installation, start-up and service instructions

SINGLE PACKAGE ROOFTOP STANDARD-EFFICIENCY HEAT PUMP UNITS

548D
Sizes 090-120
7 1/2 to 10 Tons

Cancels: II 548D-90-1

II 548D-90-2
10/15/00

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 extinguisher available for all brazing operations.

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

INSTALLATION

Unit is shipped in the vertical configuration. To convert to horizontal configuration, remove side duct opening covers.

Using the same screws, install covers on vertical duct openings with the insulation-side down. Seals around duct openings must be tight.

I. STEP 1 — PROVIDE UNIT SUPPORT

A. Roof Curb

Assemble and install accessory roof curb in accordance with instructions shipped with curb. See Fig. 1. Install insulation, cant strips, roofing felt, and counter flashing as shown. *Ductwork must be attached to curb.* If electric or control power is to be routed through the basepan, attach the accessory thru-the-bottom service connections to the basepan in accordance with the accessory installation instructions. Connections must be installed before unit is set on roof curb.

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

Curb should be level. Unit leveling tolerances are shown in Fig. 2. This is necessary for unit drain to function properly. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

B. Slab Mount (Horizontal Units Only)

Provide a level concrete slab that extends a minimum of 6 in. beyond unit cabinet. Install a 6 in. gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

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

⚠ **CAUTION:** Ensure voltage listed on unit data plate agrees with electrical supply provided for the unit.

ROOF CURB ACCESSORY	"A"	UNIT SIZE 548D
CRRFCURB003A00	1′-2″ [356]	090-150
CRRFCURB004A00	2′-0″ [610]	

"B"	"C"	"D" ALT DRAIN HOLE	"E" GAS	"F" POWER	"G" CONTROL	CONNECTOR PACKAGE ACCESSORY
2′-8 7/16″ [827]	1′-10 15/16″ [583]	1 3/4″ [44.5]	3/4″ [19] NPT	3/4″ [19] NPT	1/2″ [12.7] NPT	CRBTMPWR001A00
				1 1/4″ [31.7] NPT		CRBTMPWR002A00
			1/2″ [12.7] NPT	3/4″ [19] NPT	1/2″ [12.7] NPT	CRBTMPWR003A00
			3/4″ [19] NPT	1 1/4″ [31.7] NPT		CRBTMPWR004A00

NOTES:
1. Roof curb accessory is shipped unassembled.
2. Insulated panels, 1 in. thick polyurethane foam, 1 3/4 lb density.
3. Dimensions in [ ] are in millimeters.
4. Roof curb: 16 gage steel.
5. Attach ductwork to curb (flanges of duct rest on curb).
6. Service clearance 4 ft on each side.
7. Direction of airflow.
8. Connector packages CRBTMPWR001A00 and 002A00 are for thru-the-curb connections. Packages CRBTMP003A00 and 004A00 are for thru-the-bottom connections.

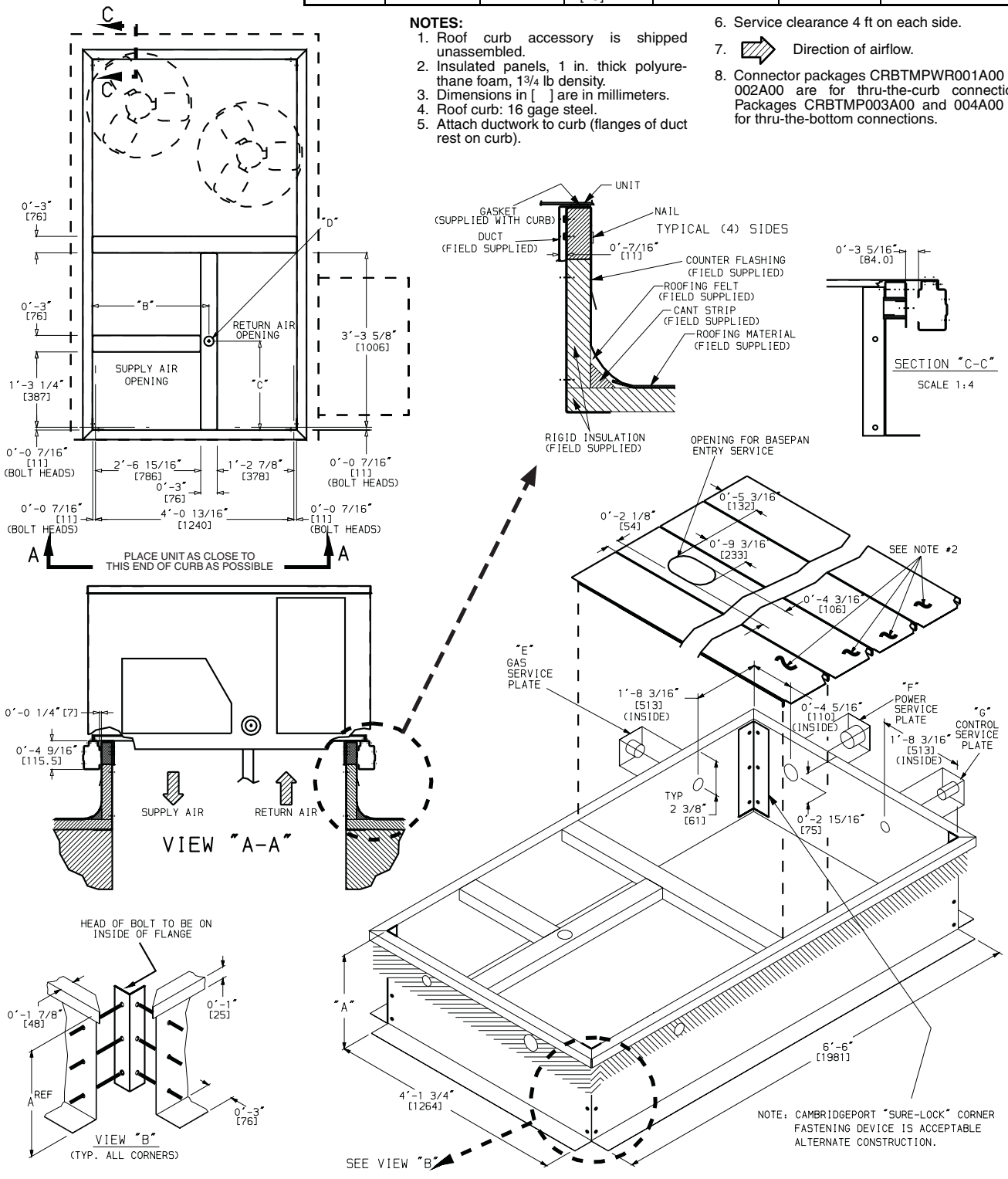
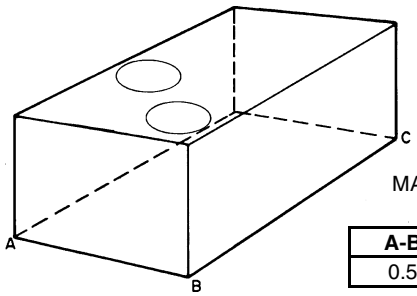


Fig. 1 — Roof Curb Details



MAXIMUM ALLOWABLE DIFFERENCE (in.)

A-B	B-C	A-C
0.5	1.0	1.0

Fig. 2 — Unit Leveling Tolerances

II. STEP 2 — FIELD FABRICATE DUCTWORK

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

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

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

A minimum clearance to combustibles is not required around ductwork on vertical discharge units. On horizontal discharge units with electric heat, a minimum clearance of 1 in. is required for the first 12 in. of ductwork. Cabinet return-air static should not exceed –0.35 in. wg with Durablade economizer, –0.30 in. wg with EconoMi$er, or –0.45 in. wg without economizer.

⚠ **CAUTION:** Ensure voltage listed on unit data plate agrees with electrical supply provided for the unit.

III. STEP 3 — INSTALL CONDENSATE DRAIN LINE AND EXTERNAL TRAP

Condensate drain connections are located on the bottom and end of the unit. Unit discharge connections do not determine the use of drain connections; either drain connection can be used in vertical or horizontal applications.

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

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

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

IV. STEP 4 — RIG AND PLACE UNIT

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

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

Positioning

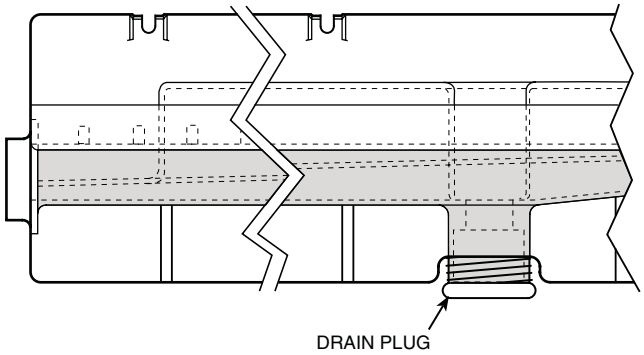
Maintain clearance around and above unit to provide proper airflow and service access. See Fig. 6.

Position unit on roof curb so that the following clearances are maintained: 1/4-in. clearance between roof curb and base rails on each side and in duct end of unit; 3 5/16-in. clearance between roof curb and condenser end (see Fig. 1, section C-C).

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

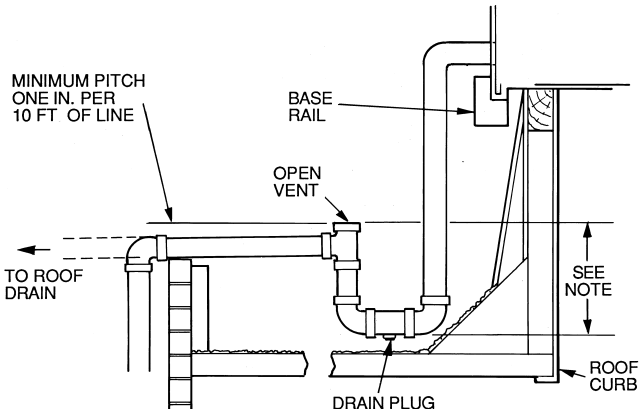
Although unit is weatherproof, guard against water from higher level runoff and overhangs.

After unit is in position, remove polyethylene shipping wrapper and rigging skid.



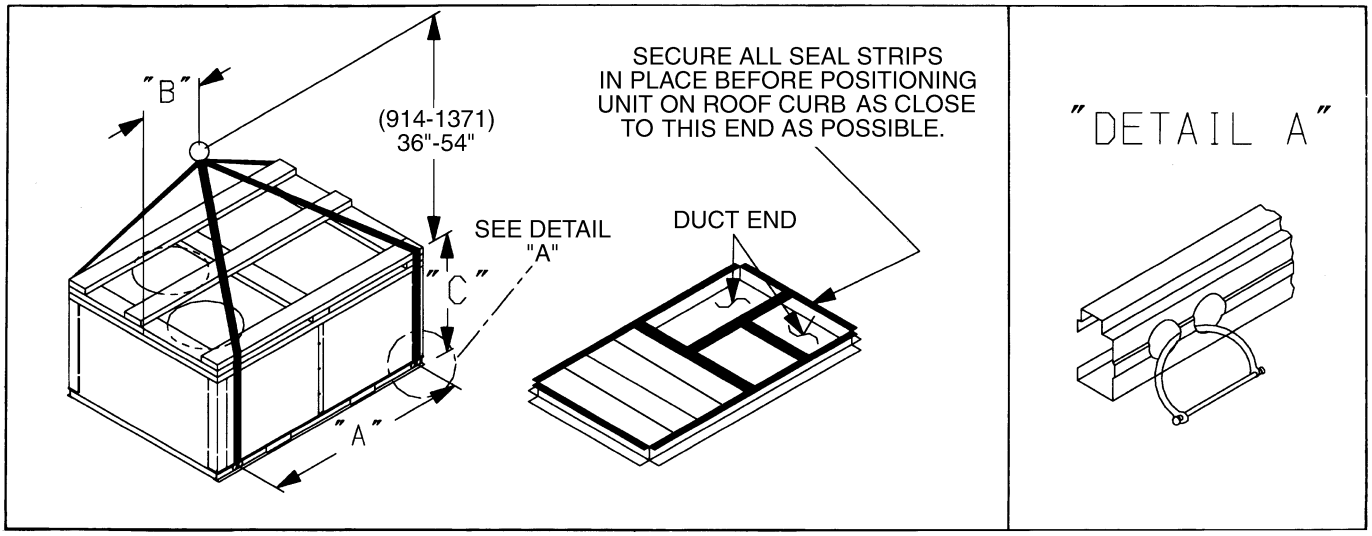
NOTE: Drain plug is shown in factory-installed position.

Fig. 3 — Condensate Drain Connection



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

Fig. 4 — External Trap Condensate Drain



NOTES:
1. Dimension in ( ) is in millimeters.
2. Hook rigging shackles through holes in base rail, as shown in detail "A." Holes in base rails are centered around the unit center of gravity. Use wooden top skid when rigging to prevent rigging straps from damaging unit.
3. Unit weights do not include economizer. See Table 1 for economizer weights.

UNIT 548D	MAX WEIGHT		DIMENSIONS					
			"A"		"B"		"C"	
	lb	kg	in.	mm	in.	mm	in.	mm
090	940	426	77.42	1966.5	41.5	1054	42.12	1070
102	965	438	77.42	1966.5	41.5	1054	42.12	1070
120	1015	460	77.42	1966.5	41.5	1054	42.12	1070

⚠ **CAUTION:** All panels must be in place when rigging and lifting.

Fig. 5 — Rigging Details

UNIT 548D	STD UNIT WEIGHT		DURABLADE ECONOMIZER WEIGHT		ECONOMI$ER WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		"H"		"J"		"K"	
	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm
090	940	426	44	20	62	28	207	94	178	81	254	115	301	136	2- 0 7/8	632	3-5 5/16	1050	2-9 11/16	856
102	965	438	44	20	62	28	212	96	183	83	261	119	309	140	2- 0 7/8	632	3-5 5/16	1050	2-9 11/16	856
120	1015	460	44	20	62	28	223	101	193	88	274	124	325	147	2-10 7/8	885	4-1 5/16	1253	3-0 3/8	924

NOTES:

1. Dimensions in [ ] are in millimeters.
2. Center of gravity.
3. Direction of airflow.
4. Ductwork to be attached to accessory roof curb only.
5. Minimum clearance (local codes or jurisdiction may prevail):
   a. Bottom to combustible surfaces (when not using curb) 0 inches, on horizontal discharge units with electric heat 1 in. clearance to ductwork for 1 ft.
   b. Condenser coil, for proper airflow, 36 in. one side, 12 in. the other. The side getting the greater clearance is optional.
   c. Overhead, 60 in. to assure proper condenser fan operation.
   d. Between units, control box side, 42 in. per NEC (National Electrical Code).
   e. Between unit and ungrounded surfaces, control box side, 36 in. per NEC.
   f. Between unit and block or concrete walls and other grounded surfaces, control box side, 42 in. per NEC.
   g. Horizontal supply and return end, 0 inches.
6. With the exception of the clearance for the condenser coil as stated in Notes 5a, b, and c, a removable fence or barricade requires no clearance.
7. Units may be installed on combustible floors made from wood or Class A, B, or C roof covering material.
8. The vertical center of gravity is 1'-7 1/2" [495] for 090 and 102, 2'-0" [610] for 120 up from the bottom of the base rail.

	CONNECTION SIZES
A	1 3/8" Dia. [35] Field Power Supply Hole
B	2 1/2" Dia. [64] Power Supply Knockout
C	1 3/4" Dia. [44] Charging Port Hole
D	7/8" Dia. [22] Field Control Wiring Hole
E	3/4" — 14 NPT Condensate Drain
F	2" Dia. [51] Power Supply Knockout

BOTTOM POWER CHART, THESE HOLES REQ'D FOR USE WITH ACCESSORY PACKAGES — CRBTMPWR001A00 (1/2", 3/4") OR CRBTMPWR002A00 (1/2", 1 1/4")

THREADED CONDUIT SIZE	WIRE USE	REQ'D HOLE SIZES (Max.)
1/2"	24 V	7/8" [22.2]
3/4"	Power*	1 1/8" [28.4]
1 1/4" FPT	Power*	1 3/4" [44.4]

*Select either 3/4" or 1 1/4" for power, depending on wire size.

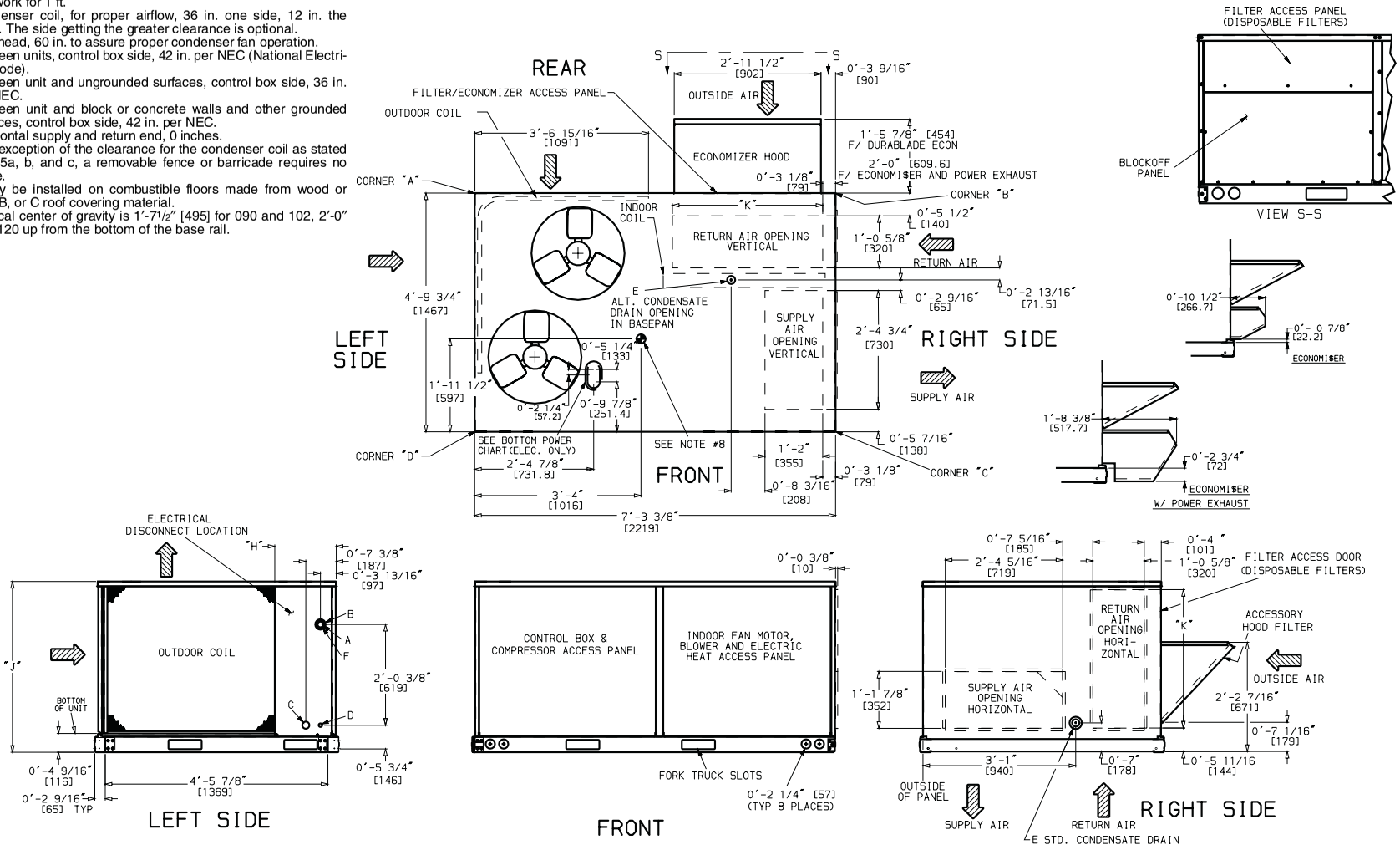


Fig. 6 — Base Unit Dimensions

Table 1 — Physical Data

UNIT SIZE 548D		090	102	120
NOMINAL CAPACITY (tons)		7 1/2	8 1/2	10
OPERATING WEIGHT (lb)				
Unit				
Al/Al*		940	965	1015
Economizer				
Durablade		44	44	44
EconoMi$er		62	62	62
Roof Curb†		143	143	143
COMPRESSOR			Hermetic Scroll	
Quantity		2	2	2
Oil (oz)		45 ea	62 ea	54 ea
REFRIGERANT TYPE			R-22	
Operating Charge (lb-oz)				
Circuit 1		5-14	8- 6	7-14
Circuit 2		5-13	8-13	8- 3
OUTDOOR COIL			Enhanced Copper Tubes, Aluminum Lanced Fins, Acutrol™ Feed Device	
Rows...Fins/in.		1...17	2...17	2...17
Total Face Area (sq ft)		20.50	18.00	18.30
OUTDOOR FAN			Propeller Type	
Nominal Cfm		6500	6500	6500
Quantity...Diameter (in.)		2...22	2...22	2...22
Motor Hp...Rpm		1/4...1100	1/4...1100	1/4...1100
Watts Input (Total)		600	600	600
INDOOR COIL			Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Acutrol Fixed Orifice Metering Feed Device	
Rows...Fins/in.		3...15	3...15	3...15
Total Face Area (sq ft)		8.0	8.0	11.1
INDOOR FAN			Centrifugal Type	
Quantity...Size (in.)	Std	1...15 x 15	1...15 x 15	1...15 x 15
	Alt	1...15 x 15	—	1...15 x 15
Type Drive	Std	Belt	Belt	Belt
	Alt	Belt	—	Belt
Nominal Cfm		3000	3600	4000
Maximum Continuous Bhp	Std	2.40	2.40	2.40
	Alt	—	—	2.90
Motor Frame Size	Std	56	56	56
	Alt	—	—	56
Nominal Rpm High/Low	Std	—	—	—
	Alt	—	—	—
Fan Rpm Range	Std	590-840	685-935	685- 935
	Alt	685-935	—	835-1085
Motor Bearing Type		Ball	Ball	Ball
Maximum Allowable Rpm		2100	2100	2100
Motor Pulley Pitch Diameter Min/Max (in.)	Std	2.4/3.4	2.8/3.8	2.8/3.8
	Alt	2.8/3.8	—	3.4/4.4
Nominal Motor Shaft Diameter (in.)	Std	5/8	5/8	5/8
	Alt	—	—	7/8
Fan Pulley Pitch Diameter (in.)	Std	7.0	7.0	7.0
	Alt	7.0	—	7.0
Belt, Quantity...Type...Length (in.)	Std	1...A...48	1...A...48	1...A...48
	Alt	1...A...48	—	1...A...48
Pulley Center Line Distance (in.)	Std	16.75-19.25	16.75-19.25	15.85-17.50
	Alt	15.75-19.25	—	15.85-17.50
Speed Change per Full Turn of Movable Pulley Flange (rpm)	Std	50	50	50
	Alt	50	—	50
Movable Pulley Maximum Full Turns From Closed Position	Std	5	5	5
	Alt	5	—	5
Factory Setting	Std	5	5	5
	Alt	5	—	5
Factory Speed Setting (rpm)	Std	590	685	685
	Alt	685	—	835
Fan Shaft Diameter at Pulley (in.)		1	1	1
HIGH-PRESSURE SWITCH (psig)**				
Standard Compressor Internal Relief (Differential)			450 ± 50	
Cutout			428	
Reset (Auto.)			320	
LOSS-OF-CHARGE SWITCH (psig)**				
Cutout			7 ± 3	
Reset (Auto.)			22 ± 5	
FREEZE-PROTECTION THERMOSTAT (F)**				
Opens			30 ± 5	
Closes			45 ± 5	
OUTDOOR-AIR INLET SCREENS			Cleanable	
Quantity...Size (in.)			1...20 x 25 x 1 1...16 x 25 x 1	
RETURN-AIR FILTERS			Throwaway	
Quantity...Size (in.)		4...16 x 20 x 2	4...16 x 20 x 2	4...20 x 20 x 2

LEGEND

Al — Aluminum
Bhp — Brake Horsepower

*Indoor coil fin material/outdoor coil fin material.
†Weight of 14-in. roof curb.
**Requires an accessory or optional controls upgrade kit.

NOTE: The 548D units have a loss-of-charge switch located in the liquid line available as an option or an accessory. (Standard on 120 units.)

V. STEP 5 — MAKE ELECTRICAL CONNECTIONS

⚠ **WARNING:** Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code) ANSI (American National Standards Institute) / NFPA (National Fire Protection Association) 70 latest year and local electrical codes. Failure to follow this warning could result in the installer being liable for personal injury of others.

A. Field Power Supply

All units except 208/230-v units are factory-wired for the voltage shown on the unit nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the transformer *must* be rewired by disconnecting the black wire from the 230-v terminal on the transformer and connecting it to the 200-v terminal from the transformer.

Refer to unit label diagram for additional information. Pigtails are provided for field wire connections. Use factory-supplied splices or UL (Underwriters' Laboratories) approved copper/aluminum connector.

When installing units, provide a disconnect per the NEC.

All field wiring must comply with the NEC and local requirements. In Canada, electrical connections must be made in accordance with CSA (Canadian Standards Association) C22.1 Canadian Electrical Code Part One.

Install field wiring as follows:

1. Install conduit through side panel openings. For units without electric heat, install conduit between disconnect and control box.
2. Install power lines to terminal connections as shown in Fig. 7.
3. For units with electric heat, refer to Accessory Installation Instructions.
4. If thru-the-bottom control connections are used, refer to the accessory installation instructions for information on control wiring. Refer to Fig. 6 for drilling holes in basepan.

During operation, voltage to compressor terminals must be within range indicated on unit nameplate (see Tables 2A and 2B). On 3-phase units, voltages between phases must be balanced within 2%, and the current within 10%. Use the formula shown in Tables 2A and 2B, Note 2 on page 10 to determine the percentage of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable warranty.

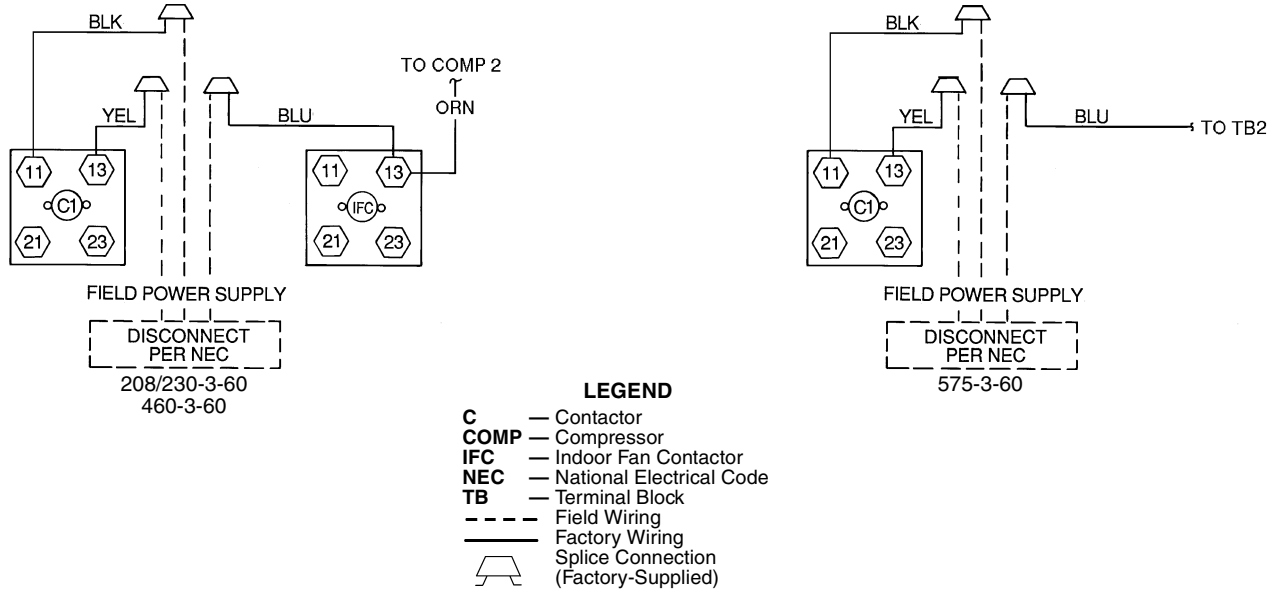


Fig. 7 — Power Wiring Connections

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

UNIT 548D	NOMINAL V-PH-Hz	IFM TYPE	VOLTAGE RANGE		COMPRESSOR (each)		OFM FLA	IFM FLA	ELECTRIC HEAT*		POWER SUPPLY		DISCONNECT SIZE†	
			Min	Max	RLA	LRA			Nominal kW**	FLA	MCA	MOCP	FLA	LRA
090 (7½ Tons)	208/230-3-60	STD	187	254	13.4	91.0	1.4	5.8	— 7.8/10.4 12.0/16.0 18.6/24.0 24.0/32.0 31.8/42.4	— 21.7/ 25.0 33.3/ 38.5 50.0/ 57.7 66.6/ 77.0 88.3/102.0	38.8/ 38.8 65.9/ 70.0 80.4/ 86.9 103.3/113.4 122.0/135.0 149.1/166.3	40/ 40†† 70/ 80 90/ 90 110/125 125/150 150/175	41/ 41 66/ 69 79/ 85 100/109 117/129 142/158	229/229 251/254 262/268ll 281/289ll 296/306ll 317/331ll
	460-3-60	STD	414	508	6.7	42.0	0.7	2.6	— 13.9 16.5 27.8 33.0 41.7	— 16.7 19.8 33.4 39.7 50.2	19.1 40.0 43.8 60.8 68.7 81.8	20†† 45†† 45†† 70 70 90	20 39 43 58 66 78	108 124 128 141 147 158
	575-3-60	STD	518	632	5.4	39.0	0.7	2.6	— 17.0 34.0	— 17.1 34.1	15.4 36.7 68.0	20†† 40†† 60††	16 36 55	97 114 131
102 (8½ Tons)	208/230-3-60	STD	187	254	16.0	137.0	1.4	5.8	— 7.8/10.4 12.0/16.0 18.6/24.0 24.0/32.0 31.8/42.4	— 21.7/ 25.0 33.3/ 38.5 50.0/ 57.7 66.6/ 77.0 88.3/102.0	44.6/ 44.6 71.7/ 75.9 86.2/ 92.7 109.1/119.2 127.9/140.9 155.0/172.0	45/ 45†† 80/ 80 90/100 110/125 150/150 175/175	47/ 47 72/ 75 85/ 91 106/115 123/135 148/164	321/321 343/346 354/360ll 373/381ll 388/398ll 409/423ll
	460-3-60	STD	414	508	8.3	69.0	0.7	2.6	— 13.9 16.5 27.8 33.0 41.7	— 16.7 19.8 33.4 39.7 50.2	22.7 43.6 47.4 64.4 72.3 85.4	25†† 45†† 50†† 70 80 90	24 43 46 62 69 81	162 178 182 195 201 212ll
	575-3-60	STD	518	632	6.4	58.0	0.7	2.6	— 17.0 34.0	— 17.1 34.1	17.3 39.0 60.2	20†† 40†† 60††	18 38 58	135 152 169
120 (10 Tons)	208/230-3-60	STD	187	254	17.2	124.0	1.4	5.8	— 7.8/10.4 12.0/16.0 24.0/32.0 31.8/42.4 37.6/50.0	— 21.7/ 25.0 33.3/ 38.5 66.6/ 77.0 88.3/102.0 104.4/120.3	47.3/ 47.3 74.4/ 78.6 88.9/ 95.4 130.6/143.6 157.7/174.8 177.8/167.6	50/ 50†† 80/ 80 90/100 150/150 175/175 200/175	49/ 49 74/ 78 88/ 94 126/138 151/167 170/188	295/295 317/320 328/334ll 362/372ll 383/397ll 399/415ll
		ALT	187	254	17.2	124.0	1.4	7.5	— 7.8/10.4 12.0/16.0 24.0/32.0 31.8/42.4 37.6/50.0	— 21.7/ 25.0 33.3/ 38.5 66.6/ 77.0 88.3/102.0 104.4/120.3	49.0/ 49.0 76.1/ 80.8 90.6/ 97.1 132.3/145.3 159.4/176.5 179.5/169.3	50/ 50†† 80/ 90 100/100 150/150 175/200 200/175	51/ 51 76/ 80 90/ 96 128/140 153/169 171/190	314/314 336/389ll 347/353ll 381/391ll 402/416ll 418/434ll
	460-3-60	STD	414	508	8.6	59.6	0.7	2.6	— 16.5 27.8 33.0 41.7 50.0	— 19.8 33.4 39.7 50.2 60.1	23.4 48.1 65.1 73.0 86.1 83.5	25†† 50†† 70 80 90 90	24 47 63 70 82 93	143 163 176 183 193ll 203ll
		ALT	414	508	8.6	59.6	0.7	3.4	— 16.5 27.8 33.0 41.7 50.0	— 19.8 33.4 39.7 50.2 60.1	24.2 48.9 65.9 73.8 86.9 84.3	25†† 50†† 70 80 90 90	25 48 64 71 83 94	182 202 216 222 233ll 243ll
	575-3-60	STD	518	632	6.9	49.4	0.7	2.6	— 17.0 34.0 51.0	— 17.1 34.1 51.2	18.7 40.1 61.4 69.9	20†† 50†† 70 70	20 39 59 78	118 135 152 159
		ALT	518	632	6.9	49.4	0.7	3.4	— 17.0 34.0 51.0	— 17.1 34.1 51.2	19.4 40.7 62.0 70.6	20†† 50†† 70 80	20 40 60 79	149 166 183 201

NOTE: Legend and Notes for Electrical Data are on page 10.

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

UNIT 548D	NOMINAL V-PH-Hz	IFM TYPE	VOLTAGE RANGE		COMPRESSOR (each)		OFM FLA	IFM FLA	ELECTRIC HEAT*		POWER SUPPLY		DISCONNECT SIZE†	
			Min	Max	RLA	LRA			Nominal kW**	FLA	MCA	MOCP	FLA	LRA
090 (7½ Tons)	208/230-3-60	STD	187	254	13.4	91.0	1.4	5.8	— 7.8/10.4 12.0/16.0 18.6/24.0 24.0/32.0 31.8/42.4	— 21.7/ 25.0 33.3/ 38.5 51.6/ 59.7 66.6/ 77.0 88.3/102.0	43.6/ 43.6 70.7/ 74.8 85.2/ 91.7 108.1/118.2 126.8/139.8 153.9/171.1	45/ 45†† 80/ 80 90/100 110/125 150/150 175/175	46/ 46 71/ 75 85/ 91 106/115 123/135 148/164	234/234 256/259 267/272ll 285/294ll 300/311ll 322/336ll
	460-3-60	STD	414	508	6.7	42.0	0.7	2.6	— 13.9 16.5 27.8 33.0 41.7	— 16.7 19.8 33.4 39.7 50.2	21.3 42.1 46.0 63.0 70.9 84.0	25†† 45†† 50†† 70 80 90	23 42 45 61 68 80	110 127 130 143 150 160ll
	575-3-60	STD	518	632	5.4	39.0	0.7	2.6	— 17.0 34.0	— 17.1 34.1	17.1 38.5 59.7	20†† 40†† 60††	18 38 57	99 116 133
102 (8½ Tons)	208/230-3-60	STD	187	254	14.4	103.0	1.4	5.8	— 7.8/10.4 12.0/16.0 18.6/24.0 24.0/32.0 31.8/42.4	— 21.7/ 25.0 33.3/ 38.5 51.6/ 59.7 66.6/ 77.0 88.3/102.0	49.4/ 49.4 76.5/ 80.7 91.0/ 97.5 113.9/124.0 132.7/145.7 159.8/176.9	50/ 50†† 80/ 90 100/100 125/125 150/150 175/200	52/ 52 77/ 81 91/ 96 112/121 129/141 154/170	326/326 348/351ll 359/364ll 377/386ll 392/403ll 414/428ll
	460-3-60	STD	414	508	7.2	52.5	0.7	2.6	— 13.9 16.5 27.8 33.0 41.7	— 16.7 19.8 33.4 39.7 50.2	24.9 45.7 49.6 66.6 74.5 187.6	25†† 50†† 50†† 70 80 90	26 45 49 65 72 84	164 181 184 197 204 214ll
	575-3-60	STD	518	632	6.0	44.0	0.7	2.6	— 17.0 34.0	— 17.1 34.1	19.3 40.7 62.0	20†† 45†† 70	20 40 60	137 154 171
120 (10 Tons)	208/230-3-60	STD	187	254	17.2	124.0	1.4	5.8	— 7.8/10.4 12.0/16.0 24.0/32.0 31.8/42.4 37.6/50.0	— 21.7/ 25.0 33.3/ 38.5 66.6/ 77.0 88.3/102.0 104.4/120.3	52.1/ 52.1 79.2/ 83.4 93.7/100.2 135.4/148.4 162.5/179.6 182.6/172.4	60/ 60†† 80/ 90 100/110 150/150 175/200 200/200	55/ 55 80/ 84 93/ 99 132/144 157/172 175/193	300/300 322/325ll 333/338ll 366/377ll 388/402ll 404/420ll
		ALT	187	254	17.2	124.0	1.4	7.5	— 7.8/10.4 12.0/16.0 24.0/32.0 31.8/42.4 37.6/50.0	— 21.7/ 25.0 33.3/ 38.5 66.6/ 77.0 88.3/102.0 104.4/120.3	53.8/ 53.8 80.9/ 85.1 95.4/101.9 137.1/150.1 164.2/181.3 184.3/174.1	60/ 60†† 90/ 90 100/110 150/175 175/200 200/200	57/ 57 82/ 86 93/101 134/145 158/174 177/195	319/319 341/344ll 352/357ll 385/396ll 407/421ll 423/439ll
	460-3-60	STD	414	508	8.6	59.6	0.7	2.6	— 16.5 27.8 33.0 41.7 50.0	— 19.8 33.4 39.7 50.2 60.1	25.5 50.3 67.3 75.2 88.3 85.6	30†† 60†† 80 80 90 90	27 50 65 73 85 96	145 165 178 185 195ll 205ll
		ALT	414	508	8.6	59.6	0.7	3.4	— 16.5 27.8 33.0 41.7 50.0	— 19.8 33.4 39.7 50.2 60.1	26.3 51.1 68.1 76.0 89.1 86.4	30†† 60†† 70 80 90 90	28 51 66 73 85 97	185 204 218 224 235ll 245ll
	575-3-60	STD	518	632	6.9	49.4	0.7	2.6	— 17.0 34.0 51.0	— 17.1 34.1 51.2	20.5 41.8 63.1 71.7	20†† 45†† 70 80	22 41 61 80	120 137 154 171ll
		ALT	518	632	6.9	49.4	0.7	3.4	— 17.0 34.0 51.0	— 17.1 34.1 51.2	21.1 42.5 63.7 72.3	20†† 45†† 70 80	22 42 62 81	151 168 185 202ll

NOTE: Legend and Notes for Electrical Data are on page 10.

LEGEND AND NOTES FOR TABLES 2A AND 2B

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
IFM — Indoor-Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
NEC — National Electrical Code
OFM — Outdoor-Fan Motor
RLA — Rated Load Amps

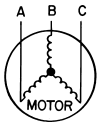
*Heaters are field installed only.
†Used to determine minimum disconnect per NEC.
**Heater capacity (kW) is based on heater voltage of 208 v, 240 v, or 480 v and 575 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.
††Fuse or HACR circuit breaker.
‖Optional disconnect switch is unavailable. (Applies to units with an FLA greater or equal to 80.)

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.
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 percentage of voltage imbalance.

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

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.

B. Field Control Wiring

Install an approved accessory thermostat assembly according to installation instructions included with the accessory. Locate thermostat assembly on a solid wall in the conditioned space to sense average temperature in accordance with thermostat installation instructions.

Route thermostat cable or equivalent single leads of colored wire from subbase terminals to low-voltage connections on unit (shown in Fig. 8) as described in Steps 1 through 4 below.

NOTE: If using Bryant electronic thermostat, set thermostat configuration for "non-heat pump operation." The use of the O terminal is not required to energize the reversing valve in this family of products.

NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 51 to 75 ft, use no. 16 AWG insulated wire (35 C minimum). For over 75 ft, use no. 14 AWG insulated wire (35 C minimum). All wire larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

1. If unit is mounted on roof curb and accessory thru-the-curb service plate connection is used, route wire through connection plate.
2. Pass control wires through the hole provided on unit (see connection D in Connection Sizes table in Fig. 6).
3. Feed wire through the raceway built into the corner post to the 24-v barrier located on the left side of the control box. See Fig. 9. The raceway provides the UL required clearance between the high- and low-voltage wiring.
4. Connect thermostat wires to screw terminals of low-voltage connector (see Fig. 8).

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

C. Defrost Board

The defrost board timer cycle is set to 30 minutes. To change the cycle time, remove the wire from defrost board connected to the 30-minute quick-connect. See Fig. 10. Connect the wire to the 50 or 90 minute quick-connects on the defrost board, depending on the desired defrost time.

D. Heat Anticipator Settings

For units with electric heat, set heat anticipator settings as shown in Table 3.

VI. STEP 6 — ADJUST FACTORY-INSTALLED OPTIONS

A. Disconnect Switch

The optional disconnect switch is non-fused. The switch has the capability of being locked in place for safety purposes. (See Fig. 9.)

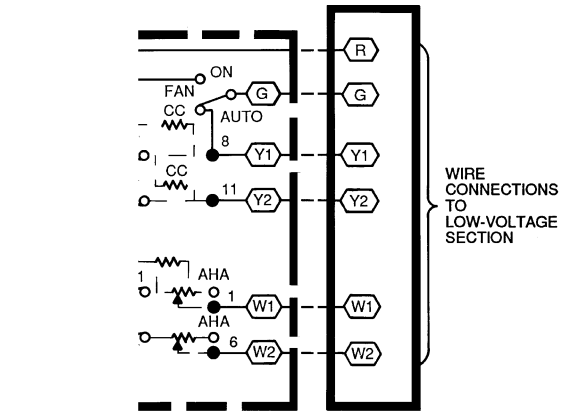
B. Optional Durablade Economizer

The optional economizer hood assembly is packaged and shipped in the filter section. Damper blades and control boards are installed at the factory and the economizer is shipped in the vertical discharge position.

NOTE: Horizontal discharge block-off plate is shipped with the air hood package. If unit is to be used for vertical discharge application, discard this plate.

Assembly

1. Determine if ventilation air is required in building. If so, determine the minimum amount to be supplied by each unit and record quantity of ventilation air needed for use in Step 8.
2. Remove filter access panel by raising panel and swinging panel outward. Panel is now disengaged from track and can be removed. No tools are required to remove filter access panel. Remove outdoor-air opening panel. Save panels and screws. See Fig. 11. Remove optional outdoor-air damper hood package from filter section.
3. Assemble outdoor-air hood top and side plates as shown in Fig. 12. Install seal strips on hoop top and sides. Put aside screen retainer and retainer screw for later assembly. *Do not attach hood to unit at this time.*



LEGEND

AHA	— Adjustable Heat Anticipator
CC	— Cooling Compensator
- - - -	Field Wiring
———	Factory Wiring

Fig. 8 — Low-Voltage Connections

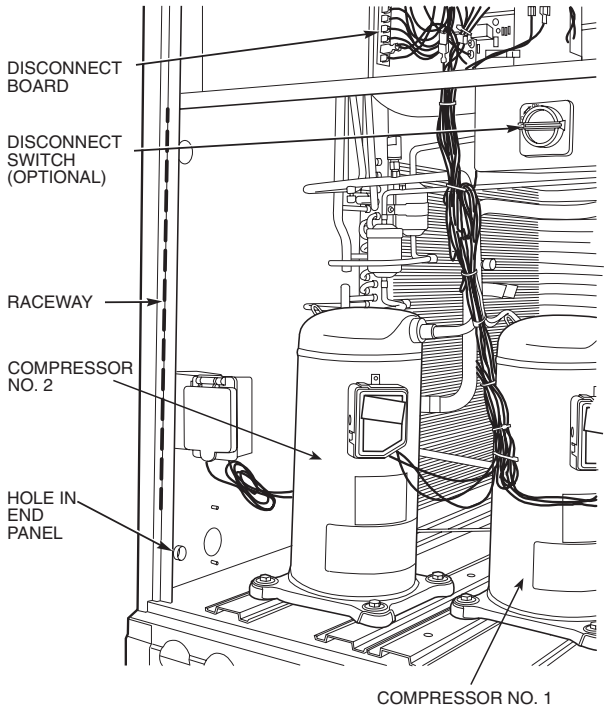


Fig. 9 — Typical Field Control Wiring Raceway

Table 3 — Heat Anticipator Settings

UNIT	UNIT VOLTAGE											
	208/230				460				575			
	Heater kW*	Configuration			Heater kW*	Configuration			Heater kW*	Configuration		
		1-Stage	2-Stage			1-Stage	2-Stage			1-Stage	2-Stage	
			Stage 1	Stage 2			Stage 1	Stage 2			Stage 1	Stage 2
548D	10.4, 16.0	0.3	NA	NA	13.9, 16.5 27.8, 33.0	0.3	NA	NA	17.0, 34.0	0.3	NA	NA
	24.8, 32.0	0.6	0.3	0.3								
	42.4, 50.0	0.9	0.6	0.3	41.7, 50.0	0.6	0.3	0.3	51.0	0.6	0.3	0.3

*Heater capacity (kW) is based on heater voltage of 208 v, 240 v, 480 v and 575 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.

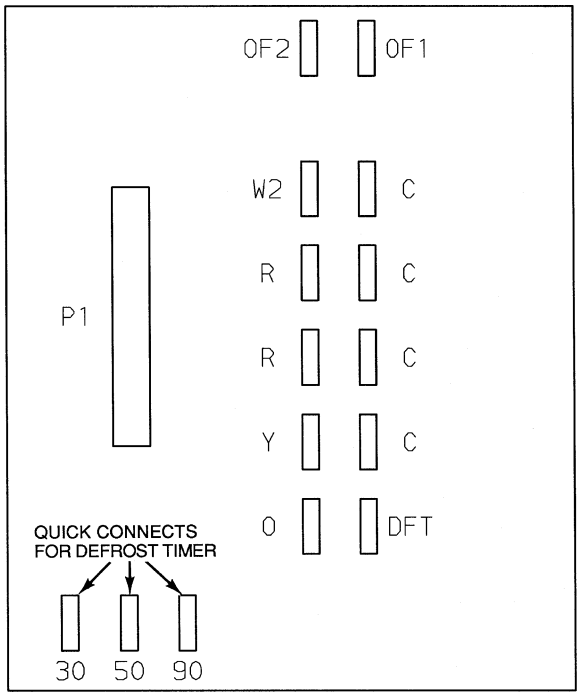


Fig. 10 — Defrost Board

4. On size 120 units, install vertical discharge block-off plate over duct openings. See Fig. 13.
5. Economizer is factory-installed in unit and secured with screws. See Fig. 14.

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

6. To convert to horizontal discharge application:
   a. Rotate the economizer 90 degrees until the economizer motor faces the outdoor section (see Fig. 15).
   b. Remove shipping screw and tape from barometric damper and rotate the barometric relief damper hinge 90 degrees. Barometric relief damper should open vertically to operate properly.
   c. Install horizontal discharge block-off plate over the opening on the access panel. (Block-off plate MUST be installed before installing hood assembly.) See Fig. 16.
7. Remove existing 12-pin blue and yellow wire jumper plug and store. Insert 12-pin economizer plug into economizer harness. See Fig. 14.
8. If ventilation air is not required, proceed to Step 9. If ventilation air is required, determine the minimum position setting for required airflow. See Fig. 17. Adjust minimum position setting by loosening the screws on the position setting bracket. See Fig. 18. Slide bracket until the top screw is in the position determined by Fig. 17. Tighten screws.
9. Remove tape and shipping screw from outdoor-air thermostat (OAT). Fas-ten OAT to inside of hood using screws and speed clips provided. See Fig. 19. Make sure OAT terminals are positioned up.
10. Replace outdoor-air opening panel using screws from Step 2. Replace filter access panel. Ensure the filter access panel slides along the tracks and is securely engaged.
11. Fasten hood top and side plate assembly to outdoor-air opening panel with screws provided.
12. Place knob supplied with economizer on OAT. See Fig. 19. Set for 3° F below indoor room thermostat setting. If accessory enthalpy control (EC) is used in place of OAT, see instructions shipped with EC for installation and adjustment. See Fig. 19.
13. Connect OAT per Fig. 20.
14. Slide outdoor-air inlet screen into screen track on hood side plate. While holding screen in place, fasten screen retainer to hood using screws provided.

NOTE: Refer to Fig. 21 for economizer barometric relief damper characteristics.

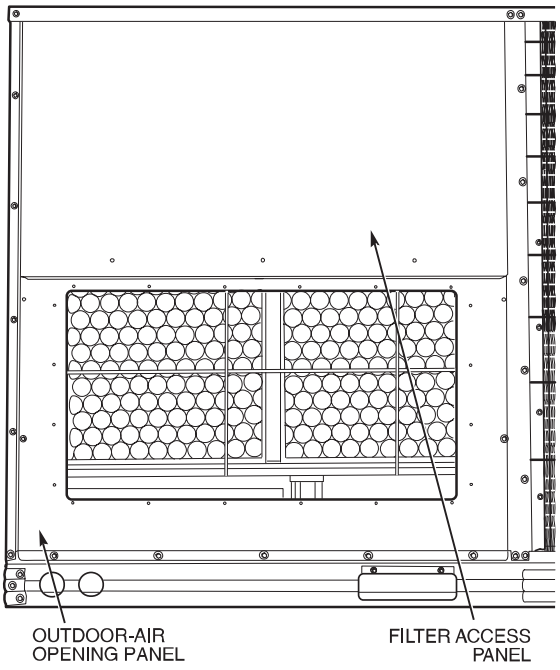


Fig. 11 — Panel Locations

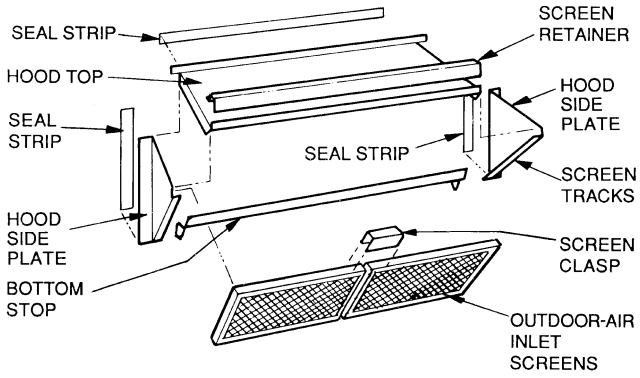


Fig. 12 — Outdoor-Air Hood Details

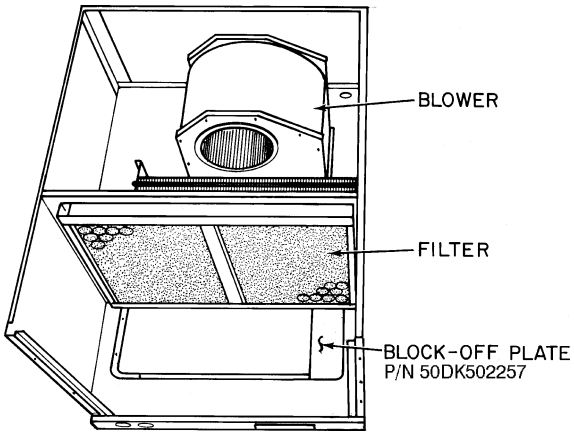


Fig. 13 — Vertical Discharge Block-Off Plate (Size 120 Only)

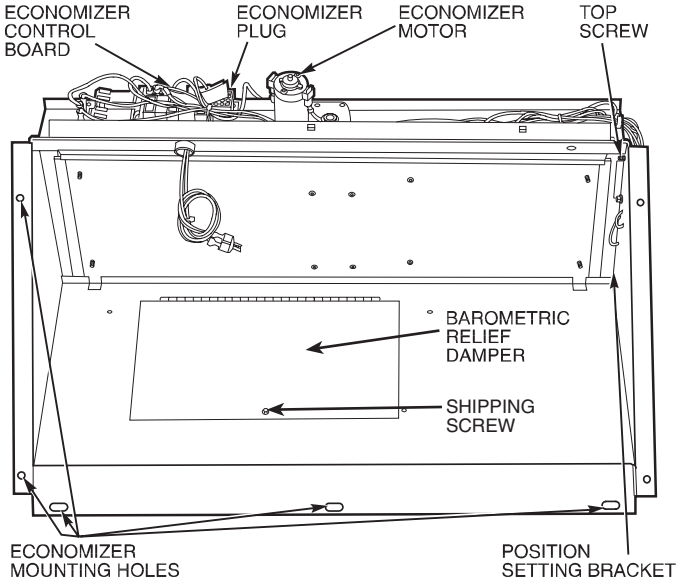


Fig. 14 — Durablade Economizer Installation

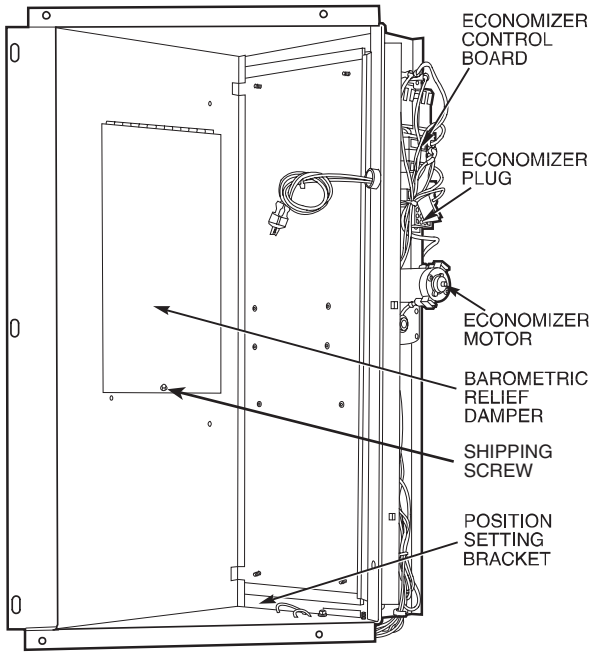


Fig. 15 — Horizontal Discharge Durablade Economizer Installation

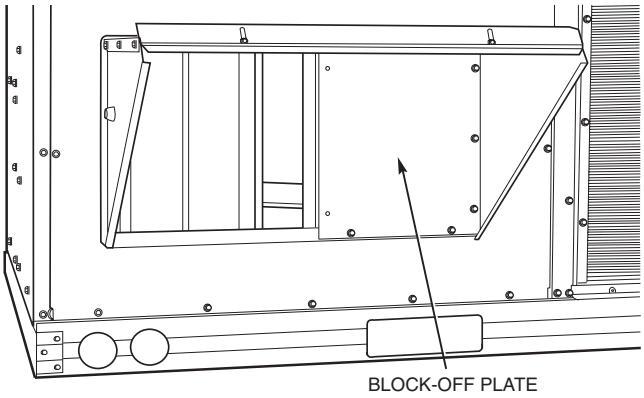
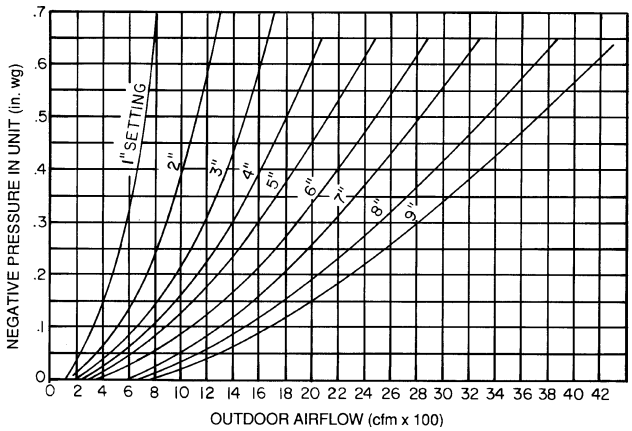


Fig. 16 — Horizontal Discharge Block-Off Plate



Example:

Given —

Negative Pressure . . . . . 0.1 in. wg

Outdoor Airflow . . . . . 1100 cfm

Determine —

Setting = 6

Fig. 17 — Durablade Economizer Damper Minimum Position Setting

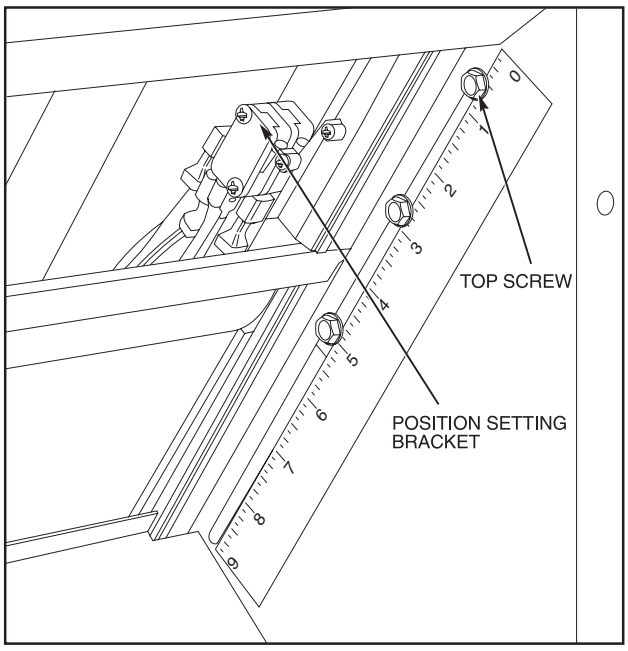


Fig. 18 — Durablade Economizer Minimum Position Damper Setting

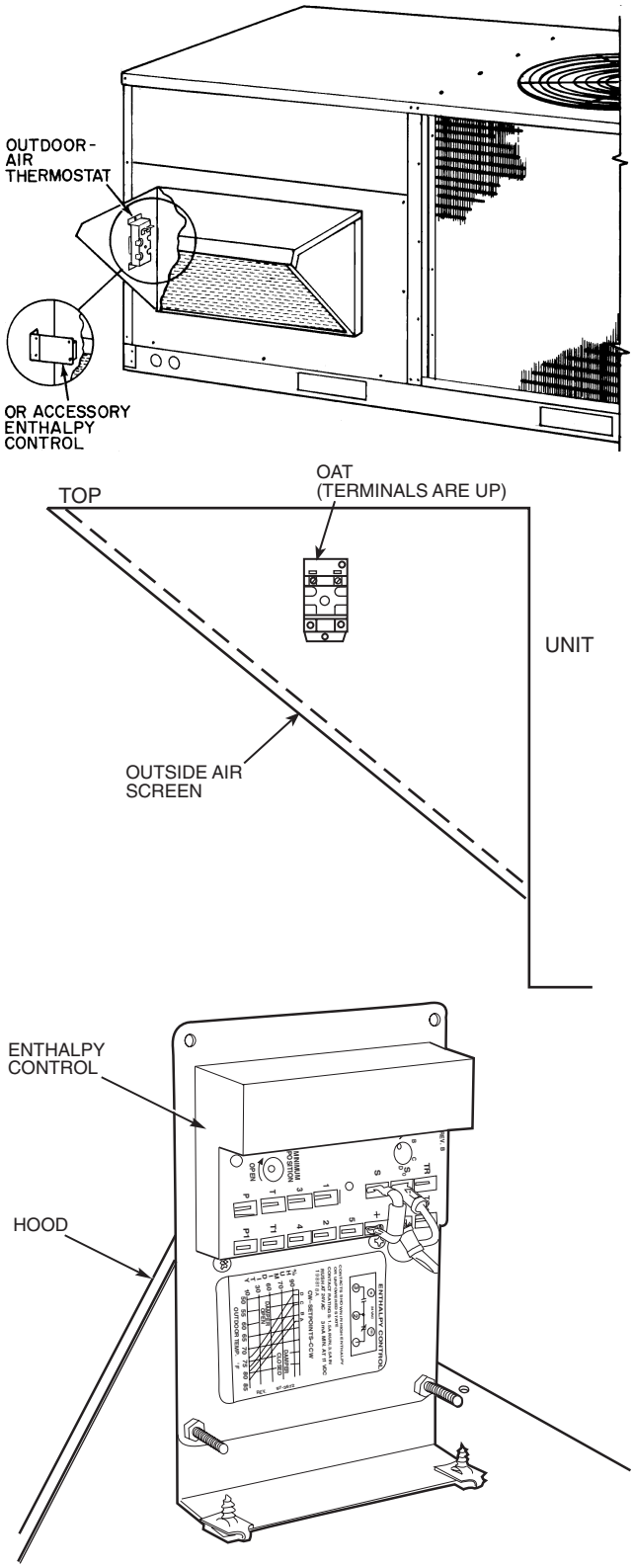


Fig. 19 — Outdoor-Air Thermostat/ Enthalpy Control Installation

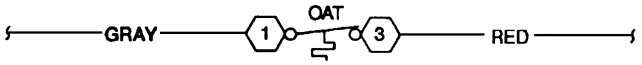


Fig. 20 — Wiring Connections for Outdoor-Air Thermostat

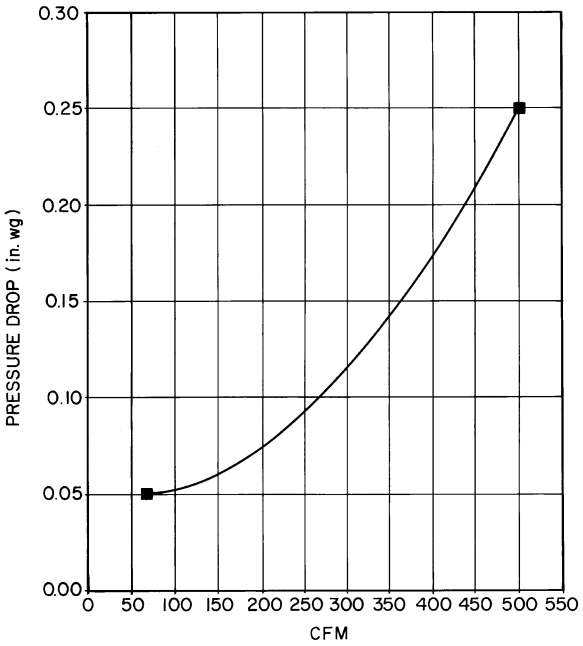


Fig. 21 — Durablade Economizer Barometric Relief Damper Characteristics

C. Optional EconoMi$er

See Fig. 22 for EconoMi$er component locations.

1. To remove the existing unit filter access panel, raise the panel and swing the bottom outward. The panel is now disengaged from the track and can be removed. Remove the indoor coil access panel and discard. See Fig. 23.

   Controller should be mounted in vertical position as shown in Fig. 22.

2. Assemble the hood assembly as follows:

   Remove the EconoMi$er hood from its packaging. Locate the outdoor air opening panel. See Fig. 24. Remove hood assembly shipping brackets located on back (sloped) side of EconoMi$er assembly. These brackets are used to retain hood assembly during shipping only.

3. Install the 1/8 x 3/4 in. seal strip on the exhaust air hood side panels and the bottom bracket. Assemble the exhaust air hood to the outdoor air opening panel as shown in Fig. 24, using the screws provided. *Do not attach hood assembly to unit at this time.*

4. Install the 1/8 x 7/8 in. seal strip on the outdoor air hood top and side panels. Assemble the outdoor air hood to the outdoor air opening panel as shown in Fig. 25, using the screws provided. *Do not attach hood assembly to the unit as this time.*

5. Slide the outdoor air inlet screens into the screen track on the hood side panels. While holding the screens in place, fasten the screen retainer to the hood using the screws provided. Repeat the process for the barometric exhaust air screen. *Do not attach completed (Fig. 26) hood assembly to unit at this time.*

6. Install the return air block-off plate over the return air duct opening. See Fig. 27.

7. Slide the EconoMi$er assembly into the rooftop unit. See Fig. 28 and 29.

NOTE: Be sure to engage rear EconoMi$er flange under tabs in return air opening of the unit base. See Fig. 28.

8. Install the outdoor air block-off plate, then secure the EconoMi$er with the screws provided. See Fig. 27 and 29.

9. Remove and save the 12-pin blue and yellow wire jumper plug from the unit wiring harness located in the upper left corner and insert the EconoMi$er plug. Refer to wiring diagram Fig. 30 and 31. Also refer to Fig. 32 if installing an accessory power exhaust.

10. Remove shipping tape from barometric relief dampers and ensure dampers move freely.

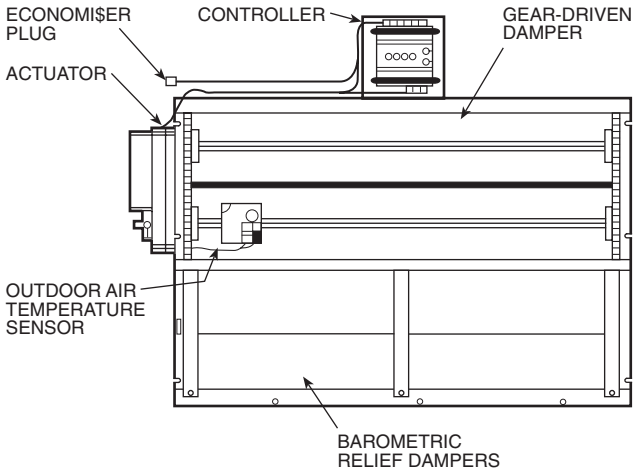


Fig. 22 — EconoMi$er Component Locations

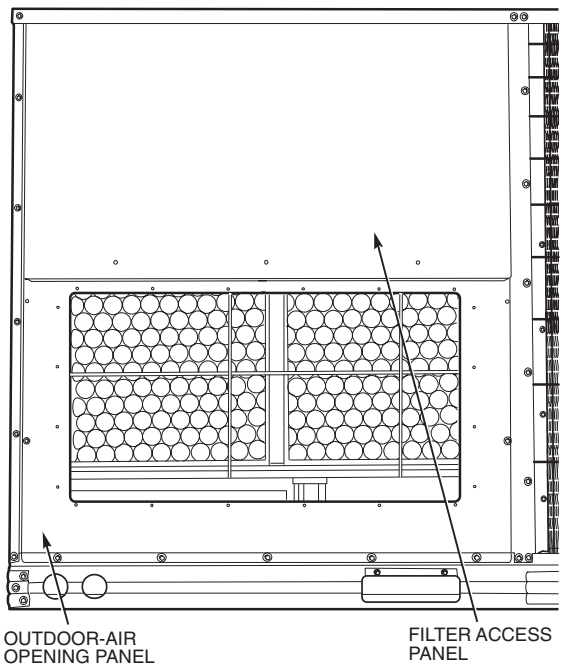


Fig. 23 — Typical Access Panel Locations

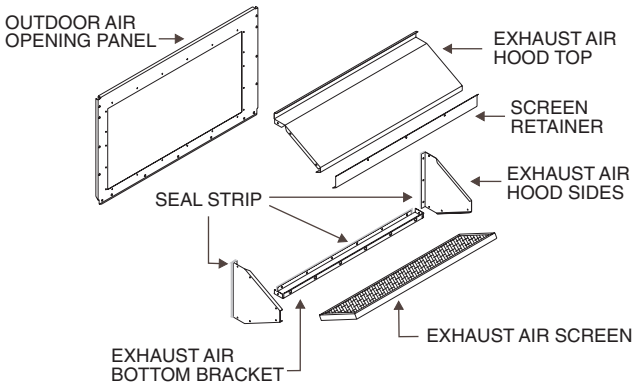


Fig. 24 — Exhaust Air Hood Assembly

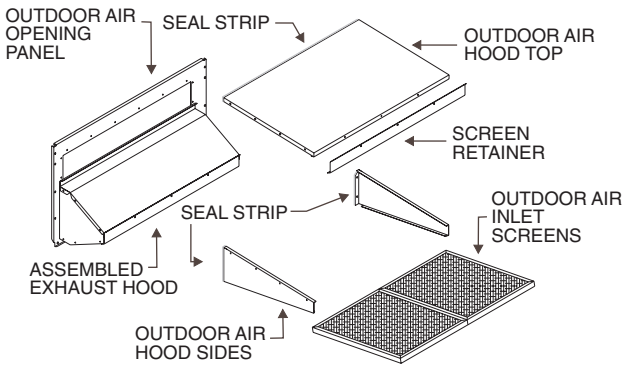


Fig. 25 — Outdoor Air Hood Assembly

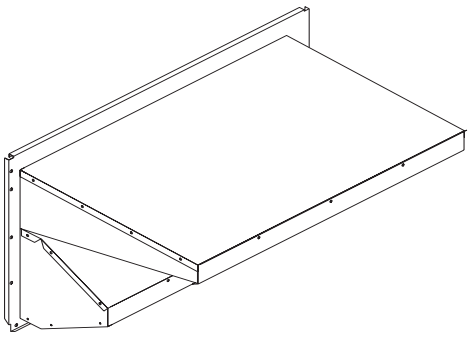


Fig. 26 — Completed Hood Assembly

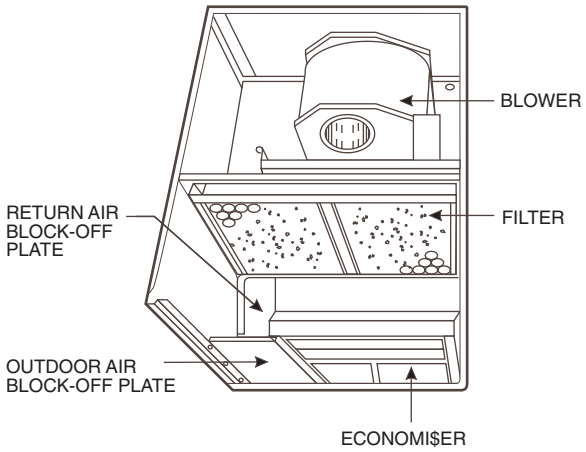


Fig. 27 — Return Air Block-Off Plate Installation

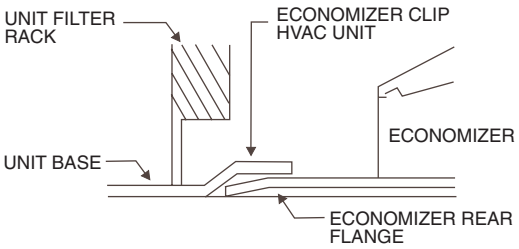


Fig. 28 — Rear EconoMi$er Flange Installation

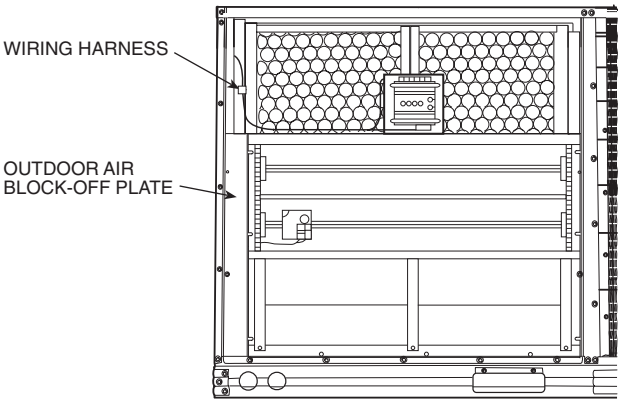


Fig. 29 — EconoMi$er Installed

11. Install the complete hood assembly on the unit and secure using the screws provided.

NOTE: If optional power exhaust is being installed, complete installation of power exhaust at this time. See Fig. 32 for wiring.

12. Remove the indoor fan motor access panel.
13. Mount the supply air temperature sensor to the lower left portion of the indoor blower housing with the two (2) screws provided (see Fig. 33). Connect the violet and pink wires to the corresponding connections on the supply air temperature sensor. Replace the indoor fan motor access panel.

CO_2 Control Set Up

If a CO_2 sensor is not being used, proceed to the next section. If a CO_2 sensor is being used, perform the following:

1. Determine the value at which you want the minimum position of the dampers to begin opening to allow a greater amount of outdoor air to enter. The range is 800 to 1,400 ppm.
2. Locate the CO_2 SP (PPM) potentiometer and adjust to the desired set point. See Fig. 34.

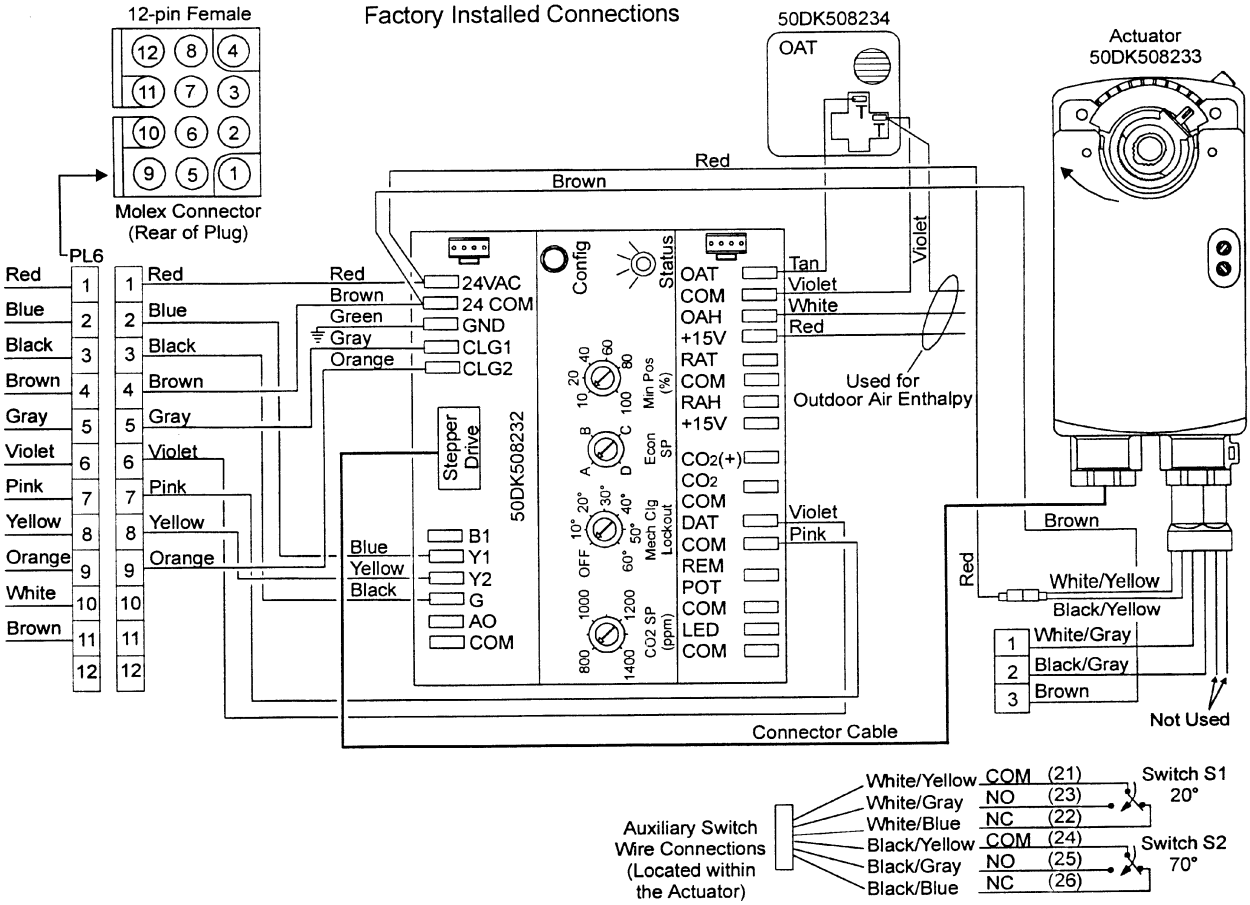


Fig. 30 — EconoMi$er Wiring

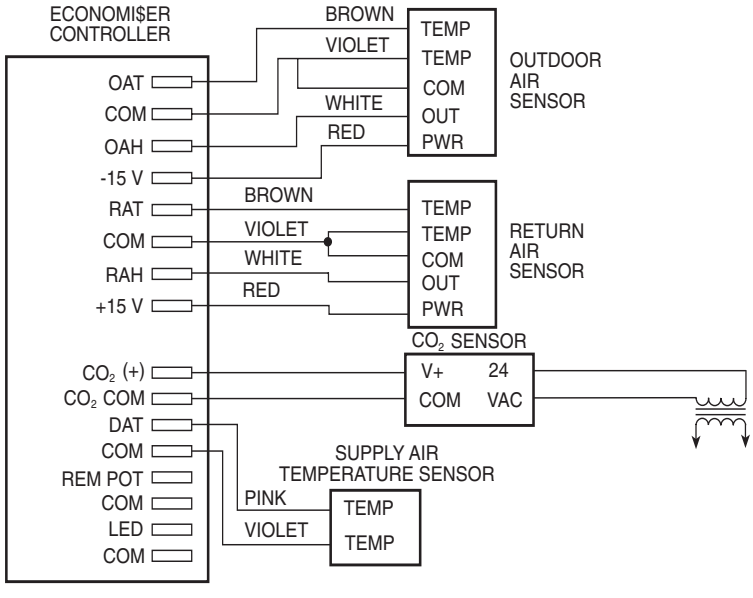


Fig. 31 — EconoMi$er Sensor Wiring

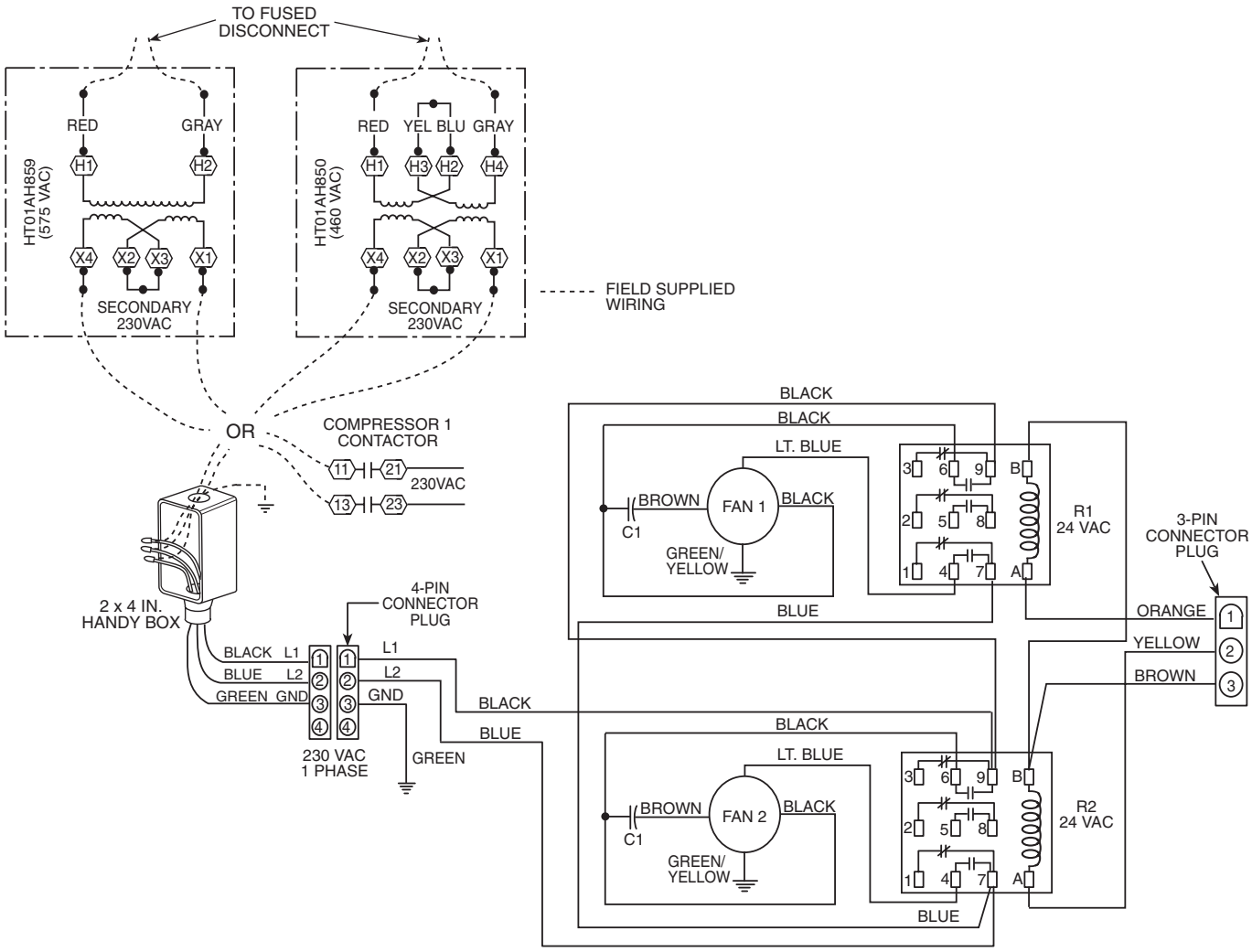


Fig. 32 — Wiring Diagram for Power Exhaust System

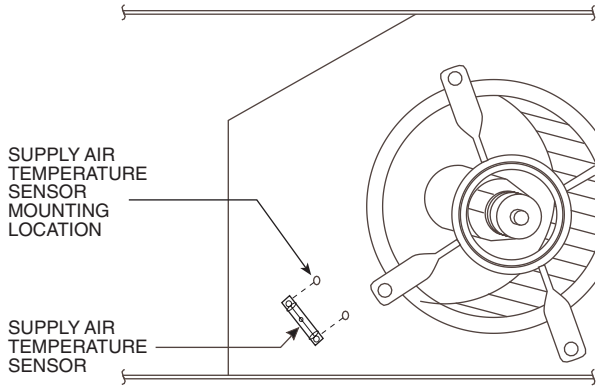


Fig. 33 — Supply Air Sensor Mounting Location

Mechanical Cooling Lockout

Determine the outdoor-air temperature at which you want the mechanical cooling (compressors) to be disabled. Locate the mechanical cooling lockout (MECH CLG LOCKOUT) potentiometer. To disable this feature, turn the potentiometer counterclockwise (CCW) to the OFF position. Otherwise, set the value between 10 and 60 F. Mechanical cooling will not operate when the outdoor-air temperature is below this value. See Fig. 34.

Dry Bulb Changeover Set Up

Determine the dry bulb changeover set point from Table 4. The settings are A, B, C and D. Locate the ECON SP potentiometer and set the dry bulb changeover set point. See Fig. 34. When the OAT is above this set point, the damper is limited to minimum position setting.

Table 4 — Changeover Set Points

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

*Field-installed accessory.

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

Table 5 — Default Potentiometer Settings

POTENTIOMETER	DEFAULT SETTING
CO_2 SP (PPM)	1,000
MECH CLG LOCKOUT	47°
ECON SP	D
MIN POS (%)	20

Ventilation Air (Minimum Position Set Up)

If ventilation air is not required, proceed to Step 5. If ventilation air is required, perform the following:

1. The indoor fan must be on to set the ventilation air. Either put the thermostat in the continuous fan mode or jumper the R and G terminals at the rooftop unit connection board.
2. Locate the minimum position (MIN POS) potentiometer. Turn the potentiometer full CCW to fully close the outdoor air dampers. Turn the potentiometer gradually clockwise (CW) to the desired position. See Fig. 34.
3. Replace the filter access panel. See Fig. 11. Ensure the filter access panel slides along the tracks and is securely engaged.
4. Calculate the minimum airflow across the EconoMi$er.
   a. Calculate % of outside air using the following formula.

      % Outdoor air through EconoMi$er

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

   b. Divide total CFM by percentage outdoor air, this gives outdoor air volume in CFM.
5. Turn on base unit power.

NOTE: The EconoMi$er begins operation three minutes after power up.

⚠ **WARNING:** PERSONAL INJURY HAZARD. Avoid possible injury by keeping fingers away from damper blades.

See Fig. 35 for barometric relief damper characteristics.

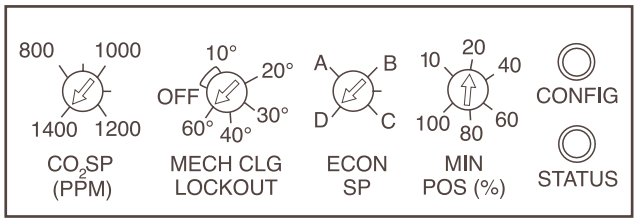


Fig. 34 — EconoMi$er Control Adjustment Potentiometers (Factory Settings)

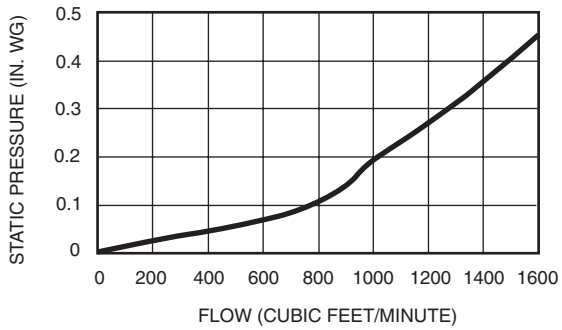


Fig. 35 — Barometric Relief Capacity

VII. STEP 7 — ADJUST INDOOR-FAN SPEED

Adjust indoor-fan speed to meet jobsite requirements.

For units with electric heat, required minimum cfm is 2250 for 548D090, 2550 for 548D102 and 3000 for 548D120 with the following exceptions:

UNIT	UNIT VOLTAGE	HEATER kW	UNIT CONFIG-URATION	REQUIRED MINIMUM CFM
548D120	208/230	42.4	Horizontal	3200
	208/230	50.0	Horizontal	3200
	460	50.0	Horizontal or Vertical	3200
	575	17.0	Horizontal or Vertical	2800
		51.0		2350

Table 6 shows indoor-fan motor data. Table 7 shows fan rpm at motor pulley settings for standard and alternate motors. Refer to Tables 8-13 to determine fan rpm settings. Fan motor pulleys are factory set for speed shown in Table 1.

To change fan speeds:

1. Shut off unit power supply and tag disconnect.
2. Loosen belt by loosening fan motor mounting nuts See Fig. 36 and 37.
3. Loosen movable pulley flange setscrew (see Fig. 38).
4. Screw movable flange toward fixed flange to increase fan rpm or away from fixed flange to decrease speed. Increasing fan rpm increases load on motor. Do not exceed maximum speed specified in Table 1.

5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table 1 for speed change for each full turn of pulley flange).

To align fan and motor pulleys:

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

To adjust belt tension:

1. Loosen fan motor mounting plate nuts.
2. *Units 090,102* — Slide motor mounting plate away from fan scroll for proper belt tension ($^1/_2$-in. deflection with 5 to 10 lbs of force) and tighten mounting nuts with 10 lbs torque (see Fig. 36).

   Unit 120 — Slide motor mounting plate downward to tighten belt tension ($^1/_2$-in. deflection with 5 to 10 lbs of force). Secure motor mounting plate nuts with 10 lbs of torque. See Fig. 37.
3. Adjust bolt and nut on mounting plate to secure motor in fixed position.

Realign 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.

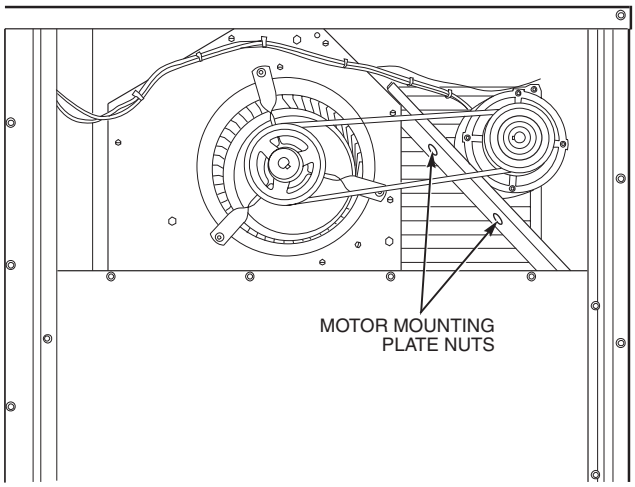


Fig. 36 — Typical Belt-Drive Motor Mounting for Sizes 090 and 102

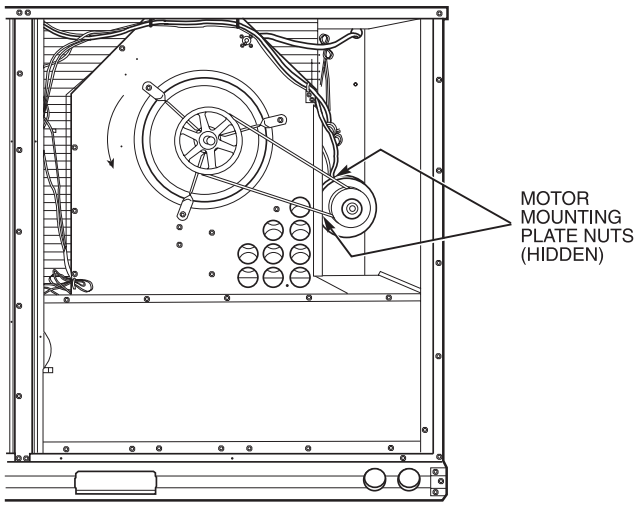


Fig. 37 — Typical Belt-Drive Motor Mounting for Size 120

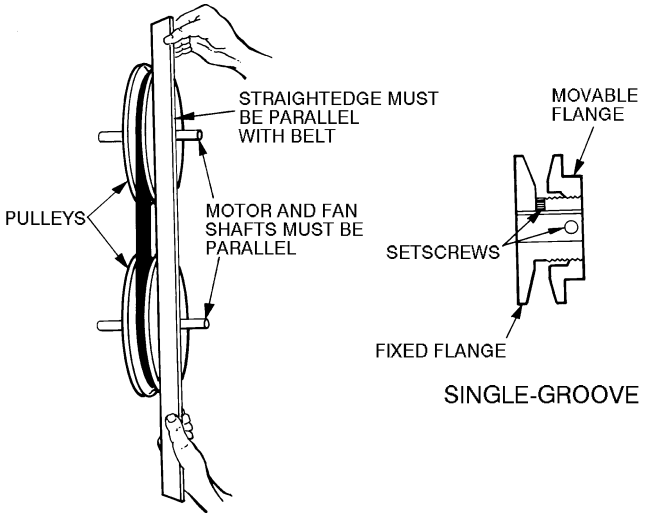


Fig. 38 — Indoor-Fan Pulley Adjustment

Table 6 — indoor-Fan Motor Performance

UNIT 548D	INDOOR-FAN MOTOR	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*	MAXIMUM ACCEPTABLE OPERATING WATTS	MAXIMUM AMP DRAW
090	Standard	208/230	2.40	2120	6.1
		460			2.7
		575			2.7
102	Standard	208/230	2.40	2120	6.1
		460			2.7
		575			2.7
120	Standard	208/230	2.40	2120	6.1
		460			2.7
		575			2.7
	Alternate	208/230	2.90	2615	7.9
		460			3.6
		575			3.6

LEGEND

BHP — Brake Horsepower

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

Table 7 — Fan Rpm at Motor Pulley Settings*

UNIT 548D	MOTOR PULLEY TURNS OPEN										
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
090†	840	815	790	765	740	715	690	665	635	615	590
090**	935	910	885	860	835	810	785	760	735	710	685
102†	935	910	885	860	835	810	785	760	735	710	685
120†	935	910	885	860	835	810	785	760	735	710	685
120††	1085	1060	1035	1010	985	960	935	910	885	860	835

*Approximate fan rpm shown.
†Indicates standard motor and drive package.
** Indicates alternate drive package only.
††Indicates alternate motor and drive package.

Table 8 — Fan Performance 548D090 — Vertical Discharge Units

STANDARD MOTOR (BELT DRIVE)																		
Airflow (Cfm)	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
2250	**511**	**0.52**	**539**	592	0.74	708	659	0.95	875	722	1.19	1072	778	1.43	1275	829	1.68	1491
2300	**518**	**0.55**	**562**	599	0.77	731	665	0.98	899	727	1.22	1097	783	1.47	1310	834	1.72	1526
2400	**534**	**0.61**	**607**	613	0.84	787	677	1.06	965	738	1.30	1165	794	1.55	1378	844	1.81	1604
2500	**549**	**0.67**	**653**	627	0.90	835	690	1.14	1031	750	1.38	1233	805	1.64	1456	855	1.91	1691
2550	**557**	**0.71**	**684**	633	0.94	867	697	1.18	1064	756	1.42	1267	811	1.69	1499	861	1.96	1735
2600	**565**	**0.74**	**708**	639	0.97	891	703	1.22	1097	761	1.46	1301	816	1.74	1543	866	2.01	1779
2700	**581**	**0.81**	**763**	652	1.04	948	717	1.31	1173	773	1.55	1378	827	1.83	1621	878	2.12	1875
2800	597	0.89	827	665	1.12	1014	733	1.40	1250	786	1.66	1473	839	1.93	1709	889	2.23	1971
2900	613	0.97	891	679	1.20	1081	745	1.50	1335	799	1.76	1560	850	2.04	1805	900	2.34	2067
3000	629	1.06	965	694	1.29	1156	759	1.59	1413	812	1.88	1665	862	2.15	1901	911	2.46	2171
3100	646	1.15	1039	709	1.39	1241	772	1.70	1508	825	1.99	1761	875	2.28	2015	923	2.58	2275
3200	662	1.25	1123	724	1.50	1335	785	1.80	1595	840	2.11	1866	887	2.41	2128	934	2.71	2386
3300	679	1.35	1207	740	1.61	1430	798	1.91	1691	854	2.24	1980	900	2.54	2240	946	2.85	2504
3400	696	1.46	1301	756	1.73	1534	811	2.02	1788	868	2.37	2093	914	2.69	2369	959	3.00	2629
3500	712	1.57	1396	771	1.85	1639	824	2.14	1892	881	2.50	2206	928	2.84	2495	971	3.16	2759
3600	729	1.69	1499	787	1.98	1753	839	2.21	2006	894	2.64	2326	942	2.99	2620	984	3.22	2886
3700	746	1.85	1613	803	2.12	1875	854	2.42	2136	907	2.78	2445	956	3.15	2751	997	3.49	3017
3750	755	1.89	1674	811	2.20	1945	862	2.49	2197	914	2.85	2504	963	3.23	2815	—	—	—

STANDARD MOTOR (BELT DRIVE) (cont)												
Airflow (Cfm)	External Static Pressure (in. wg)											
	1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	884	1.97	1744	**937**	**2.33**	**2058**	947	2.66	2343	1022	3.10	2710
2300	885	2.00	1770	**939**	**2.36**	**2084**	979	2.69	2369	1025	3.12	2727
2400	892	2.08	1840	**944**	**2.40**	**2119**	987	2.76	2428	1039	3.20	2791
2500	902	2.18	1927	949	2.48	2188	1002	2.84	2495	1041	3.25	2831
2550	908	2.24	1980	953	2.53	2232	1003	2.87	2521	1045	3.28	2854
2600	913	2.29	2023	957	2.58	2275	1004	2.91	2554	1050	3.31	2878
2700	924	2.40	2120	967	2.70	2377	1010	3.01	2637	1056	3.37	2925
2800	935	2.52	2223	978	2.62	2479	1019	3.13	2735	1061	3.47	3002
2900	946	2.65	2335	989	2.96	2595	1030	3.27	2847	—	—	—
3000	957	2.78	2445	1000	3.09	2702	1040	3.41	2956	—	—	—
3100	968	2.91	2554	1011	3.24	2832	—	—	—	—	—	—
3200	980	3.04	2661	1022	3.38	2933	—	—	—	—	—	—
3300	991	3.18	2775	—	—	—	—	—	—	—	—	—
3400	1003	3.32	2886	—	—	—	—	—	—	—	—	—
3500	1014	3.48	3009	—	—	—	—	—	—	—	—	—
3600	—	—	—	—	—	—	—	—	—	—	—	—
3700	—	—	—	—	—	—	—	—	—	—	—	—
3750	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

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

NOTES:

1. **Boldface** indicates field-supplied drive is required. (See Note 7.)
2. indicates alternate drive is required.
3. indicates field-supplied motor and drive are required.
4. Maximum usable watts input is 2120 and maximum continuous bhp is 2.40. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Values include losses for filters, unit casing, and wet coils.
6. Use of a field-supplied motor may affect wire sizing. Contact your representative to verify.
7. Standard motor drive range: 590 to 840 rpm. Alternate motor drive range: 685 to 935 rpm. All other rpms require field-supplied drive.
8. Interpolation is permissible. Do not extrapolate.

Table 9 — Fan Performance 548D102 — Vertical Discharge Units

STANDARD MOTOR (BELT DRIVE)																		
Airflow (Cfm)	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
2550	**557**	**0.71**	**684**	**633**	**0.94**	**867**	697	1.18	1064	756	1.42	1267	811	1.69	1499	861	1.96	1735
2600	**565**	**0.74**	**708**	**639**	**0.97**	**891**	703	1.22	1097	761	1.46	1301	816	1.74	1543	866	2.01	1779
2700	**581**	**0.81**	**763**	**652**	**1.04**	**948**	717	1.31	1173	773	1.55	1378	827	1.83	1621	878	2.12	1875
2800	**597**	**0.89**	**827**	**665**	**1.12**	**1014**	733	1.40	1250	786	1.66	1473	839	1.93	1709	889	2.23	1971
2900	**613**	**0.97**	**891**	**679**	**1.20**	**1081**	745	1.50	1335	799	1.76	1560	850	2.04	1805	900	2.34	2067
3000	**629**	**1.06**	**965**	694	1.29	1156	759	1.59	1413	812	1.88	1665	862	2.15	1901	911	2.46	2171
3100	**646**	**1.15**	**1039**	709	1.39	1241	772	1.70	1508	825	1.99	1761	875	2.28	2015	923	2.58	2275
3200	**662**	**1.25**	**1123**	724	1.50	1335	785	1.80	1595	840	2.11	1866	887	2.41	2128	934	2.71	2386
3300	**679**	**1.35**	**1207**	740	1.61	1430	798	1.91	1691	854	2.24	1980	900	2.54	2240	946	2.85	2504
3400	696	1.46	1301	756	1.73	1534	811	2.02	1788	868	2.37	2093	914	2.69	2369	959	3.00	2629
3500	712	1.57	1396	771	1.85	1639	824	2.14	1892	881	2.50	2206	928	2.84	2495	971	3.16	2759
3600	729	1.69	1499	787	1.98	1753	839	2.27	2006	894	2.64	2326	942	2.99	2620	984	3.32	2886
3700	746	1.82	1613	803	2.12	1875	854	2.42	2136	907	2.78	2445	956	3.15	2751	997	3.49	3017
3750	755	1.89	1674	811	2.20	1945	862	2.49	2197	914	2.85	2504	963	3.23	2815	—	—	—
3800	763	1.95	1726	819	2.27	2006	869	2.56	2257	920	2.92	2562	970	3.31	2878	—	—	—
3900	780	2.09	1849	835	2.42	2136	884	2.72	2394	933	3.07	2686	983	3.48	3009	—	—	—
4000	796	2.23	1971	851	2.56	2257	900	2.89	2537	946	3.23	2815	—	—	—	—	—	—
4100	813	2.39	2110	867	2.74	2411	915	3.06	2678	960	3.40	2948	—	—	—	—	—	—
4200	830	2.55	2249	883	2.91	2554	931	3.24	2823	—	—	—	—	—	—	—	—	—
4250	839	2.63	2317	892	3.00	2629	939	3.34	2902	—	—	—	—	—	—	—	—	—

STANDARD MOTOR (BELT DRIVE) (cont)												
Airflow (Cfm)	External Static Pressure (in. wg)											
	1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2550	908	2.24	1980	953	2.53	2232	1003	2.87	2521	1045	3.28	2854
2600	913	2.29	2023	957	2.58	2275	1004	2.91	2554	1050	3.31	2878
2700	924	2.40	2120	967	2.70	2377	1010	3.01	2637	1056	3.37	2925
2800	935	2.52	2223	978	2.62	2479	1019	3.13	2735	1061	3.41	3002
2900	946	2.65	2335	989	2.96	2595	1030	3.27	2847	—	—	—
3000	957	2.78	2445	1000	3.09	2702	1040	3.41	2956	—	—	—
3100	968	2.91	2554	1011	3.24	2832	—	—	—	—	—	—
3200	980	3.04	2661	1022	3.38	2933	—	—	—	—	—	—
3300	991	3.18	2775	—	—	—	—	—	—	—	—	—
3400	1003	3.52	2886	—	—	—	—	—	—	—	—	—
3500	1014	3.48	3009	—	—	—	—	—	—	—	—	—
3600	—	—	—	—	—	—	—	—	—	—	—	—
3700	—	—	—	—	—	—	—	—	—	—	—	—
3750	—	—	—	—	—	—	—	—	—	—	—	—
3800	—	—	—	—	—	—	—	—	—	—	—	—
3900	—	—	—	—	—	—	—	—	—	—	—	—
4000	—	—	—	—	—	—	—	—	—	—	—	—
4100	—	—	—	—	—	—	—	—	—	—	—	—
4200	—	—	—	—	—	—	—	—	—	—	—	—
4250	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

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

NOTES:

1. **Boldface** indicates field-supplied drive is required. (See Note 6.)
2. ▬ indicates field-supplied motor and drive are required.
3. Maximum usable watts input is 2120 and maximum continuous bhp is 2.40. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
4. Values include losses for filters, unit casing, and wet coils.
5. Use of a field-supplied motor may affect wire sizing. Contact your representative to verify.
6. Standard motor drive range: 685 to 935 rpm. All other rpms require field-supplied drive.
7. Interpolation is permissible. Do not extrapolate.

Table 10 — Fan Performance 548D120 — Vertical Discharge Units

548D120 (10 TONS) — STANDARD AND ALTERNATE MOTORS (BELT DRIVE)																		
Airflow (Cfm	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
3000	**532**	**0.64**	**630**	**605**	**0.81**	**763**	**670**	**0.97**	**891**	725	1.12	1014	778	1.28	1148	825	1.43	1275
3100	**544**	**0.70**	**677**	**616**	**0.86**	**803**	**680**	**1.03**	**940**	735	1.20	1081	787	1.36	1216	835	1.52	1353
3200	**557**	**0.75**	**716**	**628**	**0.93**	**859**	690	1.10	998	746	1.28	1148	796	1.44	1284	844	1.61	1430
3300	**570**	**0.81**	**763**	**639**	**0.99**	**907**	700	1.18	1064	757	1.36	1216	805	1.52	1353	854	1.70	1508
3400	**583**	**0.88**	**818**	**651**	**1.06**	**965**	711	1.25	1123	767	1.44	1284	815	1.61	1430	863	1.79	1587
3500	**596**	**0.94**	**867**	**663**	**1.14**	**1031**	721	1.33	1190	777	1.52	1353	826	1.71	1517	871	1.88	1665
3600	**609**	**1.01**	**924**	**674**	**1.22**	**1097**	732	1.42	1267	787	1.61	1430	836	1.80	1595	880	1.98	1753
3700	**622**	**1.09**	**989**	686	1.30	1165	744	1.50	1335	797	1.70	1508	847	1.91	1691	890	2.09	1849
3800	**635**	**1.16**	**1047**	698	1.39	1241	755	1.59	1413	808	1.80	1595	857	2.01	1779	901	2.20	1945
3900	**649**	**1.25**	**1123**	713	1.48	1318	767	1.68	1491	818	1.90	1683	867	2.11	1866	912	2.32	2050
4000	**662**	**1.33**	**1190**	722	1.57	1396	778	1.78	1578	829	2.01	1779	878	2.22	1962	922	2.44	2203
4100	**675**	**1.42**	**1267**	734	1.67	1482	790	1.89	1674	839	2.12	1875	888	2.33	2058	933	2.56	2309
4200	689	1.52	1353	746	1.77	1569	801	1.99	1761	851	2.23	1971	898	2.45	2212	943	2.69	2424
4300	702	1.61	1430	759	1.88	1665	813	2.11	1866	862	2.34	2067	908	2.58	2326	953	2.81	2533
4400	715	1.72	1526	772	1.99	1761	825	2.22	1962	873	2.46	2221	919	2.71	2442	963	2.94	2651
4500	729	1.83	1621	785	2.10	1858	837	2.35	2076	885	2.59	2335	929	2.85	2569	973	3.08	2782
4600	742	1.94	1718	797	2.22	1962	848	2.48	2238	896	2.72	2451	940	2.98	2688	984	3.22	2914
4700	756	2.06	1823	810	2.34	2067	860	2.61	2353	908	2.86	2578	951	3.12	2727	994	3.38	3068
4800	770	2.18	1927	823	2.46	2221	872	2.75	2505	919	3.00	2707	963	3.27	2847	1003	3.43	3202
4900	783	2.31	2041	836	2.60	2344	884	2.89	2605	931	3.14	2838	974	3.41	2956	1013	3.59	3349
5000	797	2.44	2203	849	2.73	2460	897	3.04	2661	943	3.30	2870	984	3.44	3211	1023	3.75	3501

548D120 (10 TONS) — STANDARD AND ALTERNATE MOTORS (BELT DRIVE) (cont)												
Airflow (Cfm)	External Static Pressure (in. wg)											
	1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	874	1.60	1422	926	1.82	1613	**974**	**2.11**	**1920**	1012	2.41	2134
3100	880	1.68	1491	933	1.87	1656	**983**	**2.16**	**1963**	1017	2.44	2177
3200	888	1.77	1569	934	1.94	1718	**988**	**2.18**	**1980**	1025	2.47	2230
3300	897	1.86	1648	**940**	**2.03**	**1853**	**989**	**2.24**	**2031**	1032	2.53	2282
3400	907	1.97	1744	**947**	**2.14**	**1946**	**991**	**2.32**	**2099**	1038	2.57	2318
3500	916	2.07	1831	**956**	**2.25**	**2039**	997	2.43	2195	1043	2.64	2380
3600	926	2.18	1927	966	2.41	2134	1004	2.54	2291	1045	2.74	2478
3700	934	2.28	2015	976	2.48	2238	1013	2.66	2397	1051	2.85	2569
3800	943	2.41	2160	985	2.60	2334	1023	2.79	2514	1059	2.98	2688
3900	952	2.51	2265	994	2.72	2451	1032	2.92	2633	1068	3.12	2819
4000	962	2.63	2371	1003	2.84	2560	1042	3.06	2763	1078	3.26	2952
4100	973	2.77	2496	1011	2.97	2679	1051	3.20	2895	1087	3.41	3097
4200	983	2.91	2624	1021	3.11	2810	1060	3.34	3029	1090	3.51	3276
4300	994	3.05	2754	1031	3.25	2943	1068	3.48	3166	1097	3.70	3453
4400	1004	3.19	2885	1042	3.41	3097	1080	3.63	3388	1105	3.91	3642
4500	1015	3.33	2020	1051	3.45	3218	1090	3.75	3493	1112	4.12	3843
4600	1025	3.48	3166	1060	3.61	3369	1100	3.92	3655	1119	4.35	4057
4700	1037	3.58	3335	1070	3.84	3325	1111	4.10	3822	1126	4.59	4284
4800	1048	3.75	3494	1080	3.95	3686	1121	4.28	3995	1133	4.85	4523
4900	1060	3.92	3659	1089	4.13	3854	1132	4.48	4174	1140	5.12	4775
5000	1072	4.11	3830	1099	4.32	4027	1144	4.67	4359	1147	5.40	5040

LEGEND

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

NOTES:

1. **Boldface** indicates field-supplied or alternate (as appropriate) drive is required. (See Note 7.)
2. indicates alternate motor and drive are required.
3. indicates field-supplied motor and drive are required.
4. Maximum usable watts input is 2120 with standard motor and 2615 with alternate motor. Maximum continuous bhp is 2.40 with standard motor and 2.90 with alternate motor. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Values include losses for filters, unit casing, and wet coils.
6. Use of a field-supplied motor may affect wire sizing. Contact your representative to verify.
7. Standard motor drive range: 685 to 935 rpm. Alternate motor drive range: 835 to 1085 rpm. All other rpms require field-supplied drive.
8. Interpolation is permissible. Do not extrapolate.

Table 11 — Fan Performance 548D090 — Horizontal Discharge Units

STANDARD MOTOR (BELT DRIVE)															
Airflow (Cfm)	External Static Pressure (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	**465**	**0.43**	**473**	**554**	**0.64**	**630**	630	0.86	803	695	1.09	989	757	1.34	1199
2300	**471**	**0.45**	**487**	**559**	**0.66**	**646**	635	0.89	827	699	1.12	1014	760	1.37	1224
2400	**482**	**0.50**	**524**	**569**	**0.71**	**684**	645	0.95	875	708	1.18	1064	768	1.44	1284
2500	**494**	**0.54**	**554**	**581**	**0.76**	**723**	654	1.01	924	717	1.25	1123	776	1.51	1344
2550	**501**	**0.57**	**577**	**587**	**0.79**	**747**	659	1.05	956	722	1.29	1156	780	1.55	1378
2660	**507**	**0.59**	**592**	592	0.82	771	663	1.08	981	727	1.32	1182	784	1.58	1404
2700	**520**	**0.65**	**638**	604	0.89	827	672	1.14	1031	737	1.40	1250	793	1.66	1473
2800	**533**	**0.71**	**684**	615	0.95	875	683	1.20	1081	747	1.49	1327	802	1.75	1552
2900	**546**	**0.77**	**731**	626	1.02	932	693	1.27	1140	756	1.57	1396	813	1.84	1630
3000	**559**	**0.83**	**779**	637	1.09	989	704	1.35	1207	765	1.66	1473	823	1.94	1718
3100	**572**	**0.90**	**835**	648	1.17	1056	715	1.43	1275	775	1.74	1543	832	2.05	1814
3200	**585**	**0.96**	**883**	660	1.24	1114	727	1.52	1353	785	1.83	1321	841	2.15	1901
3300	598	1.03	940	671	1.32	1182	739	1.62	1439	795	1.91	1691	851	2.26	1997
3400	610	1.10	998	682	1.41	1258	750	1.72	1526	806	2.01	1779	860	2.36	2084
3500	623	1.17	1056	694	1.50	1335	761	1.82	1613	817	2.11	1866	870	2.47	2180
3600	636	1.25	1123	707	1.60	1422	772	1.93	1709	828	2.23	1971	880	2.57	2266
3700	649	1.33	1190	720	1.71	1517	783	2.03	1796	840	2.35	2076	890	2.69	2369
3750	655	1.37	1224	727	1.77	1569	789	2.09	1849	846	2.42	2136	896	2.75	2420

STANDARD MOTOR (BELT DRIVE) (cont)															
Airflow (Cfm)	External Static Pressure (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2250	810	1.62	1439	850	1.91	1691	873	2.20	1945	883	2.50	2206	895	2.78	2445
2300	816	1.65	1465	859	1.94	1718	888	2.24	1980	903	2.55	2249	911	2.85	2504
2400	824	1.72	1526	872	2.01	1779	909	2.32	2050	931	2.64	2326	935	2.96	2595
2500	832	1.79	1587	882	2.09	1849	925	2.40	2119	955	2.72	2394	972	3.06	2678
2550	836	1.83	1621	887	2.13	1884	931	2.45	2162	964	2.77	2436	986	3.11	2718
2660	839	1.87	1656	891	2.17	1919	936	2.49	2197	973	2.82	2479	999	3.16	2759
2700	846	1.95	1726	898	2.26	1997	946	2.58	2275	987	2.91	2554	1019	3.26	2839
2800	855	2.04	1805	906	2.35	2076	954	2.67	2352	997	3.01	2637	1034	3.36	2917
2900	863	2.13	1884	913	2.44	2154	961	2.77	2436	1006	3.12	2727	—	—	—
3000	872	2.22	1962	921	2.54	2240	969	2.88	2529	1014	3.22	2807	—	—	—
3100	882	2.33	2058	930	2.65	2335	976	2.99	2620	1021	3.34	2902	—	—	—
3200	892	2.45	2162	939	2.76	2428	984	3.10	2710	—	—	—	—	—	—
3300	902	2.57	2266	948	2.88	2529	993	3.21	2799	—	—	—	—	—	—
3400	912	2.69	2369	958	3.01	2637	1002	3.34	2902	—	—	—	—	—	—
3500	921	2.82	2479	968	3.15	2751	—	—	—	—	—	—	—	—	—
3600	930	2.95	2587	978	3.29	2862	—	—	—	—	—	—	—	—	—
3700	940	3.07	2686	—	—	—	—	—	—	—	—	—	—	—	—
3750	945	3.14	2743	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

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

NOTES:

1. **Boldface** indicates field-supplied drive is required. (See Note 7.)
2. indicates alternate drive is required.
3. indicates field-supplied motor and drive are required.
4. Maximum usable watts input is 2120 and maximum continuous bhp is 2.40. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Values include losses for filters, unit casing, and wet coils.
6. Use of a field-supplied motor may affect wire sizing. Contact your representative to verify.
7. Standard motor drive range: 590 to 840 rpm. Alternate motor drive range: 685 to 935 rpm. All other rpms require field-supplied drive.
8. Interpolation is permissible. Do not extrapolate.

Table 12 — Fan Performance 548D102 — Horizontal Discharge Units

STANDARD MOTOR (BELT DRIVE)															
Airflow (Cfm)	External Static Pressure (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2550	**501**	**0.57**	**577**	**587**	**0.79**	**747**	**659**	**1.05**	**956**	722	1.29	1156	780	1.55	1378
2660	**507**	**0.59**	**592**	**592**	**0.82**	**771**	**663**	**1.08**	**981**	727	1.32	1182	784	1.58	1404
2700	**520**	**0.65**	**638**	**604**	**0.89**	**827**	**672**	**1.14**	**1031**	737	1.40	1250	793	1.66	1473
2800	**533**	**0.71**	**684**	**615**	**0.95**	**875**	**683**	**1.20**	**1081**	747	1.49	1327	802	1.75	1552
2900	**546**	**0.77**	**731**	**626**	**1.02**	**932**	693	1.27	1140	756	1.57	1396	813	1.84	1630
3000	**559**	**0.83**	**779**	**637**	**1.09**	**989**	704	1.35	1207	765	1.66	1473	823	1.94	1718
3100	**572**	**0.90**	**835**	**648**	**1.17**	**1056**	715	1.43	1275	775	1.74	1543	832	2.05	1814
3200	**585**	**0.96**	**883**	**660**	**1.24**	**1114**	727	1.52	1353	785	1.83	1321	841	2.15	1901
3300	**598**	**1.03**	**940**	**671**	**1.32**	**1182**	739	1.62	1439	795	1.91	1691	851	2.26	1997
3400	**610**	**1.10**	**998**	**682**	**1.41**	**1258**	750	1.72	1526	806	2.01	1779	860	2.36	2084
3500	**623**	**1.17**	**1056**	694	1.50	1335	761	1.82	1613	817	2.11	1866	870	2.47	2180
3600	**636**	**1.25**	**1123**	707	1.60	1422	772	1.93	1709	828	2.23	1971	880	2.57	2266
3700	**649**	**1.33**	**1190**	720	1.71	1517	783	2.03	1796	840	2.35	2076	890	2.69	2369
3750	**655**	**1.37**	**1224**	727	1.77	1569	789	2.09	1849	846	2.42	2136	896	2.75	2420
3800	**661**	**1.41**	**1258**	733	1.82	1613	795	2.15	1901	852	2.48	2188	901	2.80	2462
3900	**674**	**1.49**	**1327**	746	1.93	1709	806	2.26	1997	863	2.61	2300	912	2.93	2571
4000	687	1.57	1396	759	2.05	1814	817	2.38	2102	874	2.75	2420	923	3.08	2694
4100	699	1.60	1473	772	2.17	1919	828	2.50	2206	885	2.88	2529	935	3.23	2815
4200	712	1.75	1552	785	2.30	2032	840	2.64	2326	897	3.03	2653	947	3.39	2940
4250	719	1.80	1595	792	2.37	2093	846	2.71	2386	903	3.10	2710	—	—	—

STANDARD MOTOR (BELT DRIVE) (cont)															
Airflow (Cfm)	External Static Pressure (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
2550	836	1.83	1621	887	2.13	1884	931	2.45	2162	964	2.77	2436	986	3.11	2718
2660	839	1.87	1656	891	2.17	1919	936	2.49	2197	973	2.82	2479	999	3.16	2759
2700	846	1.95	1726	898	2.26	1997	946	2.58	2275	987	2.91	2554	1019	3.26	2839
2800	855	2.04	1805	906	2.35	2076	954	2.67	2352	997	3.01	2637	1034	3.36	2917
2900	863	2.13	1884	913	2.44	2154	961	2.77	2436	1006	3.12	2727	—	—	—
3000	872	2.22	1962	921	2.54	2240	969	2.88	2529	1014	3.22	2807	—	—	—
3100	882	2.33	2058	930	2.65	2335	976	2.99	2620	1021	3.34	2902	—	—	—
3200	892	2.45	2162	939	2.76	2428	984	3.10	2710	—	—	—	—	—	—
3300	902	2.57	2266	948	2.88	2529	993	3.21	2799	—	—	—	—	—	—
3400	912	2.69	2369	958	3.01	2637	1002	3.34	2902	—	—	—	—	—	—
3500	921	2.82	2479	968	3.15	2751	—	—	—	—	—	—	—	—	—
3600	930	2.95	2587	978	3.29	2862	—	—	—	—	—	—	—	—	—
3700	940	3.07	2686	—	—	—	—	—	—	—	—	—	—	—	—
3750	945	3.14	2743	—	—	—	—	—	—	—	—	—	—	—	—
3800	949	3.20	2781	—	—	—	—	—	—	—	—	—	—	—	—
3900	959	3.33	2894	—	—	—	—	—	—	—	—	—	—	—	—
4000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4250	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

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

NOTES:

1. **Boldface** indicates field-supplied drive is required. (See Note 6.)
2. ▭ indicates field-supplied motor and drive are required.
3. Maximum usable watts input is 2120 and maximum continuous bhp is 2.40. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
4. Values include losses for filters, unit casing, and wet coils.
5. Use of a field-supplied motor may affect wire sizing. Contact your representative to verify.
6. Standard motor drive range: 685 to 935 rpm. All other rpms require field-supplied drive.
7. Interpolation is permissible. Do not extrapolate.

Table 13 — Fan Performance 548D120 — Horizontal Discharge Units

STANDARD AND ALTERNATE MOTORS (BELT DRIVE)															
Airflow (Cfm)	External Static Pressure (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	**484**	**0.55**	**562**	**560**	**0.70**	**677**	**631**	**0.87**	**810**	690	1.03	940	747	1.20	1081
3100	**495**	**0.61**	**607**	**570**	**0.76**	**723**	**638**	**0.92**	**851**	699	1.10	998	755	1.27	1140
3200	**505**	**0.66**	**646**	**579**	**0.81**	**763**	**646**	**0.98**	**899**	708	1.16	1047	761	1.34	1199
3300	**516**	**0.72**	**692**	**589**	**0.87**	**810**	**655**	**1.05**	**956**	717	1.23	1106	767	1.40	1250
3400	**527**	**0.78**	**739**	**599**	**0.93**	**859**	**664**	**1.11**	**1006**	724	1.30	1165	775	1.48	1318
3500	**537**	**0.85**	**795**	**609**	**0.99**	**907**	**672**	**1.18**	**1064**	731	1.36	1216	784	1.56	1387
3600	**548**	**0.92**	**851**	**619**	**1.05**	**956**	**680**	**1.24**	**1114**	738	1.43	1275	794	1.64	1456
3700	**560**	**1.00**	**916**	**629**	**1.12**	**1014**	688	1.31	1173	747	1.51	1344	802	1.73	1534
3800	**571**	**1.08**	**981**	**639**	**1.19**	**1072**	698	1.39	1241	756	1.60	1422	810	1.81	1604
3900	**582**	**1.16**	**1047**	**649**	**1.27**	**1140**	708	1.47	1310	764	1.69	1499	816	1.89	1674
4000	**593**	**1.25**	**1123**	**659**	**1.35**	**1207**	717	1.56	1387	773	1.78	1578	823	1.98	1753
4100	**605**	**1.35**	**1207**	**670**	**1.44**	**1284**	727	1.65	1465	781	1.86	1648	832	2.08	1840
4200	**616**	**1.45**	**1292**	**680**	**1.53**	**1361**	737	1.74	1543	789	1.95	1726	841	2.18	1927
4300	**628**	**1.56**	**1387**	690	1.63	1447	747	1.83	1621	798	2.05	1814	849	2.30	2032
4400	**639**	**1.67**	**1482**	701	1.73	1534	757	1.92	1700	807	2.16	1910	858	2.41	2177
4500	**651**	**1.78**	**1578**	712	1.84	1630	767	2.02	1788	817	2.27	2006	866	2.51	2265
4600	**662**	**1.91**	**1691**	722	1.95	1726	777	2.13	1884	827	2.38	2102	874	2.62	2362
4700	**674**	**2.03**	**1796**	733	2.07	1831	787	2.24	1980	836	2.50	2256	882	2.73	2460
4800	686	2.17	1919	744	2.20	1945	797	2.36	2084	846	2.62	2362	891	2.85	2569
4900	698	2.31	2041	755	2.33	2058	808	2.48	2238	856	2.73	2460	900	2.99	2698
5000	710	2.45	2212	766	2.47	2230	818	2.61	2353	866	2.86	2578	910	3.12	2819

STANDARD AND ALTERNATE MOTORS (BELT DRIVE) (cont)															
Airflow (Cfm)	External Static Pressure (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
3000	800	1.38	1233	850	1.52	1353	879	1.38	1233	925	1.81	1604	**964**	**1.92**	**1761**
3100	805	1.44	1284	857	1.63	1447	896	1.66	1473	935	1.93	1709	**975**	**1.98**	**1811**
3200	812	1.51	1344	862	1.71	1517	908	1.85	1639	**944**	**2.01**	**1836**	**984**	**2.09**	**1903**
3300	819	1.59	1413	867	1.78	1578	915	1.98	1753	**952**	**2.11**	**1920**	**993**	**2.22**	**2014**
3400	827	1.67	1482	873	1.85	1639	920	2.07	1831	**963**	**2.21**	**2005**	**1001**	**2.31**	**2091**
3500	833	1.75	1552	880	1.94	1718	926	2.15	1901	970	2.41	2134	1007	2.46	2221
3600	840	1.83	1621	888	2.04	1805	931	2.23	1971	976	2.47	2230	1017	2.62	2362
3700	847	1.92	1700	895	2.13	1884	**938**	**2.33**	**2108**	981	2.56	2309	1024	2.77	2496
3800	856	2.02	1788	901	2.23	1971	945	2.44	2203	986	2.65	2389	1029	2.89	2605
3900	865	2.12	1875	908	2.32	2050	953	2.55	2300	993	2.75	2478	1034	3.00	2707
4000	875	2.22	1962	915	2.42	2186	960	2.65	2389	1000	2.87	2587	1039	3.10	2800
4100	883	2.32	2050	924	2.54	2291	966	2.76	2487	1008	2.99	2698	1046	3.21	2904
4200	889	2.41	2177	934	2.65	2389	972	2.87	2587	1015	3.12	2819	1053	3.34	3029
4300	896	2.51	2265	943	2.77	2406	980	2.99	2698	1021	3.23	2923	1061	3.48	3166
4400	903	2.62	2362	951	2.89	2603	990	3.12	2819	1028	3.36	3049	1068	3.61	3241
4500	912	2.74	2469	958	3.00	2707	999	3.26	2982	1035	3.51	3161	1074	3.74	3346
4600	921	2.87	2587	965	3.11	2810	1008	3.39	3078	1041	3.68	3295	1081	3.90	3450
4700	930	3.00	2707	972	3.23	2923	1017	3.45	3224	1048	3.80	3436	1088	4.13	3552
4800	938	3.14	2838	980	3.37	3058	1025	3.55	3362	1055	3.85	3584	1095	4.30	3653
4900	946	3.27	2962	990	3.51	3149	1034	3.71	3505	1062	3.98	3741	1101	4.45	3753
5000	954	3.39	3078	998	3.62	3271	1042	3.85	3654	1068	4.08	3907	1108	4.59	3851

LEGEND

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

NOTES:

1. **Boldface** indicates field-supplied or alternate (as appropriate) drive is required. (See Note 7.)
2. indicates alternate motor and drive are required.
3. indicates field-supplied motor and drive are required.
4. Maximum usable watts input is 2120 with standard motor and 2615 with alternate motor. Maximum continuous bhp is 2.40 with standard motor and 2.90 with alternate motor. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Values include losses for filters, unit casing, and wet coils.
6. Use of a field-supplied motor may affect wire sizing. Contact your representative to verify.
7. Standard motor drive range: 685 to 935 rpm. Alternate motor drive range: 835 to 1085 rpm. All other rpms require field-supplied drive.
8. Interpolation is permissible. Do not extrapolate.

PRE-START-UP

⚠ **WARNING:** Failure to observe the following warnings could result in serious personal injury:

1. Follow recognized safety practices and wear protective goggles when checking or servicing refrigerant system.
2. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
3. Do not remove compressor terminal cover until all electrical sources are disconnected and tagged.
4. Relieve all pressure from system before touching or disturbing anything inside compressor terminal box if refrigerant leak is suspected around compressor terminals. Use accepted methods to recover refrigerant.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
   a. Shut off electrical power to unit and install lockout tag.
   b. Relieve all pressure from system using both high- and low-pressure ports. Use accepted methods to recover refrigerant.
   c. Cut component connection tubing with tubing cutter and remove component from unit.
   d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to or shipped with unit.
3. Make the following inspections:
   a. Inspect for shipping and handling damages such as broken lines, loose parts, or disconnected wires.
   b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution.
   c. Inspect all field- and factory-wiring connections. Be sure that connections are completed and tight. Ensure electrical wiring does not come into contact with refrigerant tubing or sharp edges.
   d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
   a. Make sure that outdoor-fan blades are correctly positioned in fan orifice. Refer to Outdoor Fan Adjustment section on page 32 for more details.
   b. Make sure that air filter(s) is in place.
   c. Make sure that condensate drain trap is filled with water to ensure proper drainage.
   d. Make sure that all tools and miscellaneous loose parts have been removed.
   e. Ensure belt and blower pulley are properly aligned and at correct tension.

START-UP

I. UNIT PREPARATION

Make sure that unit has been installed in accordance with these installation instructions and applicable codes.

II. RETURN AIR FILTERS

Make sure correct filters are installed in unit (see Table 1). Do not operate unit without return-air filters.

III. OUTDOOR-AIR INLET SCREEN

Outdoor-air inlet screen must be in place before operating unit.

IV. COMPRESSOR MOUNTING

Compressors are internally spring mounted. Do not loosen or remove compressor holddown bolts.

V. INTERNAL WIRING

Check all electrical connections in unit control boxes; tighten as required. Ensure wiring does not come into direct contact with refrigerant tubing or sharp edges.

VI. REFRIGERANT SERVICE PORTS

Each refrigerant system has 4 Schrader-type service gage ports: One on the suction line, one on the cooling mode liquid line, and 2 on the compressor discharge line. Be sure that caps on the ports are tight.

VII. HIGH FLOW VALVES

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

VIII. COMPRESSOR ROTATION

It is important to be certain the scroll compressor is rotating in the proper direction. To determine whether or not compressor is 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 indoor fan is probably also rotating in the wrong direction.
2. Turn off power to the unit and tag disconnect.
3. Reverse any two of the unit power leads.
4. Turn on power to the unit. Reenergize compressor.

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

NOTE: When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide heating/cooling.

IX. ADJUST GAS INPUT

The gas input to the unit is determined by measuring the gas flow at the meter or by measuring the manifold pressure. Manifold pressure should be 3.5 in. wg.

X. COOLING

To start unit, turn on main power supply. Set system selector switch at COOL position and fan switch at AUTO position. Adjust thermostat to a setting below room temperature. Compressor indoor and outdoor fans start on closure of contactors.

Check unit charge. Refer to Refrigerant Charge section on page 32. Unit must operate for at least 15 minutes before adjusting charge.

Reset thermostat at a position above room temperature. Compressor and outdoor fans will shut off.

To Shut Off Unit

Set system selector switch at OFF position. Resetting thermostat at a position above room temperature shuts unit off temporarily until space temperature exceeds thermostat setting.

Compressor restart is accomplished by manual reset at the thermostat by turning the selector switch to OFF position and then ON position.

XI. HEATING

To start unit, turn on main power supply.

Set thermostat at HEAT position and a setting above room temperature, fan at AUTO position.

First stage of thermostat energizes the indoor fan motor, compressor, and outdoor fan; second stage energizes electric heater elements if installed. Check heating effects at air supply grille(s).

If accessory electric heaters do not energize, reset limit switch (located on indoor-fan scroll) by depressing button located between terminals on the switch.

To Shut Unit Off

Set system selector switch at OFF position. Resetting heating selector lever below room temperature temporarily shuts unit off until space temperature falls below thermostat setting.

XII. SAFETY RELIEF

A soft solder joint in the suction line at the loss-of-charge/low-pressure switch fitting provides pressure relief under abnormal temperature and pressure conditions.

XIII. VENTILATION (CONTINUOUS FAN)

Set fan and system selector switches at ON and OFF positions, respectively. Indoor fan operates continuously to provide constant air circulation.

XIV. OPERATING SEQUENCE

A. Cooling, Units Without Economizer

When the thermostat calls for cooling, terminals G and Y1 are energized. The indoor fan contactor (IFC), outdoor fan contactor (OFC), RVS1 (reversing valve solenoid), and compressor contactor no. 1 (C1) are energized and the indoor-fan motor, compressor no. 1, outdoor-fan motors and outdoor fans start. The outdoor-fan motors run continuously while unit is cooling. If the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) and RVS2 are energized and compressor no. 2 starts.

B. Heating, Units Without Economizer

Upon a call for heating through terminal W1, IFC, OFC, C1, and C2 are energized. On units equipped for 2 stages of heat, when additional heat is needed, HC is energized through W2.

C. Cooling, Units With Durablade Economizer

When the outdoor-air temperature is above the OAT setting and the room thermostat calls for cooling, the compressor contactor no. 1 and outdoor fan contactor (OFC) are energized to start compressor no. 1 and outdoor-fan motors. RVS1 (reversing valve solenoid) is energized). The indoor-fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon a further call for cooling, compressor contactor no. 2 will be energized, starting compressor no. 2. RVS2 is energized. After the thermostat is satisfied and the IFM is deenergized, the damper moves to the fully closed position.

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

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

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

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

If the outdoor air alone cannot satisfy the cooling requirements of the conditioned space, economizer cooling is integrated with mechanical cooling, providing second stage cooling. Compressor no. 1 and outdoor fans will be energized, and the position of the economizer damper will be determined by the supply-air temperature. Compressor no. 2 is locked out.

When the second stage of cooling is satisfied, the compressor, RVS2, and outdoor fan motors will be deenergized. The damper position will be determined by the supply-air temperature.

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

D. Cooling, Units With EconoMi$er

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

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

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

NOTE: Compressors have a two-minute Minimum On, Minimum Off, and Interstage delay timer.

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

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

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

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

E. Heating, Units With Economizer (If Accessory Heater is Installed)

When the room thermostat calls for heat through terminal W1, the indoor-fan contactor outdoor fan contactor, C1, and C2 are energized. On units equipped for 2 stages of heat, when additional heat is needed, heater contactor is energized through W2. The indoor-fan motor is energized, and the economizer damper moves to the minimum position. If the two-position damper is used, the outdoor-air damper opens to the minimum position whenever the indoor fan opens. When the thermostat is satisfied, the damper moves to the fully closed position.

F. Defrost

When the temperature of the outdoor coil drops below 28 F as sensed by the defrost thermostat (DFT2) and the defrost timer is at the end of a timed period (adjustable at 30, 50, or 90 minutes), reversing valve solenoids (RVS1 and RVS2) are energized and the OFC is deenergized. This switches the position of the reversing valves and shuts off the outdoor fans. The electric heaters (if installed) will be energized.

The unit continues to defrost until the coil temperature as measured by DFT2 reaches 65 F, or the duration of defrost cycle completes a 10-minute period.

During the defrost mode, if circuit 1 defrosts first, RVS1 will oscillate between heating and cooling modes until the defrost mode is complete.

At the end of the defrost cycle, the electric heaters (if installed) will be deenergized; the reversing valves switch and the outdoor-fan motors will be energized. The unit will now operate in the heating mode.

If the space thermostat is satisfied during a defrost cycle, the unit will continue in the defrost mode until the time or temperature constraints are satisfied.

SERVICE

⚠ **CAUTION:** When servicing unit, shut off all electrical power to unit and install lock out tag to avoid shock hazard or injury from rotating parts.

I. CLEANING

Inspect unit interior at the beginning of each heating and cooling season or more frequently as operating conditions require.

A. Indoor Coil

1. Turn unit power off and tag disconnect. Remove filter access panel and indoor coil access panel.
2. If economizer or accessory two-position damper is installed, remove economizer/two-position damper by disconnecting economizer plug and removing mounting screws (see Fig. 14, 15, or 22). Refer to Accessory Economizer or Two-Position Damper Installation Instructions for more details.
3. Slide filters out of unit.
4. Clean coil using a commercial coil cleaner or dishwasher detergent in a pressurized spray canister. Wash both sides of coil and flush with clean water. For best results, backflush toward return-air section to remove foreign material. Caution should be taken as to not overflow the evaporator drain condensate pan.
5. Flush condensate pan after completion.
6. Reinstall economizer/two-position damper and filters.
7. Reconnect wiring.
8. Replace access panels.

B. Outdoor Coils

Inspect coils monthly. Clean condenser coils annually, and as required by location and outdoor-air conditions.

Clean 2-row coils as follows:

1. Turn off unit power and tag disconnect.
2. Remove top panel screws on outdoor end of unit.
3. Remove outdoor coil corner post. See Fig. 39. To hold top panel open, place coil corner post between top panel and center post. See Fig. 40.
4. Remove device holding coil sections together at return end of outdoor coil. Carefully separate the outer coil section 3 to 4 in. from the inner coil section. See Fig. 41.
5. Use a water hose or other suitable equipment to flush down between the 2 coil sections to remove dirt and debris. Clean the outer surfaces with a stiff brush in the normal manner.
6. Secure the sections together. Reposition the coil sections, and remove the coil corner post from between the top panel and center post. Install the coil corner post and coil center post, and replace all screws.

C. Condensate Drain

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

D. Filters

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

E. Outdoor-Air Inlet Screen

Clean screen with steam or hot water and a mild detergent. Do not use disposable filters in place of screens.

F. Belts

Adjust belt tension and pulley alignment at least twice a year or more frequently as operating conditions require.

II. LUBRICATION

A. Compressors

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

B. Fan Motor Bearings

Fan motor bearings are permanently lubricated. No further lubrication of outdoor- or indoor-fan motors is required.

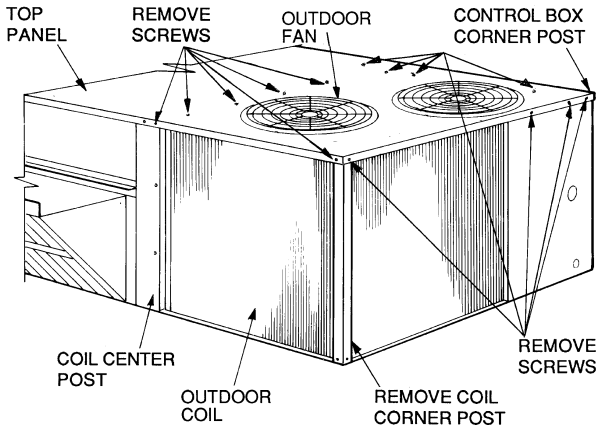


Fig. 39 — Cleaning Outdoor Coil

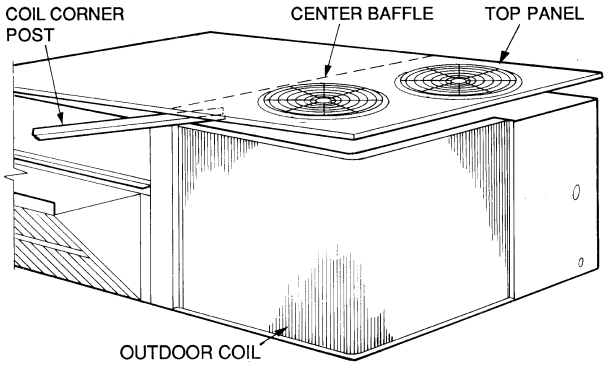


Fig. 40 — Propping Up Top Panel

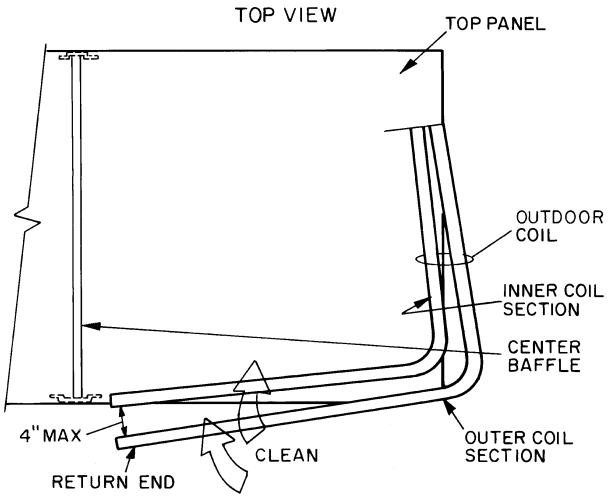
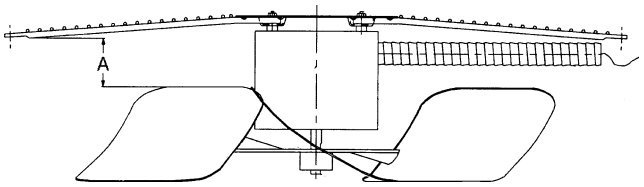


Fig. 41 — Separating Coil Sections

III. OUTDOOR FAN ADJUSTMENT (Fig. 42)

1. Shut off unit power supply.
2. Remove outdoor-fan assembly (grille, motor, motor cover, and fan) and loosen fan hub setscrews.
3. Adjust fan height as shown in Fig. 42.
4. Tighten setscrews and replace outdoor-fan assembly.



UNIT VOLTAGE	"A" in.
208/230 V	2.75
460 V and 575 V	3.50

Fig. 42 — Outdoor Fan Adjustment

IV. ECONOMIZER ADJUSTMENT

Refer to Optional Economizer sections on pages 11 and 15.

IMPORTANT: Refer to Troubleshooting Tables 14-16 for additional information.

V. REFRIGERANT CHARGE

A. Checking and Adjustment Refrigerant Charge

The refrigerant system is fully charged with R-22 refrigerant, tested, and factory-sealed. Unit must operate in cooling mode a minimum of 10 minutes before checking charge.

NOTE: Adjustment of the refrigerant charge is not required unless the unit is suspected of not having the proper R-22 charge.

A superheat charging chart is attached to the outside of the service access panel. The chart includes the required suction line temperature at given suction line pressures and outdoor ambient temperatures.

An accurate superheat, thermocouple- or thermistor-type thermometer and a gage manifold are required when using the superheat charging method for evaluating the unit charge. *Do not use mercury or small dial-type thermometers because they are not adequate for this type of measurement.*

⚠ **CAUTION:** When evaluating the refrigerant charge, an indicated adjustment to the specified factory charge must always be very minimal. If a substantial adjustment is indicated, an abnormal condition exists somewhere in the cooling system, such as insufficient airflow across either coil or both coils.

Proceed as follows:

1. Remove caps from low- and high-pressure service fittings.
2. Using hoses with valve core depressors, attach low- and high-pressure gage hoses to low- and high-pressure service fittings, respectively.
3. Start unit in Cooling mode and let unit run until system pressures stabilize.
4. Measure and record the following:
   a. Outdoor ambient-air temperature (F db).
   b. Evaporator inlet-air temperature (F wb).
   c. Suction-tube temperature (F) at low-side service fitting.
   d. Suction (low-side) pressure (psig).
5. Using "Cooling Charging Charts" compare outdoor-air temperature (F db) with the suction line pressure (psig) to determine desired system operating suction line temperature. See Fig. 43-45.
6. Compare actual suction-tube temperature with desired suction-tube temperature. Using a tolerance of ± 3° F, add refrigerant if actual temperature is more than 3° F higher than proper suction-tube temperature, or remove refrigerant if actual temperature is more than 3° F lower than required suction-tube temperature.

B. To Use Cooling Charging Charts

Take the outdoor ambient temperature and read the suction pressure gage. Refer to appropriate chart to determine what the suction temperature should be. If suction temperature is high, add refrigerant. If suction temperature is low, carefully recover some of the charge. Recheck the suction pressure as charge is adjusted.

EXAMPLE: (Fig. 43)

Outdoor Temperature . . . . . 85 F

Suction Pressure . . . . . 70 psig

Suction Temperature should be . . . . . 49 F

(Suction Temperature may vary ±5° F.)

C. Heating Mode Charge

Do not attempt to adjust charge by cooling methods while in Heating mode. When charging is necessary in Heating mode, recover refrigerant and weigh in according to unit data plate refrigerant data.

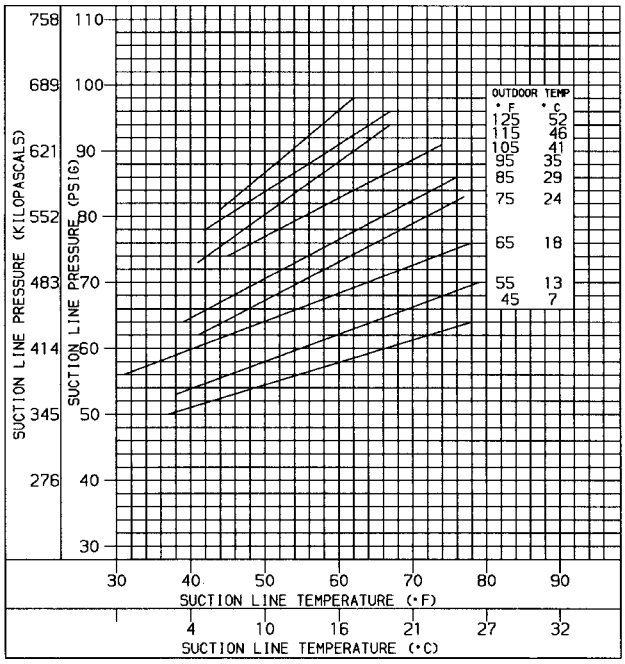


Fig. 43 — Cooling Charging Chart, 548D090

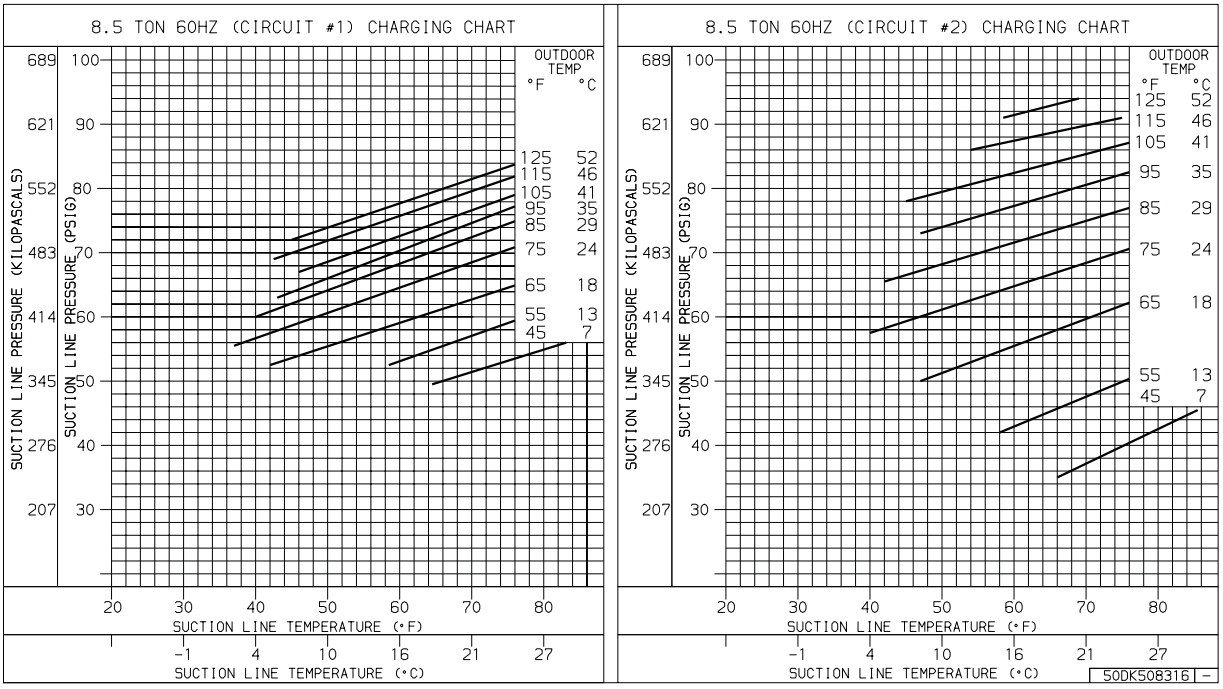


Fig. 44 — Cooling Charging Chart; 548D102

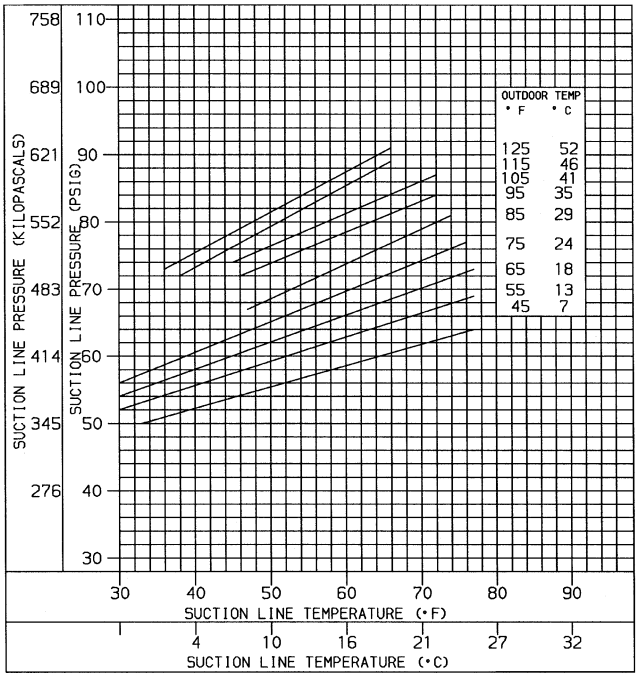


Fig. 45 — Cooling Charging Chart; 548D120

TROUBLESHOOTING

Refer to Tables 14-16 and Fig. 46 for troubleshooting information.

Table 14 — Heating and Cooling Troubleshooting

PROBLEM	CAUSE	REMEDY
Compressor and outdoor 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.
	High-pressure switch tripped.	See problem “Excessive head pressure.’’
	Low-pressure switch tripped.	Check for leaks, repair, and recharge.
	Freeze-up protection thermostat tripped.	See problem “Suction pressure too low.’’
Compressor will not start but outdoor fan runs.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective overload.	Determine cause and replace.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor.	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked outdoor coil or dirty air filter.	Determine cause and correct.
	Defective overload.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty outdoor-fan (cooling) or indoor-fan (heating) motor or capacitor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor operates continuously.	Dirty air filter.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Leaking valves in compressor.	Replace compressor.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Outdoor coil dirty or restricted.	Clean coil or remove restriction.
Scroll compressor makes excessive noise.	Compressor rotating in the wrong direction.	Reverse the 3-phase power leads as described in Start-Up, page 28.
Excessive head pressure	Dirty air filter.	Replace filter.
	Dirty outdoor coil.	Clean coil.
	Refrigerant overcharged.	Remove excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condensing air restricted or air short-cycling.	Determine cause and correct.
Head pressure too low.	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive suction pressure.	High heat load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter (cooling) or dirty outdoor coil (heating).	Replace filter or clean coil.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted	Remove source of restriction.
	Insufficient indoor airflow (cooling mode).	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.
	Outdoor ambient temperature below 25 F.	Install low-ambient kit.
Compressor no. 2 will not run.	Unit in economizer mode.	Proper operation; no remedy necessary.

Table 15 — Durablade Economizer Troubleshooting

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

LEGEND

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

Table 16 — EconoMi$er Troubleshooting

PROBLEM	CAUSE	REMEDY
Damper does not open.	Indoor Fan is Off.	Check to ensure that 24 vac is present at Terminal C1 (Common Power) on the IFC (Indoor Fan contactor) or that 24 vac is present at the IFO (Indoor Fan On) terminal. Check whether 24 vac is present at PL (Plug) 6-1 (red wire) and/or PL6-3 (black wire). If 24 vac is not present, check wiring (see unit label diagram). Check proper thermostat connection to G on the connection board.
	No power to EconoMi$er controller.	Check to ensure that 24 vac is present across Terminals 24 VAC and 24V COM on the EconoMi$er control. If 24 vac is not present, check wiring (see unit label diagram). If 24 vac is present, STATUS light should be on constantly.
	No power to G Terminal.	If IFM is on, check to ensure 24 vac is present on G Terminal of the EconoMi$er controller. If 24 vac is not present, check wiring (see unit label diagram).
	Controller fault.	If STATUS light is flashing one flash, the EconoMi$er controller is experiencing a fault condition. Cycle power to the controller. If condition continues, replace the EconoMi$er controller.
	Thermostat fault.	If STATUS light is flashing two flashes, the EconoMi$er controller senses the thermostat is wired incorrectly. Check wiring between the thermostat and the connection board in the electrical panel. The fault condition is caused by Y2 being energized before Y1.
	Actuator Fault.	Check the wiring between the EconoMi$er controller and the actuator. Hold CONFIG button between three and ten seconds to verify the actuator's operation. (This process takes three minutes to complete.)
EconoMi$er operation limited to minimum position.	Minimum position set incorrectly.	Verify that the MIN POS (%) is set greater than zero. Adjust MIN POS (%) to 100% to verify operation, and then set to correct setting.
	EconoMi$er changeover set point set too high or too low.	Set at correct value. See Table 4.
	Supply air temperature sensor faulty.	If STATUS light is flashing 4 flashes, the supply air temperature sensor is faulty. Check wiring or replace sensor.
	Outdoor air temperature sensor faulty.	If STATUS light is flashing 5 flashes, the outdoor-air temperature sensor is faulty. Check wiring or replace sensor.
Damper position less than minimum position set point.	Supply air low limit strategy controlling.	The supply air temperature is less than 45 F, causing the minimum position to decrease. Refer to the Start-Up instructions. Verify correct setting of MIN POS (%). If correct, EconoMi$er is operating correctly.
Damper does not return to minimum position.	CO_2 ventilation strategy controlling.	If a CO_2 sensor is being used, and the damper position is greater than minimum position, the ventilation control strategy is controlling. Refer to the Start-Up instructions. EconoMi$er is operating correctly.
Damper does not close on power loss	Damper travel is restricted.	Check to ensure the damper is not blocked.

LEGEND

IFM — Indoor-Fan Motor
OAT — Outdoor-Air Temperature

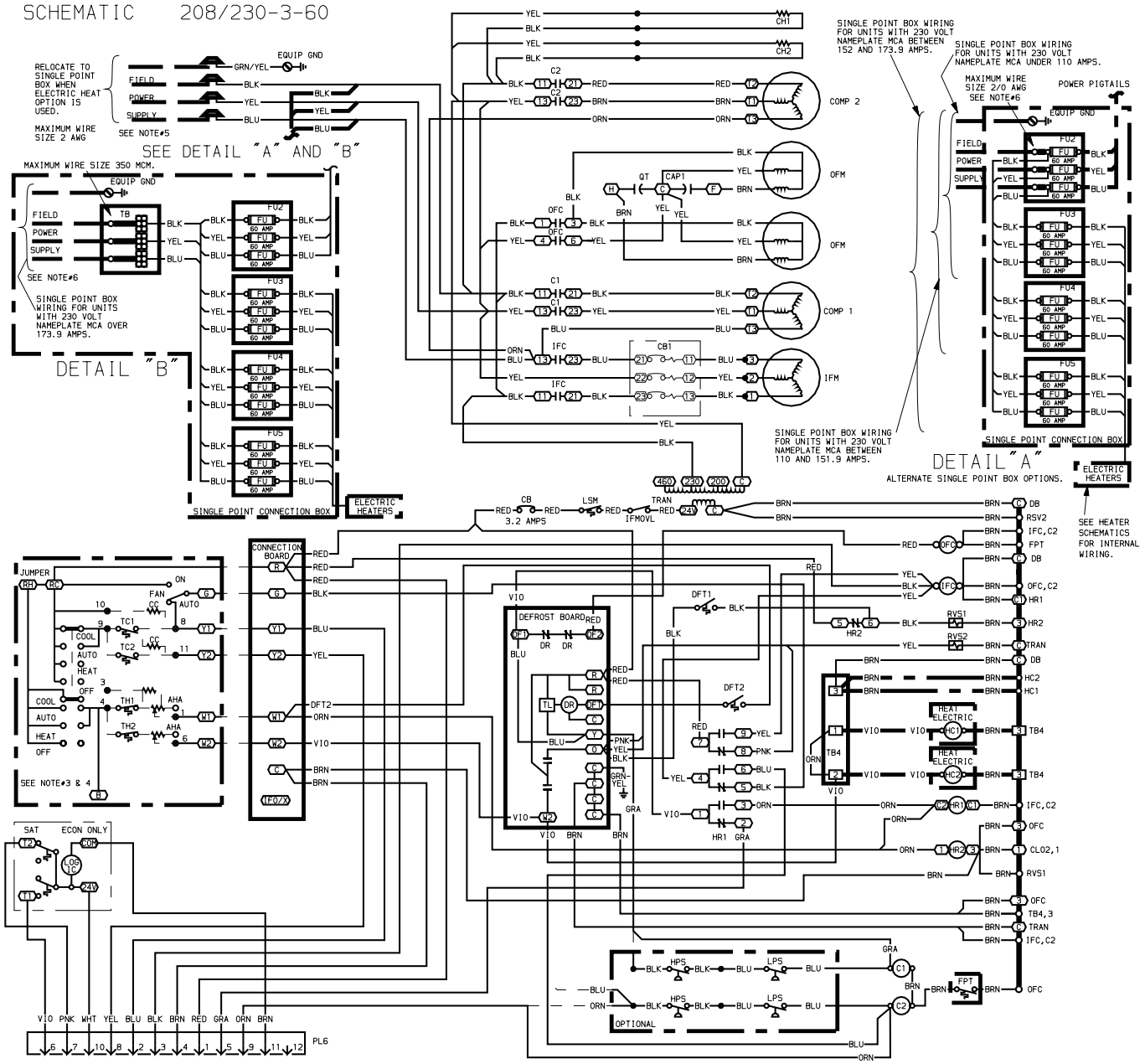
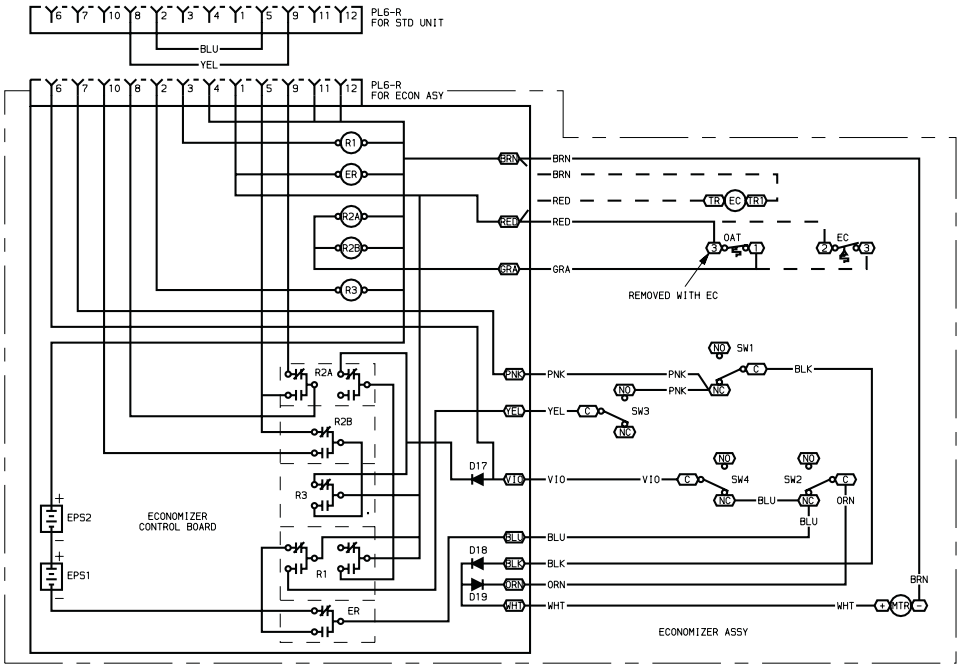


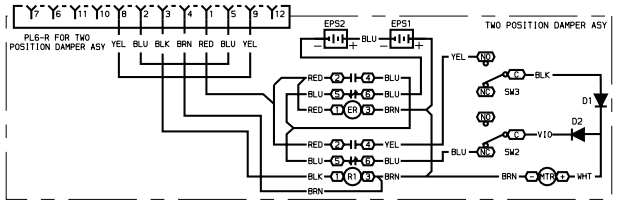
Fig. 46 — Typical Wiring Diagram

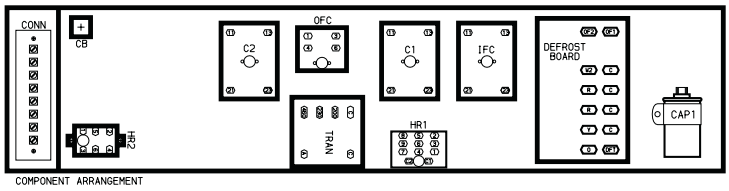


NOTES:

1. If any of the original wire furnished must be replaced, it must be replaced with type 90° C wire or its equivalent.
2. Three-phase motors are protected under primary single-phasing conditions.
3. Thermostat: HH07AT172 and P272-2783
   Subbase: HH93AZ176, 178 and P272-1882, 1883
4. Set Heat anticipator at .8 amp for 1st stage and .3 amp for 2nd stage.
5. Use copper conductors only.
6. Use copper, copper clad aluminum or aluminum conductors.
7.

VOLTAGE RATING	CB Mfg. Pt. No. Potter & Brumfield	MUST TRIP AMPS
24 V	W28X-1024-3.2	3.2





LEGEND

AHA — Adjustable Heat Anticipator
AWG — American Wire Gage
C — Contactor, Compressor
CAP — Capacitor
CB — Circuit Breaker
CC — Cooling Capacitor
CH — Crankcase Heater
CLO — Compressor Lockout
COMP — Compressor Motor
D — Diode
DB — Defrost Board
DFT — Defrost Thermostat
EC — Enthalpy Control
ECON — Economizer
EPS — Emergency Power Supply (nine volt battery)
EQUIP — Equipment
ER — Economizer Relay
FPT — Freeze-Up Protection Thermostat
FU — Fuse
GND — Ground
HC — Heater Contactor (Strip Heat)
HPS — High-Pressure Switch
HR — Heater Relay
IFC — Indoor Fan Contactor
IFM — Indoor Fan Motor
IFMOVL — Indoor Fan Motor Overload Switch
LPS — Low-Pressure Switch
LSM — Limit Switch (Manual Reset)
MCA — Minimum Circuit Amps
MTR — Motor
OAT — Outdoor Air Thermostat
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
P — Plug
PL — Plug Assembly
QT — Quadruple Terminal
R — Relay
RVS — Reversing Valve Solenoid
SAT — Supply Air Thermostat
SW1 — Switch Fully Open
SW2 — Switch Fully Closed
SW3 — Switch Minimum Vent Position
SW4 — Switch Maximum Vent Position
TB — Terminal Block
TC — Thermostat-Cooling
TH — Thermostat-Heating
TRAN — Transformer

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

Fig. 46 — Typical Wiring Diagram (cont)

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

I. PRELIMINARY INFORMATION

MODEL NO.:_____ SERIAL NO. _____

DATE: _____ TECHNICIAN: _____

UNIT NO.: _____ JOB LOCATION: _____

JOB NAME:_____

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

- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTALLATION INSTRUCTIONS
- ☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ☐ CHECK THAT RETURN (INDOOR) AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT INSTALLATION IS LEVEL
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND SETSCREW TIGHTNESS
- ☐ CHECK PULLEY ALIGNMENT AND BELT TENSION PER INSTALLATION INSTRUCTIONS
- ☐ ENSURE BELT TENSION AND BLOWER PULLEYS ARE PROPERLY ALIGNED

III. START-UP

ELECTRICAL

SUPPLY VOLTAGE	L1-L2	_____	L2-L3	_____	L3-L1	_____
CIRCUIT NO. 1 COMPRESSOR AMPS	L1	_____	L2	_____	L3	_____
CIRCUIT NO. 2 COMPRESSOR AMPS	L1	_____	L2	_____	L3	_____
INDOOR FAN AMPS	L1	_____	L2	_____	L3	_____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ DB (dry bulb)

RETURN-AIR TEMPERATURE _____ DB _____ WB (wet bulb)

COOLING SUPPLY AIR _____ DB _____ WB

PRESSURES (Cooling Mode)

REFRIGERANT SUCTION, CIRCUIT 1	_____	PSIG	_____	° F
REFRIGERANT SUCTION, CIRCUIT 2	_____	PSIG	_____	° F
REFRIGERANT DISCHARGE, CIRCUIT 1	_____	PSIG	_____	° F
REFRIGERANT DISCHARGE, CIRCUIT 2	_____	PSIG	_____	° F

- ☐ VERIFY THAT 3-PHASE SCROLL COMPRESSOR IS ROTATING IN CORRECT DIRECTION.
- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS ON PAGES 32 AND 33.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

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