternate state. To change again, push the READ/ADJUST button and repeat the test or change the status of the output. As an example, for channel 5 (EconoMi$er+ control damper motor) use the READ/ADJUST button to toggle the motor from open to close in %.

At any time, the ADVANCE/MANUAL (#2) button can be used to advance to the next SET I/O. To exit the mode, push and hold the READ/ADJUST and ADVANCE/MANUAL buttons (#1 and #2) for more than 3 seconds.

NOTE: After exiting the Manual mode, the controller will re-initialize and start with all outputs off.

ERROR MODE — The error mode is used to indicate that an error has occurred The error is indicated by LED #1 red and #2 yellow are on steady.

Enter the RUN mode by pushing the READ/ADJUST and ADVANCE/MANUAL buttons (#1 and #2) for at least 3 seconds until all LEDs flash. Next, push and release button #1 to enter the Read mode. Then push button #2 to advance to item 20 ("first most recent error"). Determine the error by reading the value in items 20 to 24 and referring to the Troubleshooting section.

Once the error has been fixed, press buttons #1 and 2 for at least 3 seconds to exit Read mode. All LEDs will flash.

Enter Setup mode by pressing the READ/ADJUST button (#1) for at least 3 seconds. All LEDs will flash. Push the ADVANCE/MANUAL button (#2) to advance to item 20. Push READ/ADJUST to read item 20.

To reset the error code while the green DS4 LED is on, press the READ/ADJUST button (#1) once. In addition to resetting the error mode, this will erase all error codes. Cycling the power will also erase the error code.

**EconoMi$er+ Configuration —** For most applications, the factory setting will be used to control the EconoMi$er+. However, there are 19 different variables that can be used to configure the control for wide range of applications. The factory settings and variables are shown in Table 26.

IMPORTANT: There is no way to reset/restore the factory default configurations; use caution when making changes to any set point or operational variable.

The EconoMi$er+ control accepts an occupied/unoccupied switch input. This input is used to control the occupied and unoccupied minimum ventilation damper position as shown in Table 26 items 2 (ECONOMIN_SP) and 3 (U_ECONOMIN_SP). These values represent the minimum damper position. In addition, the controls allows for different modes of compressor operation in the unoccupied mode. Using item 13 in Table 26 (OCC_MODE), the user can select one of the following unoccupied modes:

- No unoccupied cooling
- Unoccupied free cooling (EconoMi$er+)
- Unoccupied free cooling and mechanical cooling

The EconoMi$er+ will control the cooling operation of the unit based on the demand from the thermostat outputs Y1 and Y2. The EconoMi$er+ will monitor the fan output G, but will not control the fan directly. Note that G must be energized for any cooling to take place. Gas or electric heating will be controlled directly from the thermostat.

When a demand for cooling occurs, the control will check to see if it is in the occupied or unoccupied mode. Depending on the configuration, the control will move the outside air damper to the ventilation position. If the outside air conditions are acceptable, then the control will use the EconoMi$er+ for free cooling. If the supply air temperature does not meet the configurable set point, then the control will turn on additional stages of mechanical cooling. Several compressor sequences can be used depending on the application requirements; these will be covered in the mechanical compressor staging section.

COMPRESSOR CONFIGURATION AND CONTROL — The EconoMi$er+ control can support from 1 to 4 compressor stages. For the 15 to 25 ton units, there will only be 1 or 2 stages of compressor cooling, so the control is factory configured for 2 stages. There is no difference between 1 and 2 stages. The control also provides the option to configure for high sensible or high latent loads, but for units with only two compressors this option does not apply.

Compressors are configured using item 10 (STAGE_TYPE) in Table 26. The control also has the capability of controlling directly to Y1 and Y2 inputs. The control can be configured to control to the leaving air temperature using Y1 and Y2 as a low cool and high cool demand based on the supply air set point and the rate of change of supply air temperature. For low cool the leaving air temperature set point will be SAT_SP+2 F. For high cool the leaving air temperature set point will be the supply air temperature set point (SAT_SP).

To use this option, configure the compressor sequencing variable (STAGE_TYPE) to a value of 3. Configure the supply air temperature set point (SAT_SP) to the desired leaving air temperature.

NOTE: The supply air temperature set point is also the temperature used for EconoMi$er+ control.

The logic will control the operation of the compressors depending on the configuration selected. If free cooling can be used, then the compressors will be integrated with the EconoMi$er+ to provide the lowest cost cooling control. The logic includes time guards on the compressors to provide a minimum of 3 minutes on and 3 minutes off time. The control will also prevent two compressors from starting at the same time. The logic uses the EconoMi$er+ to prevent rapid cycling of the compressors and low air temperatures.

VENTILATION AIR AND FREE COOLING — In order for the EconoMi$er+ to control ventilation air and free cooling, several items must be configured.

EconoMi$er+ Type — First, select the EconoMi$er+ control type that will be used. This is the EconoMi$er+ Type function (ECONO_TYPE) defined by item 5 in Table 26. The choices are:

1. Vent only — This is used to have just ventilation control. The EconoMi$er+ will not provide free cooling, but the occupied and unoccupied minimum positions can be used.
2. Proportional — In this configuration, full proportional EconoMi$er+ control will be used. When EconoMi$er+ free cooling cannot be used, the dampers will be set to the appropriate occupied and unoccupied minimum positions.
3. Three-Position — This mode of EconoMi$er+ is used to provide a minimum ventilation EconoMi$er+ position and a fixed free cooling or high ventilation position. The high ventilation position is controlled by the optional Remote EconoMi$er+ Enable Switch Input connected to terminals 11 and 12 on T3.

Supply Air Temperature Set Point — Once the type of EconoMi$er+ control has been selected, the user will need to set the Supply Air Temperature set point (SAT_SP). The SAT_SP has a range of 40 to 65 F.

NOTE: This will be the set point when both Y1 and Y2 are closed. When just Y1 is closed, the set point will be 2 F higher.

Minimum Damper Position — Set the occupied minimum damper position (ECONOMIN_SP) and unoccupied minimum position (U_ECONOMIN_SP). These should be set to provide the ventilation requirements at full occupancy as defined by the building specifications. When demand ventilation is used, the control will close the dampers below this position based on measured CO_2 levels in the space to provide additional operation savings.

The control will also allow for the use of a remote minimum position potentiometer. This will only adjust the Occupied Minimum position. If used, the software set point ECONOMIN_SP should be set to 0 as the control will use the largest set point.

The damper position is not linear with the amount of outside air, so the user will need to set the position of the EconoMi$er+ accordingly. It is best to use the following equation and measured data to set the position:

$$OA = \frac{SAT - RAT}{OAT - RAT} * 100$$

OA = % outdoor air

SAT = supply-air temperature

RAT = return-air temperature

OAT = outdoor-air temperature

The SAT and OAT values can be read from the control and, if the unit is equipped with an RAT sensor, then all three values can be read. For the calculation to work properly, there should be at least a 10° F difference between the OAT and RAT temperatures.

Maximum Damper Position — Set the maximum EconoMi$er+ position. Normally this is set at 100%. If using 3-position control or there is a reason not to use 100% outside air, this can be set using the EconoMi$er+ Maximum Position (MAX_POS_SP).

Compressor Lockout Temperature — Set the Compressor Lockout Temperature. The Compressor Lockout Temperature (CMP_LOCK) is used to prevent compressor from running at low ambient conditions when an EconoMi$er+ can easily satisfy the load.

EconoMi$er+ Changeover Control — Determine the type of EconoMi$er+ changeover control which will be used to enable and disable free cooling. This is done using the EconoMi$er+ Changeover Type.

1. Switch — This changeover setting is used when a remote signal from an energy management system will enable and disable the EconoMi$er+. This is done through a remote EconoMi$er+ enable switch.
2. Outdoor Dry Bulb — For this changeover setting, the EconoMi$er+ will be enabled based on the outdoor-air temperature. The EconoMi$er+ is shipped with an outdoor-air temperature sensor. The outdoor-air temperature set point can be configured by the user. The EconoMi$er+ will be disabled when the outdoor-air temperature rises above the set point. The configuration variable is the EconoMi$er+ Changeover set point (OAT_SP).

3. Differential Dry Bulb — For this changeover setting, the EconoMi$er+ will be enabled whenever the outside-air temperature is lower than the return-air temperature. No configuration of set points is required other than to select the differential dry bulb function.
4. Outdoor Enthalpy — For this changeover setting, the control will enable the EconoMi$er+ based on the outside-air enthalpy curves as shown in Fig. 36. Using the EconoMi$er+ Changeover set point (ENTHALPY_SP), select curves A, B, C or D. The control will then use the EconoMi$er+ at conditions below the curve. The control uses the OAT and optional humidity sensor to calculate the enthalpy and also has the A, B, C, and D curves stored in memory.
5. Differential Enthalpy — For this changeover setting, the EconoMi$er+ will be enabled based on the comparison of the enthalpy of the return air and outside air. If the outside air enthalpy is lower than the return air, then the EconoMi$er+ will be enabled. To use this option, an accessory outside air humidity sensor, a return air dry bulb sensor and a return air humidity sensor must be ordered and installed. No configuration of set points is required other than to select the function.

DEMAND VENTILATION CONFIGURATION — The EconoMi$er+ control has demand ventilation control capability when using an IAQ sensor. The indoor air quality (IAQ) is measured using a CO_2 sensor. The IAQ sensor can be field-installed in the return duct or the occupied space.

The EconoMi$er+ control algorithm modulates the position of the EconoMi$er+ damper between two user configurations depending upon the relationship between the IAQ and the Outdoor Air Quality (OAQ). The lower of these two positions is referred to as the Minimum IAQ Minimum EconoMi$er+ Position (IAQMIN_SP).

The higher position is referred to as the Occupied EconoMi$er+ Minimum Position (ECONOMIN_SP). The IAQMIN_SP should be set to an EconoMi$er+ position that brings in enough fresh air to remove contaminants and CO_2 generated by sources other than people. The ECONOMIN_SP should be set to an EconoMi$er+ position that brings in enough fresh air to remove contaminants and CO_2 generated by all sources including people at the design value for maximum occupancy.

A reference differential CO_2 level above the outside CO_2 level is used as the starting point for IAQ control and another reference differential level for maximum ventilation at design occupancy is used for the end of IAQ control. Between these points the control will modulate the dampers open from the IAQMIN_SP and the ECONOMIN_SP setpoints. The damper position will never go above ECONOMIN_SP or below IAQMIN_SP.

The control does not measure the outdoor IAQ reference level as these levels are relatively constant. The installer should take a measurement at start-up of the unit and enter this value into the control using the Outdoor Air IAQ reference level configuration.

The control is configured for air quality sensors which provide 4 mA at 0 ppm and 20 mA at 2000 ppm. If a sensor has a different range, these bounds must be reconfigured.

To configure the control for an IAQ sensor perform the following steps:

1. Determine the Occupied EconoMi$er+ Minimum position (ECONOMIN_SP) and enter it into the control.
2. Determine the IAQ minimum EconoMi$er+ position (IAQMIN_SP) and enter it into the control.
3. Enable IAQ control using IAQ Enable (IAQ_FLG).
4. Determine the Outdoor Air IAQ Reference (OAQ) and enter it into the control.

   NOTE: The value entered into the control will be the CO_2 ppm level divided by 10. For example, 400 ppm would be entered as 40.
5. Determine the lower control point differential level (DAQLO) and enter it into the control. This is a differential level so if the desired level to start IAQ control is 500 ppm and the OAQ reference level is 400 then a value of 100 would be used.

   NOTE: The value entered into the control will be the CO_2 ppm level divided by 10. For example 100 ppm would be entered as 10.
6. Determine the upper control point differential level (DAQHI) and enter it into the control. This is a differential level so if the desired level to start IAQ control is 1100 ppm and the OAQ reference level is 400 then a value of 700 would be used.

   NOTE: The value entered into the control will be the CO_2 ppm level divided by 10. For example 700 ppm would be entered as 70.

POWER EXHAUST CONFIGURATION — The EconoMi$er+ can control up to 2 stages of power exhaust. Power exhaust activation is done through configurable damper position set points. The first stage of power is controlled by relay C4 on the EconoMi$er+ board. The activation point for the first stage is set using the Power Exhaust Stage 1 Activation set point (PE_SP1). The second stage of power exhaust must be set at a value greater than the first stage. It is configured using the Power Exhaust Stage 2 Activation set point (PE_SP2).

Operating Sequence

COOLING, UNITS WITHOUT ECONOMIZER — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor-fan contactor (IFC) and compressor contactor no. 1 (C1) are energized and indoor-fan motor, compressor no. 1, and outdoor fans start. The outdoor fan motor runs 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 ECONOMIZER

NOTE: The 48TJ016-028 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.

COOLING, UNITS WITH ECONOMI$ER+ — For EconoMi$er+ operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position.

When the EconoMi$er+ control is the occupied mode and a call for cooling exists (Y1 on the thermostat), the control will first check for indoor fan operation. If the fan is not on, then cooling will not be activated. If the fan is on, then the control will open the EconoMi$er+ damper to the minimum position.

On the initial power to the EconoMi$er+ board, it will take the damper up to $2^1/_2$ minutes before it begins to position itself. With subsequent fan signal (G) to the board, the change in damper position will take up to 30 seconds to initiate. Damper movement from full closed to full open (or vice versa) will take $2^1/_2$ minutes.

If the damper is in the process of a change (for example going to 100% open) and the signal (G) is turned off, the damper will continue to open to 100% before it closes (due to no fan signal [G]).

If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to main the supply air temperature set point plus 2° F.

If there is a further demand for cooling (cooling second stage — Y2 is energized), then the control set point for the leaving air will be set at the supply air set point to increase the cooling capacity. If this cannot satisfy the load then the control will bring on compressor stages as needed to maintain the supply air temperature set point. The EconoMi$er+ damper will be locked open at 100% or the maximum damper position set point.

To ensure that there is oil return, the compressors will operate for at least 3 minutes. If, during this period, the leaving temperature drops below the set point by 5° F, then the EconoMi$er+ dampers will be closed to 60% until the compressor is turned off to avoid cold leaving air temperatures.

If the conditions are not suitable for free cooling then the EconoMi$er+ dampers will be closed to the minimum ventilation position.

Compressor stages will be used to cool the air. If the control is configured for direct control by Y1 and Y2, then the stages will sequence based on the demand of Y1 and Y2. If the control is configured for leaving air temperature control, then Y1 will maintain the leaving air temperature at the supply air set point plus 2° F. If Y1 and Y2 are closed, then the leaving air will be controlled to the supply air set point. If Y2 is closed and Y1 is open, then control will shut down and indicate an error due to a thermostat failure or improper wiring of the thermostat.

If the unit is in the unoccupied mode, then the control of the temperature will depend on the unoccupied free cooling configuration: no unoccupied cooling, unoccupied free cooling with any mechanical cooling, or unoccupied free and mechanical cooling. If free cooling is enabled, then the control will check if free cooling can be used. The EconoMi$er+ will then control to the leaving air temperature set point plus 2° F for a Y1 command, or the leaving air temperature set point for a Y1 and Y2 command. If mechanical cooling is allowed to be used, then the control will then bring on additional stages of mechanical cooling if free cooling cannot satisfy the load.

If the EconoMi$er+ control:

- is in the occupied mode
- is configured to use demand ventilation
- cannot use free cooling
- has return air or space CO_2 levels below the DAQLO limit,

then the EconoMi$er+ damper position will be set to the IAQMIN_SP set point. If the CO_2 level rises above the DAQLO limit, then the dampers will modulate open in a linear relationship until the return air or space CO_2 levels are at or above the DAQHIGH limit. The damper position will be at the ECONOMIN_SP set point.

When the EconoMi$er+ is being used for free cooling and the position exceeds the power exhaust set point, then the control will turn on the appropriate power exhaust fans.

Unoccupied and Occupied Minimum Position Control — There is an unoccupied minimum damper position and an occupied minimum damper position on the EconoMi$er+ controller. When the HVAC fan is off the outside air damper will always be closed. When the fan is on and in the unoccupied mode, the outside air damper will be at the unoccupied minimum position. When the fan is on (G call) and in the occupied mode, the outside air damper will be at the occupied minimum position.

A jumper wire is factory-installed to force the unit into occupied configuration whenever G or Y1 are closed. Without the jumper wire, the unit will always be in unoccupied mode.

The 2 minimum position settings are also used in the IAQ sequence of operation. See Indoor Air Quality Sensor on page 22.

NOTE: The minimum position signal takes priority over the maximum position signal. If the maximum damper position is set below the minimum damper position, the EconoMi$er+ controller will maintain the actuator at minimum position.

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

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

Calculate the appropriate supply-air temperature using the following formula: (TO x OA) + (TR x RA) = TM

TO = Outdoor-Air Temperature

OA = Percent of Outdoor Air

TR = Return-Air Temperature

RA = Percent of Return Air

TM = Supply-Air Temperature

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

(60 x 0.10) + (75 x 0.90) = 73.5 F

Carefully adjust the unoccupied minimum position until the measured supply-air temperature matches the calculated value. Then, carefully adjust the occupied minimum position set point on the controller until the desired position is reached.

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

COOLING, UNITS WITH ECONOMI$ER2, PREMIERLINK™ CONTROL AND A THERMOSTAT — When free cooling is not available, the compressors will be controlled by the PremierLink control in response to the Y1 and Y2 inputs from the thermostat.

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

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

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

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

The 3 routines are based on OAT where:

SASP = Supply Air Set Point

DXCTLO = Direct Expansion Cooling Lockout Set Point

PID = Proportional Integral

Routine 1 (OAT < DXCTLO)

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

Routine 2 (DXCTLO < OAT < 68 F)

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

Routine 3 (OAT > 68)

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

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

If field-installed accessory CO_2 sensors are connected to the PremierLink™ control, a PID-controlled demand ventilation strategy will begin to operate. As the CO_2 level in the zone increases above the CO_2 set point, the minimum position of the damper will be increased proportionally. As the CO_2 level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed.

HEATING, UNITS WITH ECONOMI$ER2, PREMIERLINK CONTROL AND A THERMOSTAT — When the thermostat calls for heating, terminal W1 is energized. The PremierLink control will move the economizer damper to the minimum position if there is a call for G and closed if there is a call for W1 without G. In order to prevent thermostat from short cycling, the unit is locked into the heating mode for at least 10 minutes when W1 is energized. The induced-draft motor is then energized and the burner ignition sequence begins.

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

COOLING, UNITS WITH ECONOMI$ER2, PREMIERLINK CONTROL AND A ROOM SENSOR — When free cooling is not available, the compressors will be controlled by the PremierLink controller using a PID Error reduction calculation as indicated by Fig. 46.

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

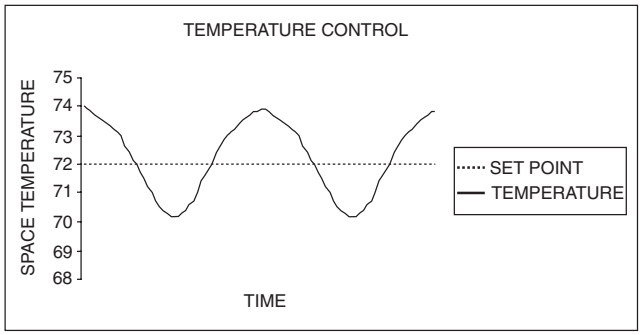
- Indoor fan has been on for at least 30 seconds.
- The SPT, SAT, and OAT inputs must have valid readings.
- OAT must be less than 75 F.
- OAT must be less than SPT.
- Enthalpy must be LOW (may be jumpered if and enthalpy sensor is not available).
- Economizer position is NOT forced.

When free cooling is available, the outdoor-air damper is positioned through the use of a Proportional Integral (PID) control process to provide a calculated supply-air temperature into the zone. The supply air will maintain the space temperature between the heating and cooling set points as indicated in Fig. 47.

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

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

The high space set point is used for DX (direct expansion) cooling control, while the economizer space set point is a calculated value between the heating and cooling set points. The economizer set point will always be at least one degree below the cooling set point, allowing for a smooth transition from mechanical cooling with economizer assist, back to economizer cooling as the cooling set point is achieved. The compressors may be used for initial cooling then the PremierLink controller will modulate the economizer using an error reduction calculation to hold the space temperature between the heating and cooling set points. See Fig. 47.



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

Fig. 46 — DX Cooling Temperature Control Example

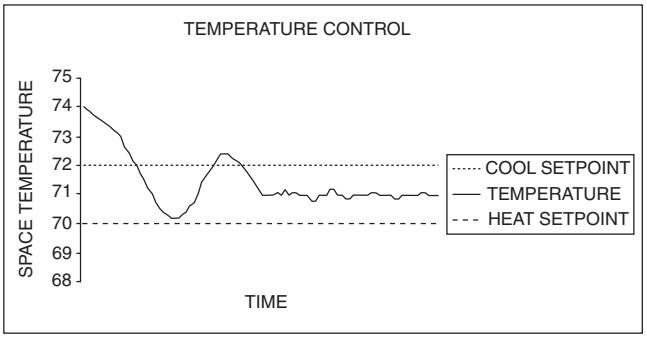


Fig. 47 — Economizer Temperature Control Example

The controller uses the following conditions to determine economizer cooling:

- Enthalpy is Low
- SAT reading is available
- OAT reading is available
- SPT reading is available
- OAT ≤ SPT
- Economizer Position is NOT forced

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

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

If field-installed accessory CO_2 sensors are connected to the PremierLink control, a PID-controlled demand ventilation strategy will begin to operate. As the CO_2 level in the zone increases above the CO_2 set point, the minimum position of the damper will be increased proportionally. As the CO_2 level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed.

HEATING, UNIT WITH ECONOMI$ER2, PREMIERLINK CONTROL AND A ROOM SENSOR — Every 40 seconds the controller will calculate the required heat stages (maximum of 3) to maintain Supply Air Temperature (SAT) if the following qualifying conditions are met:

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

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

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

Staging should be as follows:

If Heating PID STAGES=2

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

If Heating PID STAGES=3 and AUXOUT = HS3

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

In order to prevent short cycling, the unit is locked into the Heating mode for at least 10 minutes when HS1 is deenergized. When HS1 is energized the induced-draft motor is then energized and the burner ignition sequence begins. On units equipped for two stages of heat, when additional heat is needed, HS2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the space condition is satisfied and HS1 is deenergized the IFM stops after a 45-second time-off delay unless in the occupied mode. The fan will run continuously in the occupied mode as required by national energy and fresh air standards.

SERVICE

⚠ WARNING

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

Cleaning — Inspect unit interior at beginning of each heating and cooling season and as operating conditions require (see Fig. 48). Remove unit top panel and/or side panels for access to unit interior.

EVAPORATOR COIL — Clean as required with commercial coil cleaner.

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

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

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

OUTDOOR-AIR INLET SCREENS — Clean screens with steam or hot water and a mild detergent. Do not use throwaway filters in place of screens. See Table 1 for quantity and size.

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 51.

FLUE GAS PASSAGEWAYS — The flue collector box and heat exchanger cells may be inspected by removing heat exchanger access panel (see Fig. 4 and 5), flue box cover, and main burner assembly. Refer to Main Burners section on page 51 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. 49.

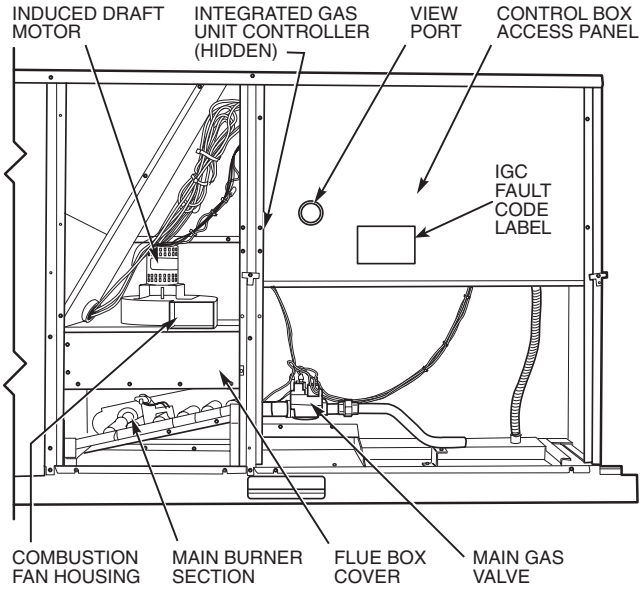
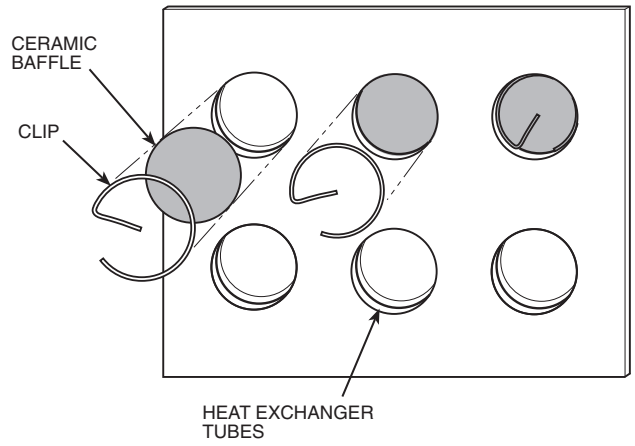


Fig. 48 — Typical Gas Heating Section



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

Fig. 49 — Removing Heat Exchanger Ceramic Baffles and Clips

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. 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.

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 — For size 016 units, bearings are permanently lubricated. No field lubrication is required. For size 020-028 units, 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-fan and evaporator-fan motors have permanently-sealed bearings, so no field lubrication is necessary.

Evaporator Fan Performance Adjustment (Fig. 50-52) — Fan motor pulleys are factory set for speed shown in Table 1.

To change fan speeds:

1. Shut off unit power supply.
2. a. Size 016 Only: Loosen belt by loosening carriage nuts holding motor mount assembly to fan scroll side plates (A and B).

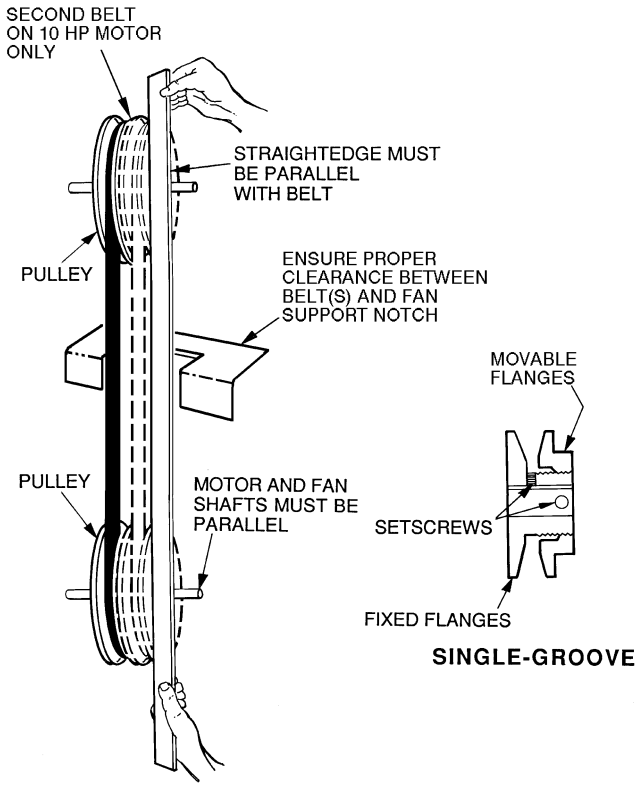


Fig. 50 — Evaporator-Fan Pulley and Adjustment

b. Size 020-028 Only: 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. 50).
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 17 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 50.

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.

Evaporator Fan Service and Replacement

48TJ016 UNITS (See Fig. 51)

NOTE: To remove belts only, follow Steps 1-6.

1. Remove filter and supply-air section panels.
2. Remove unit top panel.
3. Loosen carriage nuts A and B holding motor mount assembly to fan scroll side plates.
4. Loosen screw C.
5. Rotate motor mount assembly (with motor attached) as far as possible away from evaporator coil.
6. Remove belt.
7. Rotate motor mount assembly back past original position toward evaporator coil.
8. Remove motor mounting nuts D and E (both sides).
9. Lift motor up through top of unit.
10. Reverse above procedure to reinstall motor.
11. Check and adjust belt tension as necessary.

48TJ020-028 UNITS (See Fig. 52) — The 48TJ020-028 units use a fan motor mounting system that features a slide-out motor mounting plate. 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.

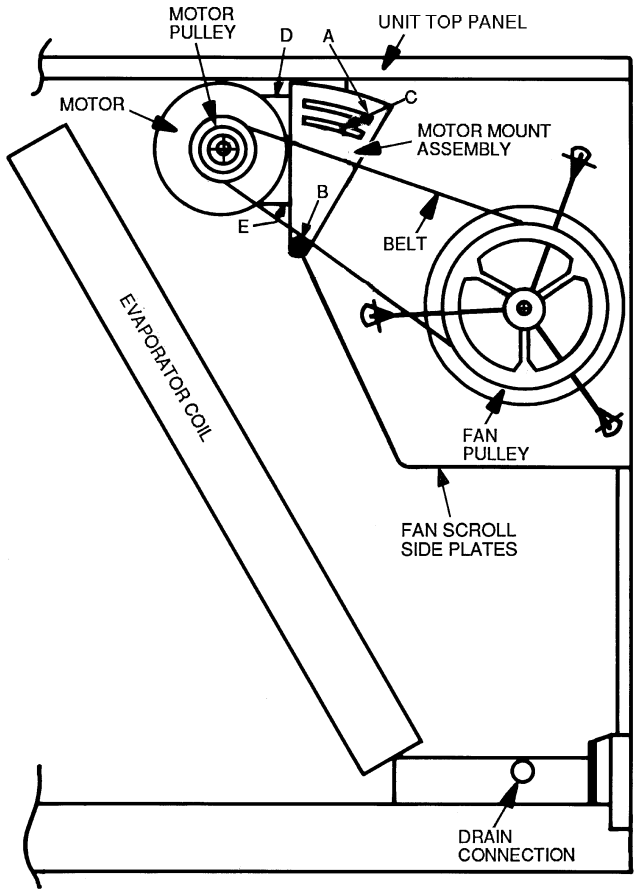
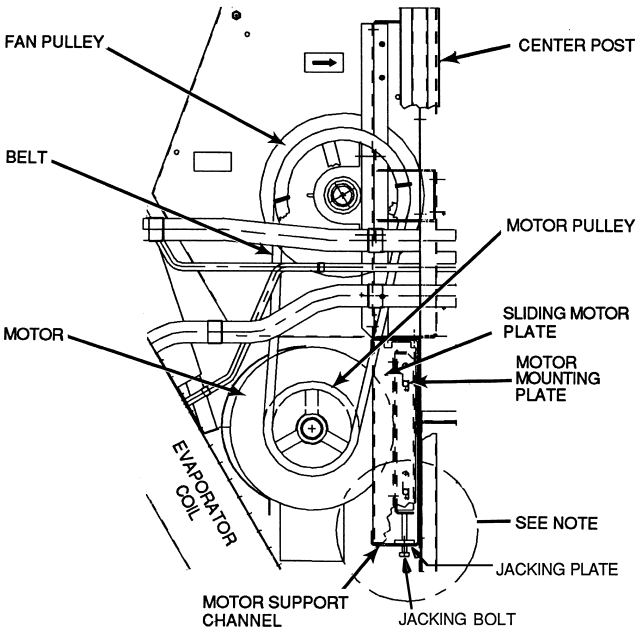


Fig. 51 — 48TJ016 Evaporator-Fan Motor Adjustment



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. 52 — 48TJ020-028 Evaporator-Fan Motor Section

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. a Size 016 Units:

   Move motor mounting plate up or down for proper belt tension ($^1/_2$ in. deflection with one finger).

   b. Size 020-028 Units:

   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

48TJ016,020 UNITS (Fig. 53)

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.

48TJ024,028 UNITS (Fig. 54)

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.

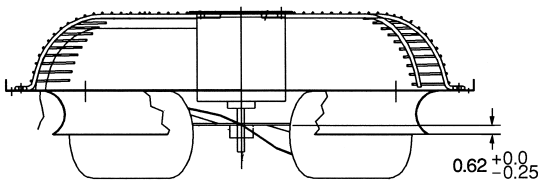
Power Failure — Dampers have a spring return. In event of power failure, dampers will return to fully closed position until power is restored. *Do not manually operate economizer motor.*

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.

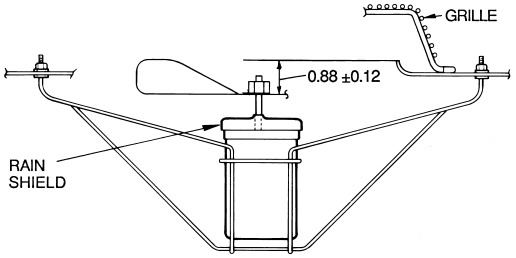
NO CHARGE — Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to Table 1).

LOW CHARGE COOLING — Using cooling charging chart (see Fig. 55), 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 sub-cooling. 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.



NOTE: Dimensions are in inches.

Fig. 53 — Condenser Fan Adjustment, 48TJ016,020



NOTE: Dimensions are in inches.

Fig. 54 — Condenser-Fan Adjustment, 48TJ024,028

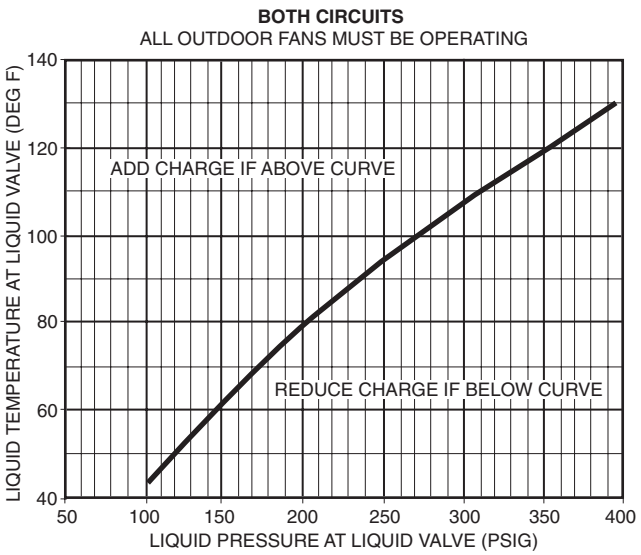


Fig. 55 — Cooling Charging Chart

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.

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. 56).
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 (see Fig. 4 and 5).
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. 57.
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, except the circuit no. 1 on the 48TJ028 units. Compressor no. 1 on the 48TJ028 unit uses an electronic module, located with the compressor junction box, to provide motor protection. This electronic module monitors winding and discharge temperatures. If these temperatures reach the trip values, the module interrupts the control line and causes the compressor to switch off.

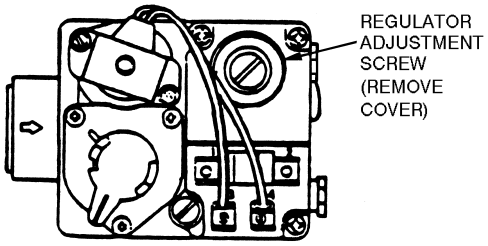


Fig. 56 — Gas Valve

Crankcase Heater — Only the 48TJ028 unit and units with optional MoistureMiser Dehumidification System 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-PRESSURE 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. 58 and 59 for typical wiring diagram and component arrangement.

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

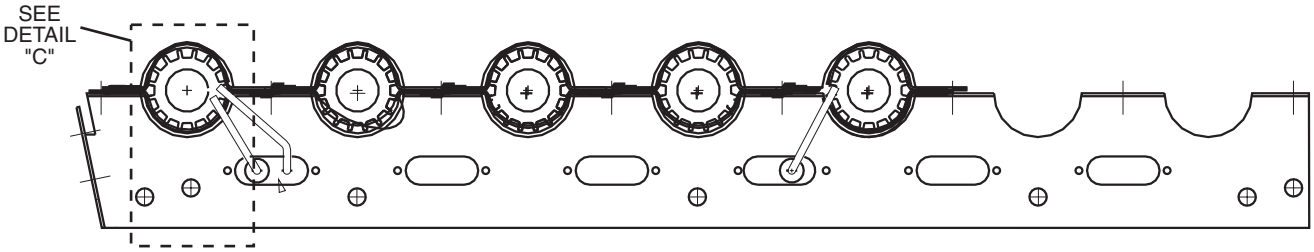
Diagnostic IGC Control LEDs — The IGC board has LEDs for diagnostic purposes. Refer to Troubleshooting section on page 55.

**EconoMi$er+ LEDs —** The EconoMi$er+ control module has LEDs for diagnostic purposes. See Appendix A.

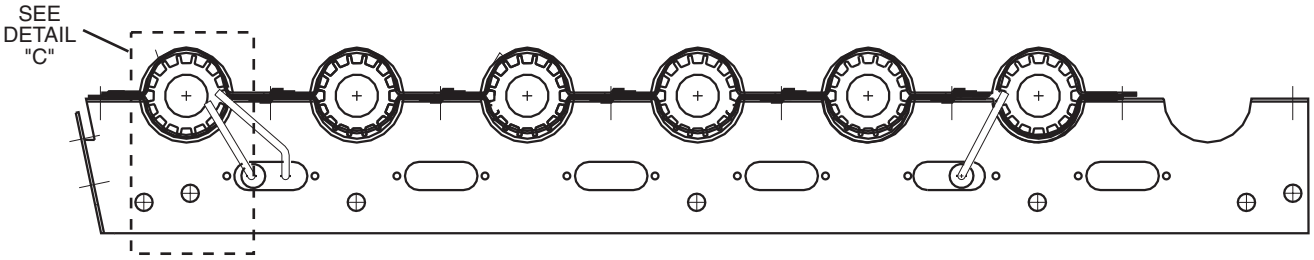
Optional Hinged Access Doors — When the optional service package is ordered or the if the hinged access doors option is ordered, the unit will be provided with external and internal hinged access doors to facilitate service.

Four external hinged access doors are provided. 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 for access to the compressor compartment.

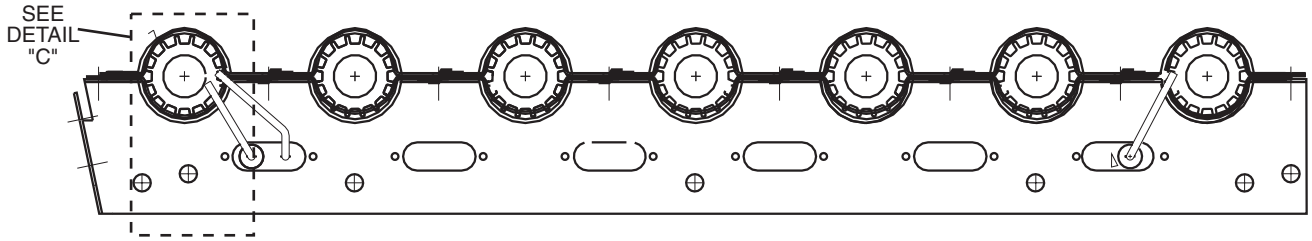
Two internal access doors are provided inside the filter/drive access door. The filter access door (on the left) is secured by 2 small 1/4 turn latches with folding bail-type handles. This door must be opened prior to opening the drive access door. The drive access door is shipped with 2 sheet metal 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.



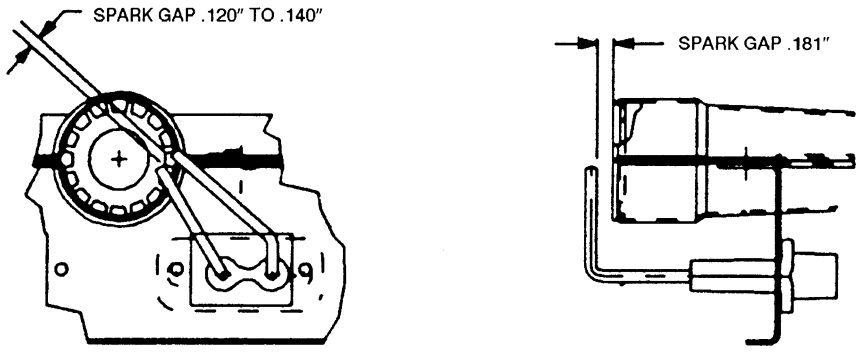
48TJD016



48TJD020-028 AND 48TJF016



48TJF020-028



DETAIL "C"

Fig. 57 — Spark Gap Adjustment

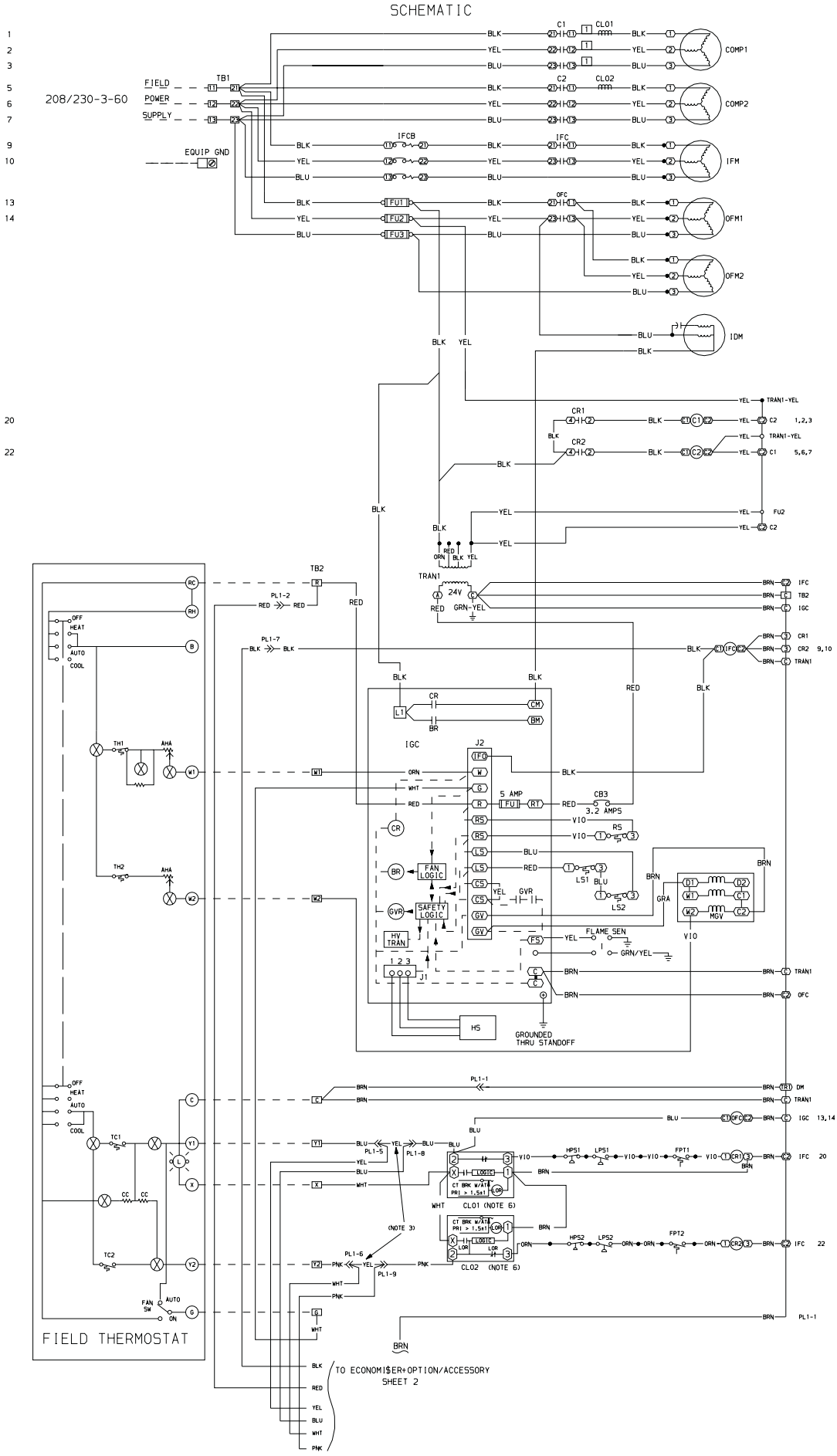


Fig. 58 — Typical Wiring Schematic (48TJ024, 208/230-v Shown)

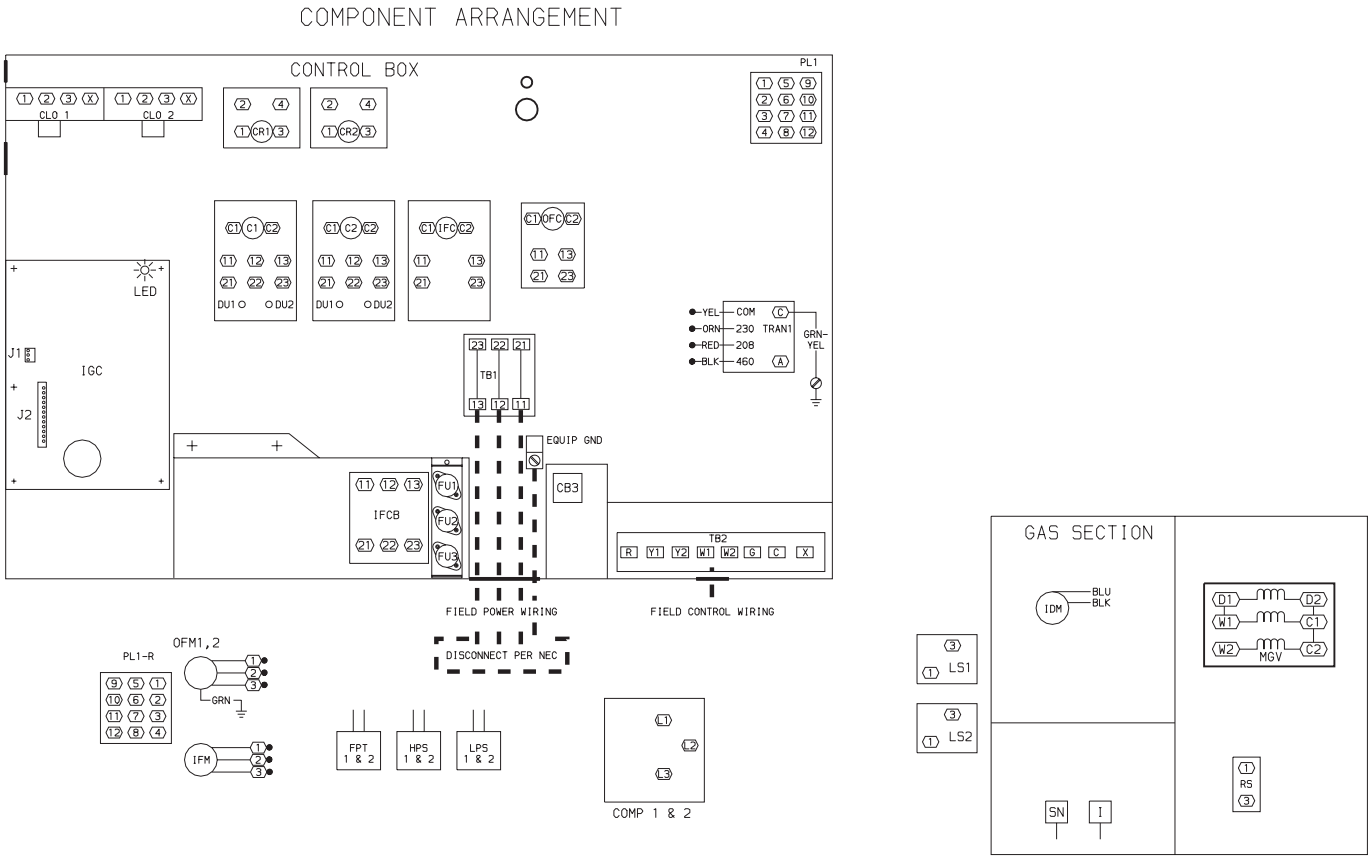


Fig. 59 — Typical Component Arrangement (48TJ024 Shown)

LEGEND AND NOTES

Fig. 58 — Typical Wiring Schematic and Fig. 59 — 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
DM — Damper Motor
DU — Dummy Terminal
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
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

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

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 economizer.
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.

TROUBLESHOOTING

**EconoMi$er+ Troubleshooting —** The EconoMi$er+ control has built-in diagnostics. The control can detect and display 10 different diagnostic codes as shown in Table 28. The user can also use the integrated display to check the status of all the inputs and outputs and run the manual control mode to check the operation of the EconoMi$er+ and compressors.

Table 28 — EconoMi$er+ Error Codes

NO.	DESCRIPTION	CRITERIA
1	SAT Sensor Failure	Temperature <–40 F or Greater Than 250 F
2	RAT Sensor Failure	Temperature <–40 F or Greater Than 250 F
3	OAT Sensor Failure	Temperature <–40 F or Greater Than 250 F
4	ORH Sensor Failure	Read Less Than 2 mA or Greater Than 22 mA
5	IRH Sensor Failure	Read Less Than 2 mA or Greater Than 22 mA
6	IAQ Sensor Failure	Read Less Than 2 mA or Greater Than 22 mA
7	Y2 On Y1 Off	Wiring Error
8	Micro Fails E2 Tests	Hardware/Software Check
*	Micro Fails RAM Test	Hardware/Software Check
†	Micro Fails ROM Tests	Hardware/Software Check

LEGEND

IAQ — Indoor Air Quality
IRH — Indoor Relative Humidity
OAT — Outdoor Air Temperature
ORH — Outdoor Relative Humidity
RAT — Return Air Temperature
SAT — Supply Air Temperature

*If there is a RAM failure DS1+DS3/DS2+DS4 will alternately flash.
†If there is a ROM failure DS1+DS2/DS3+DS4 will alternately flash.

ERROR CODE 1 — SAT SENSOR FAILURE

Error Criteria — An SAT Sensor Failure error will occur if the sensor is shorted or faulty. If the measured temperature reads below –40 F or above 250 F an error will occur.

Required Action — If an error occurs, then the control will default to Mode 2 compressor stage control where Y1 and Y2 have direct control of the compressors. Use of free cooling is disabled and the EconoMi$er+ will be set to the minimum damper position for either the occupied or unoccupied mode of operation. Replace sensor if faulty.

Reset Method — The error will automatically reset after the value has returned to a normal level. The alarm has to be cleared from the display in the Setup mode or a power reset.

ERROR CODE 2 — RAT SENSOR FAILURE

Error Criteria — The RAT Sensor failure error is only applicable the unit has been configured for EconoMi$er+ changeover methods 3 (differential dry bulb) or 5 (differential humidity). For other modes it should be ignored. If the sensor is shorted or faulty, then the measured temperature will be below –40 F or above 250 F and the error will occur.

Required Action — If this error occurs, then change the default EconoMi$er+ changeover control to method 2 (dry bulb changeover control) or replace sensor.

Reset Method — This error will automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode.

ERROR CODE 3 — OAT SENSOR FAILURE

Error Criteria — An OAT Sensor Failure error occurs if the sensor is shorted or faulty, then the measured temperature will be below –40 F or above 250 F.

Required Action — If this error occurs disable the economizer and set the economizer to the minimum economizer position.

Reset Method — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

ERROR CODE 4 — ORH (Outdoor Relative Humidity) SENSOR FAILURE

Error Criteria — If the unit is configured for economizer changeover type 3 or 4, and the input signal is less than 2 mA or greater than 22 mA, then the sensor is faulty and an error will occur.

Required Action — If this error occurs, switch the EconoMi$er+ to dry bulb changeover control.

Reset Method — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

ERROR CODE 5 — IRH (Indoor Relative Humidity) SENSOR FAILURE

Error Criteria — This error occurs if the unit is configured for EconoMi$er+ changeover type 5 and the input signal is less than 2 mA or greater than 22 mA (faulty sensor).

Required Action — If this error occurs, switch the EconoMi$er+ to differential dry bulb changeover control.

Reset Method — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

ERROR CODE 6 — IAQ SENSOR FAILURE

Error Criteria — This error occurs if the unit is configured for IAQ demand ventilation control and the input signal is less than 2 mA or greater than 22 mA (faulty sensor).

Required Action — If this error occurs, disable the IAQ control routine and default to the standard EconoMi$er+ minimum position.

Reset Method — This error should automatically reset after the value has returned to a normal level. The alarm will have to be cleared from the display in the Setup mode or by a power reset.

ERROR CODE 7 — Y2 ON WITH Y1 OFF

Error Criteria — This error occurs if Y2 is turned on and Y1 is off. This indicates that there is a wiring error at the thermostat connections. This alarm should be ignored for the first 20 seconds of operation so that it does not conflict with the special production test mode.

Required Action — Shut the unit off and check wiring.

Reset Method — This error must be manually reset and requires a power reset.

ERROR CODE 8 — E2 TEST FAILURE

Error Criteria — This error occurs if internal hardware detects an E2 failure.

Required Action — Shut the unit off.

Reset Method — This error must be manually reset and requires a power reset.

ERROR MODE — When an error occurs, the red and yellow LEDs both come on steady. To determine the error, follow these steps:

1. Enter the Run mode by pushing buttons #1 and #2 for at least 3 seconds until all LEDs flash.
2. Press and release the #1 button to enter the READ mode.
3. Push the ADVANCE/MANUAL (#2) button to advance to item number 20, "1st Most Recent Error." Determine the error(s) by reading the values in items 20-24 and referring to the error codes described above.
4. Fix the error(s).
5. Press buttons 1 and 2 to exit read mode. Enter SETUP mode by pressing button #1 for at least 3 seconds until all the LEDs flash.
6. Push button #2 to advance to item number 20.

7. To reset the error code while the green DS4 LEDS is ON, press the READ/ADJUST (#1) button once. This resets the error mode and erases all repaired error codes.

   NOTE: Cycling power to the board will also erase the repaired error codes.

RAM TEST FAILURE

Error Criteria — If internal hardware detects a RAM failure, this alarm will be displayed by alternately flashing DS1+DS3 and DS2+DS4.

Required Action — Shut the unit off.

Reset Method — This error must be manually reset and requires a power reset.

ROM TEST FAILURE

Error Criteria — If internal hardware detects a ROM failure, the alarm is displayed by alternately flashing DS1+DS2 and DS3+DS4.

Required Action — Shut the unit off.

Reset Method — This error must be manually reset and requires a power reset.

UNIT ALWAYS IN UNOCCUPIED MODE — A jumper wire is factory-installed to force the unit into occupied configuration whenever G or Y1 are closed. Without the jumper wire, the unit will always be in unoccupied mode. Check the wire. An occupied/unoccupied switch may be installed in place of the jumper. Check the wiring and setting of the switch.

Unit Troubleshooting — Refer to Tables 29-31 and Fig. 60.

Table 29 — 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 30 — Heating Service Analysis

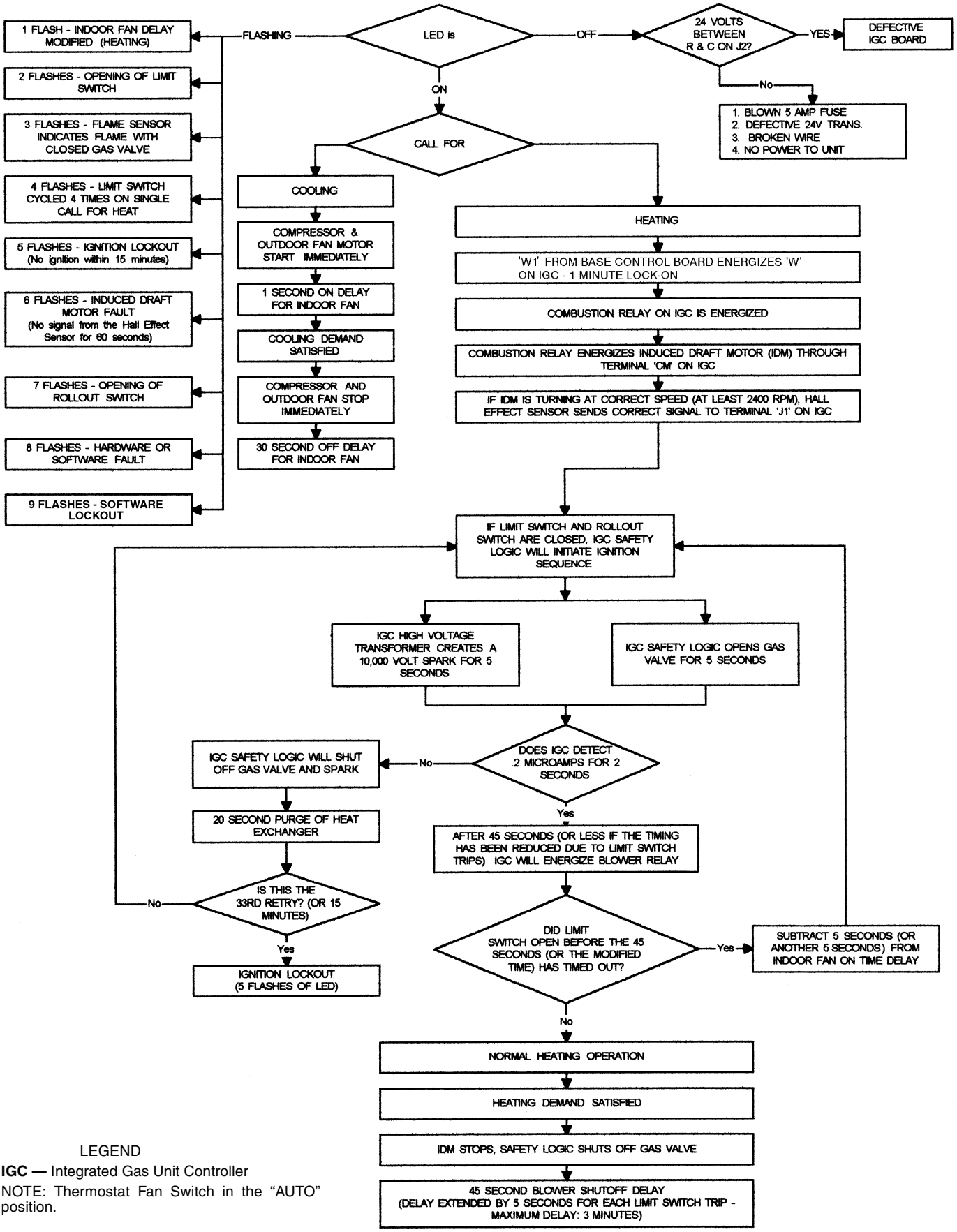
PROBLEM	CAUSE	REMEDY
Burners Will Not Ignite.	Misaligned spark electrodes.	Check flame ignition and sensor electrode positioning. Adjust as needed.
	No gas at main burners.	Check gas line for air; purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before 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 31 — 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.



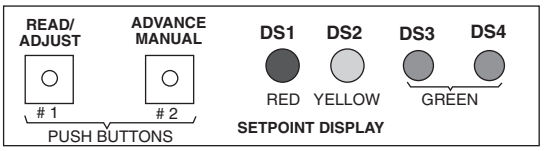
LEGEND

IGC — Integrated Gas Unit Controller

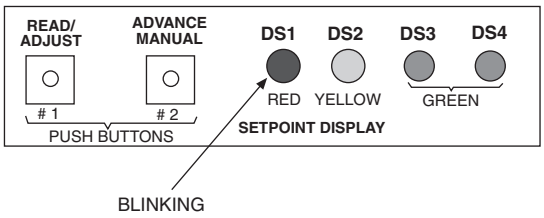
NOTE: Thermostat Fan Switch in the "AUTO" position.

Fig. 60 — IGC Control (Heating and Cooling)

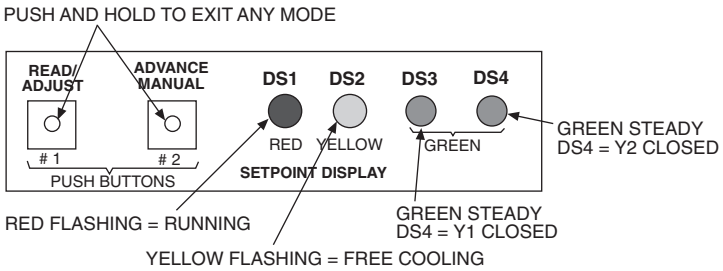
APPENDIX A — ECONOMI$ER+ LEDs



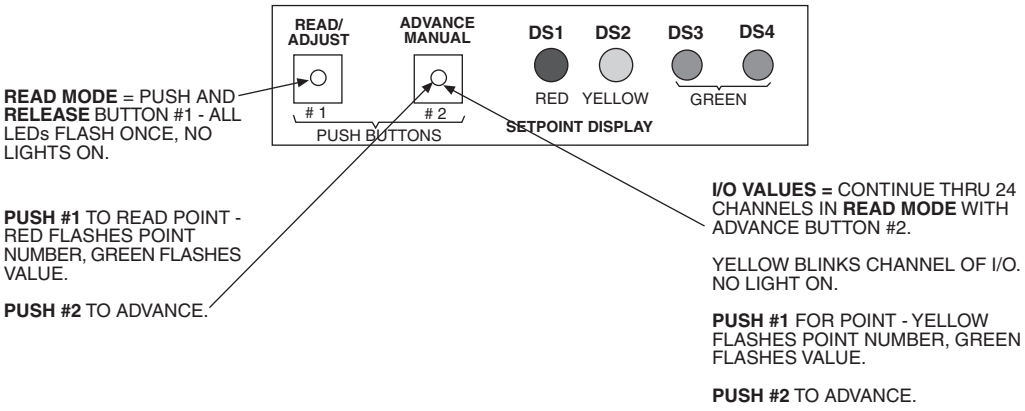
Start-Up — 4 lights blink sequentially



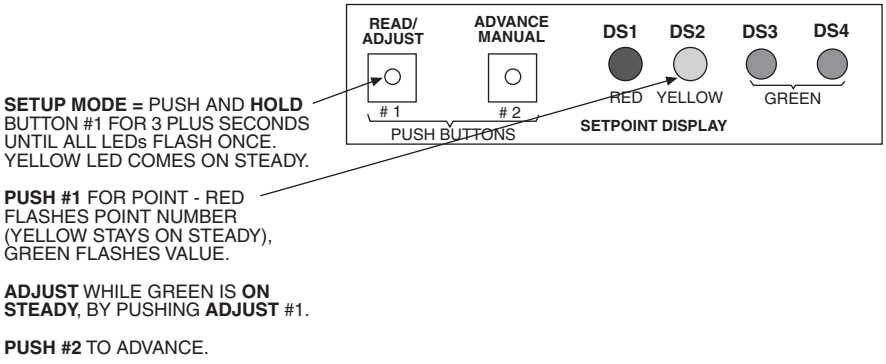
Running — No Problems — Red light blinking.



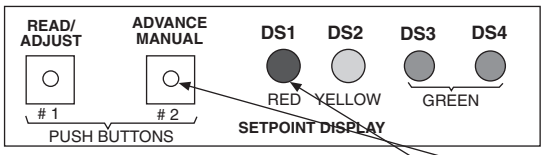
Read and I/O Modes



Setup Mode



Manual Mode



MANUAL MODE = PUSH AND **HOLD** BUTTON #2 FOR AT LEAST 3 SECONDS UNTIL ALL LEDs FLASH ONCE.

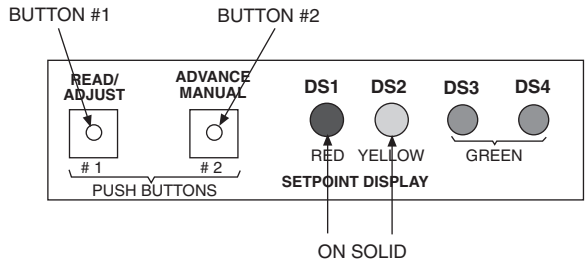
RED LED COMES ON STEADY.

PUSH #1 FOR POINT - YELLOW FLASHES POINT NUMBER (RED STAYS ON STEADY), GREEN FLASHES VALUE.

ADJUST WHILE GREEN IS **ON STEADY**, BY PUSHING **ADJUST** #1.

PUSH #2 TO ADVANCE.

Error Mode



ERROR — Red and yellow light on steady.

- **To Enter the Read Mode —** Push and release button #1 (all lights flash once).
- **Scroll to ERROR Code —** Using button #2, scroll to #20 (1st most recent error).
- **Push Button #1 to READ —** Red light blinks setup point and DS4 light blinks ALARM item.
- **Reset —** While DS4 is ON push button #1 OR cycle power.

MODE OF OPERATION		PUSHBUTTONS		LED INDICATORS			
		Button 1	Button 2	DS1 (Red)	DS2 (Yellow)	DS3 (Green)	DS4 (Green)
STARTUP MODE	Action			flash →	flash →	flash →	flash

Note 1 Indicators flash in sequence at .5 sec intervals

RUN MODE	Names			HB	ECONO	Y1	Y2
	Actions			flash	flash	steady	steady

Note 1 Heartbeat Indicator flashes to indicate proper operation of the control
Note 2 Econo indicator flashes to indicate free cooling being used
Note 3 Y1 and Y2 are on steady when a call thermostat Y1 and Y2 are closed
Note 4 ERROR - HB and Econo are on steady to indicate the presence of an error

READ MODE	Names	READ	ADV	SET NO	I/O NO	TEN'S OR ON	ONES OR OFF
	Actions	Push	Push	flash, no	flash no	flash no	flash no

Note 1 Push and release the READ button to enter Read Mode. The SET NO Indicator flashes once to indicate the setup point is selected for viewing
Note 2 Push and release ADV button repeatedly to advance to the desired setup point or I/O point
Each time the ADV button is pushed, the SET NO flashes the point number until the desired I/O point is reached and then the I/O NO flashes the I/O point no.
Note 3 After the SET NO indicator identifies the desired point no, push and release the READ button to display the value in the TEN's and ONE's indicator (i.e., 5 flashes for a value of 5) or a steady TEN's indicator for an on and a steady ONE's for off.
To aid in counting, values of 5 are flashed in groups of 5 (i.e., 15 = 3 groups of fast 5 flashes) and then follow by balance in slow flashes (i.e., 7 = 5 quick flashes + 2 slow flashes)
Note 4 Setpoint values are displayed first followed by I/O values and then back to Setpoint values
Red Set No LED displays Setup item numbers, and Yellow I/O LED displays I/O item no
Note 5 Routine exits after 10 min of no activity or push and hold button 1 and 2 for 3 seconds to exit

MODE OF OPERATION		PUSHBUTTONS		LED INDICATORS			
		Button 1	Button 2	DS1 (Red)	DS2 (Yellow)	DS3 (Green)	DS4 (Green)

SETUP MODE	Names	ADJUST	ADV	SET NO	SETUP	TEN'S OR ON	ONES OR OFF
	Actions	Hold/Push	Push	flash, no	steady	flash no	flash no

Note 1 Push and hold the ADJUST button until the SETUP indicator turns on.
Note 2 Push and release ADV button repeatedly to advance to the desired setup point.
Each time the ADV button is pushed, the SET NO flashes the point number and then displays the current setting
Note 3 Once the current value has been displayed the TENS indicator will turn on steady and while it on use the ADJUST button to enter the value. (i.e., push the button 4 times to enter 4)
Then wait for indicator to turn off and then push read/adjust to check the setting
Note 4 Routine exits after 10 min of no activity or push and hold button 1 and 2 for 3 seconds to exit

MANUAL	Names	ADJUST	MAN	MAN	I/O NO	TEN'S OR ON	ONES OR OFF
	Actions	Push	Hold/Push	steady	flash no	flash no	flash no

Note 1 Push and hold the MAN button until the MAN indicator turns on.
Note 2 Push and release MAN button repeatedly to advance to the desired I/O point.
Each time the MAN button is pushed, the I/O NO flashes the I/O point number.
Note 3 After the desired I/O No is reached push and release the ADJUST to toggle the output on and off or open and closed
Note 4 Routine exits after 10 min of no activity or push and hold button 1 and 2 for 3 seconds to exit

I/O POINTS

NO	I/O Points	UNITS
1	C1 Output	-
2	C2 Output	-
3	C3 Output	-
4	C4 Output	-
5	Economizer Damper Output	%
6	Supply Air temperature	F
7	Outside Air temperature	F
8	Return Air Temperature	F
9	Indoor Relative Humidity	%
10	Outdoor Relative Humidity	%
11	Indoor Air Quality	PPM
12	Remote Minimum Position	%
13	Y1 Status (next version)	-
14	Y2 Status (next version)	-
15	G Status (next version)	-
16	Occ Status (next version)	-

ALARM CODES

NO	DESCRIPTION
1	SAT sensor invalid
2	RAT Sensor Invalid (only with changeover type 3&5)
3	OAT Sensor Invalid
4	ORH Sensor invalid (only with changeover type 3&4)
5	IRH Sensor invalid (only with changeover type 5)
6	IAQ Sensor Invalid (only if IAQ=1)
7	Y2 on Y1 off
8	Micro Fails E2 test
note 1	Micro Fails RAM test
note 2	Micro Fails ROM test

Note 1 DS1+DS3/DS2+D4 will alternately flash
Note 2 DS1+DS2/DS3+D4 will alternately flash

CONFIGURATION VARIABLES (READ AND SETUP MODE)

NO	SETUP POINTS (viewable and adjustable)	MINIMUM VALUE	MAXIMUM VALUE	FACTORY SETTING	COMMENTS
1	Supply Air Temperature Setpoint	40 F	65 F	55 F	Supply air temperature control setpoint
2	Occupied minimum economizer position	Item 15+1	100 %	15 %	Min economizer position (occupied mode)
3	Unoccupied minimum economizer position	1 %	100 %	5 %	Min economizer position (unoccupied mode)
4	Economizer Maximum Position	1 %	100 %	100 %	Maximum econo position
5	Economizer Type	1	3	2	1 = vent only, 2 = proportional, 3 = 3 position
6	Economizer Changeover Type	1	5	2	1 = Switch, 2= Outdoor drybulb, 3=diff drybulb, 4= outdoor enthalpy, 5= diff enthalpy
7	Economizer Changeover Setpoint (mode 2)	45 F	70 F	65 F	For outdoor changeover dry bulb temperature
8	Economizer Changeover Setpoint (mode 3)	1	4	1	Outdoor Enthalpy changeover setpoint 1=A, 2=B, 3=C, 4=D
9	No of compressors	1	4	2	1, 2, 3, or 4
10	Compressor Sequencing	1	4	1	1=DC-Sensible, 2=DC-Latent, 3= LAT- Sensible, 4=LAT-Latent
11	Power Exhaust Stage 1 Activation	1 %	Item 12 - 5%	25 %	Economizer position for exhaust stage 1
12	Power Exhaust Stage 2 Activation	Item 11+1%	100 %	50 %	Economizer position for exhaust stage 2
13	Unoccupied configuration	1	3	3	1=no unoccupied cooling, 2= unoccupied free cooling, 3= unoccupied free & mech cooling
14	Compressor Lockout temperature	1 F	65 F	45 F	Low ambient compressor limit
15	IAQ min economizer position setpoint	1 %	Item 2 + 1%	5 %	Min IAQ position for demand ventilation
16	IAQ Enable	1	2	1	1= Disabled, 2= Enabled
17	Outdoor IAQ Reference	1 PPM/10	100 PPM/10	40 PPM/10	Outdoor reference IAQ level
18	IAQ lower limit control point differential	1 PPM/10	Item 19 - 1 PPM/10	60 PPM/10	Differential lower limit Indoor IAQ level
19	IAQ upper limit control point differential	Item 18 + 1 PPM/10	200 PPM/10	140 PPM/10	Differential upper limit indoor IAQ level
20	1st Most Recent Error /reset	1	8	--	Used in setup mode to reset alarms
21	2nd Most Recent Error (read only)	1	8	--	not displayed in Setup mode
22	3rd Most Recent Error (read only)	1	8	--	not displayed in Setup mode
23	4th Most Recent Error (read only)	1	8	--	not displayed in Setup mode
24	5th Most Recent Error (read only)	1	8		not displayed in Setup mode

APPENDIX C — JOB SPECIFIC ECONOMI$ER+ CONFIGURATION SETTINGS

Enter the job specific settings in the "Job Setting" column below.

CONFIGURATION VARIABLES (READ AND SETUP MODE)

NO	SETUP POINTS (viewable and adjustable)	MINIMUM VALUE	MAXIMUM VALUE	FACTORY SETTING	JOB SETTING	COMMENTS
1	Supply Air Temperature Setpoint	40 F	65 F	55 F		Supply air temperature control setpoint
2	Occupied minimum economizer position	Item 15+1	100 %	15 %		Min economizer position (occupied mode)
3	Unoccupied minimum economizer position	1 %	100 %	5 %		Min economizer position (unoccupied mode)
4	Economizer Maximum Position	1 %	100 %	100 %		Maximum econo position
5	Economizer Type	1	3	2		1 = vent only, 2 = proportional, 3 = 3 position
6	Economizer Changeover Type	1	5	2		1 = Switch, 2= Outdoor drybulb, 3=diff drybulb, 4= outdoor enthalpy, 5= diff enthalpy
7	Economizer Changeover Setpoint (mode 2)	45 F	70 F	65 F		For outdoor changeover dry bulb temperature
8	Economizer Changeover Setpoint (mode 3)	1	4	1		Outdoor Enthalpy changeover setpoint 1=A, 2=B, 3=C, 4=D
9	No of compressors	1	4	2		1, 2, 3, or 4
10	Compressor Sequencing	1	4	1		1=DC-Sensible, 2=DC-Latent, 3= LAT- Sensible, 4=LAT-Latent
11	Power Exhaust Stage 1 Activation	1 %	Item 12 - 5%	25 %		Economizer position for exhaust stage 1
12	Power Exhaust Stage 2 Activation	Item 11+1%	100 %	50 %		Economizer position for exhaust stage 2
13	Unoccupied configuration	1	3	3		1=no unoccupied cooling, 2= unoccupied free cooling, 3= unoccupied free & mech cooling
14	Compressor Lockout temperature	1 F	65 F	45 F		Low ambient compressor limit
15	IAQ min economizer position setpoint	1 %	Item 2 + 1%	5 %		Min IAQ position for demand ventilation
16	IAQ Enable	1	2	1		1= Disabled, 2= Enabled
17	Outdoor IAQ Reference	1 PPM/10	100 PPM/10	40 PPM/10		Outdoor reference IAQ level
18	IAQ lower limit control point differential	1 PPM/10	Item 19 - 1 PPM/10	60 PPM/10		Differential lower limit Indoor IAQ level
19	IAQ upper limit control point differential	Item 18 + 1 PPM/10	200 PPM/10	140 PPM/10		Differential upper limit indoor IAQ level
20	1st Most Recent Error /reset	1	8	--		Used in setup mode to reset alarms
21	2nd Most Recent Error (read only)	1	8	--		not displayed in Setup mode
22	3rd Most Recent Error (read only)	1	8	--		not displayed in Setup mode
23	4th Most Recent Error (read only)	1	8	--		not displayed in Setup mode
24	5th Most Recent Error (read only)	1	8			not displayed in Setup mode

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SERVICE TRAINING

Packaged Service Training programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Installation Overview
- Maintenance
- Operating Sequence

A large selection of product, theory, and skills programs are available, using popular video-based formats and materials. All include video and/or slides, plus companion book.

Classroom Service Training which includes "hands-on" experience with the products in our labs can mean increased confidence that really pays dividends in faster troubleshooting and fewer callbacks. Course descriptions and schedules are in our catalog.

CALL FOR FREE CATALOG 1-800-644-5544

[ ] Packaged Service Training [ ] Classroom Service Training

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 (48TJ020-028 ONLY)
- ☐ VERIFY INSTALLATION OF OUTDOOR-AIR 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 (SIZE 028 AND UNITS WITH MOISTUREMI$ER DEHUMIDIFICATION SYSTEM ONLY)

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 50.

GENERAL

☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE