Carrier®
HEATING & COOLING

50DF034
Single-Package Cooling Units

Installation, Start-Up and Service Instructions

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. Electrical shock could cause personal injury.

INSTALLATION

Rigging and Unit Placement — Inspect unit for transportation damage. File claim with transportation agency. Do not remove shipping skid until unit is ready to be set in final location. Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Rollers may be used to move unit across a roof. Level by using unit frame as reference. See Fig. 1 for additional information. Unit weight is shown in Table 1.

Units are designed to be hoisted only. However, units with optional shipping skids may be moved with a fork truck. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

Roof Curb — Assemble and install as described in instructions shipped with this accessory. Accessory roof curb and information required to field fabricate a roof curb of 2-in. x 14-in. planks is shown in Fig. 2. Install insulation, cant strips, roofing and flashing as required. For unit drains to function properly, curb must be level or within tolerances shown in Fig. 3.

Roof Mount — Check building codes for weight distribution requirements Unit weight is shown in Table 1.

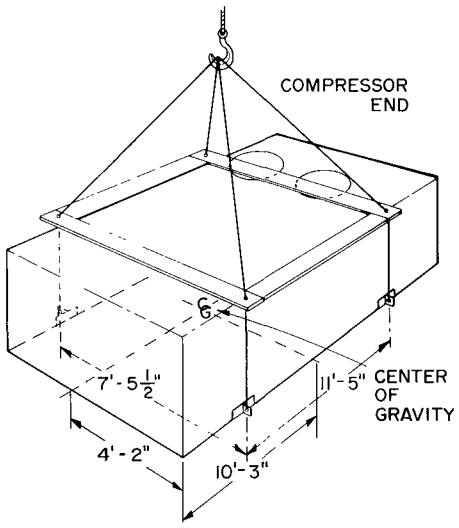
Slab Mount — Provide a level concrete slab that extends beyond unit cabinet at least 6 inches. Make a slab 8 in. thick with 4 in. above grade. Use gravel apron in front of condenser air inlet to prevent grass and foliage from obstructing airflow.

Alternate Unit Support Methods — Where the preferred curb or slab mount cannot be used, support unit with sleepers on perimeter, using curb support area. However, if sleepers cannot be used, support long sides of unit (dimension A, Fig. 4) with three 4-in. x 4-in. pads equally spaced. Unit may sag if supported by corners only.

Positioning — Unit condenser air inlets and outlets may be located in any compass direction since they are not affected by wind. Provide clearances around and above unit for airflow, safety and service access (Fig 4).

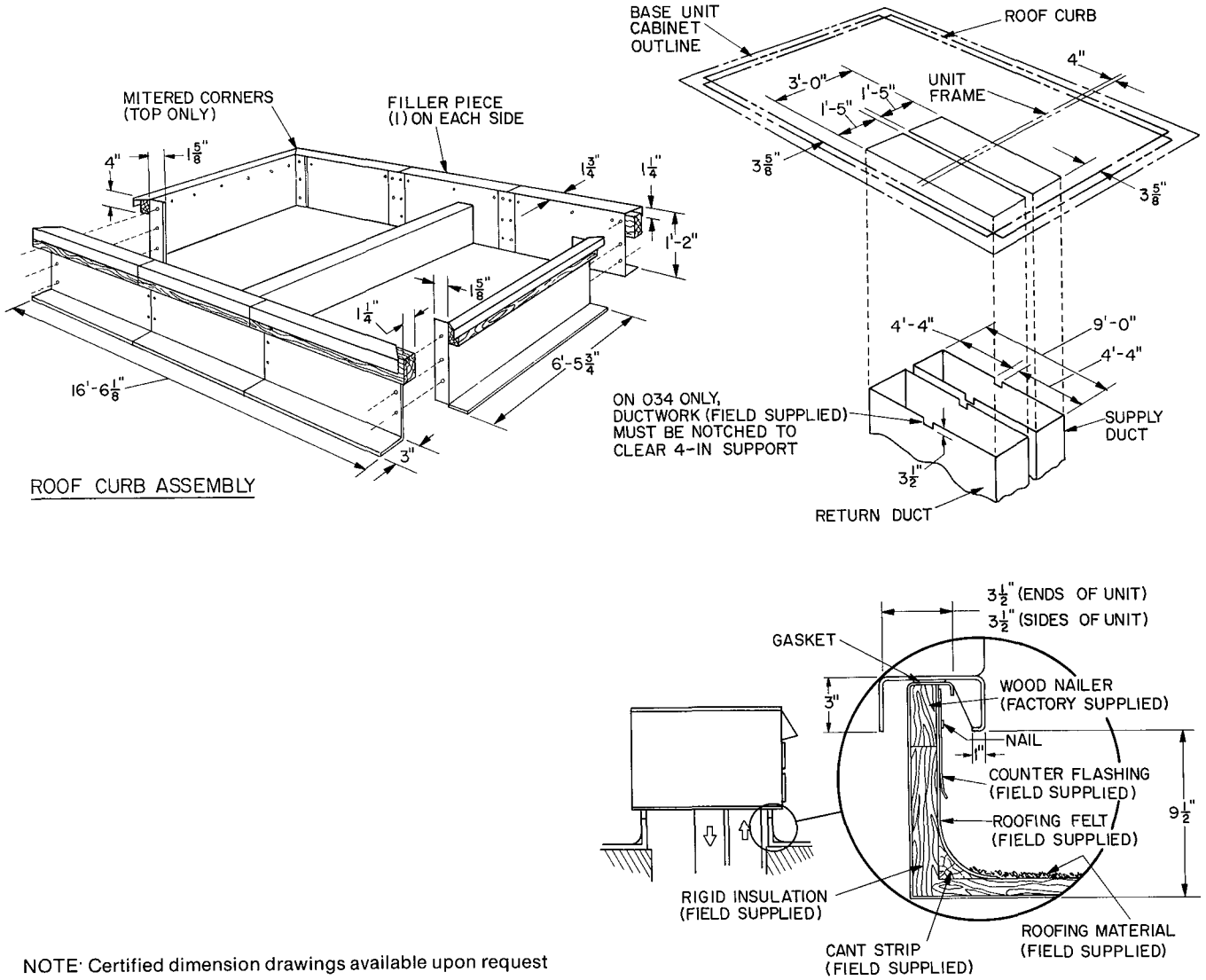
Do not install unit in an indoor location Do not locate air inlets near exhaust vents or other sources of contaminated air

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



NOTES:
1 All unit panels must be in place when rigging.
2 Do not handle unit with fork trucks
3 Use 4 cables and four 2-by-4's or 4-by-4's of dimensions shown.

Fig. 1 — Rigging Details



NOTE: Certified dimension drawings available upon request

Fig. 2 — Roof Curb Dimensions

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

Insulate ducts passing through unconditioned spaces and cover with a vapor barrier.

Maintain one-in. minimum clearance between supply air duct and any combustible material for at least 3 ft of duct run from unit.

Unit is shipped set up for through-the-bottom duct connections. Ductwork openings are shown in Fig. 4. Field-fabricated concentric ductwork may be connected to units as shown in Fig. 5.

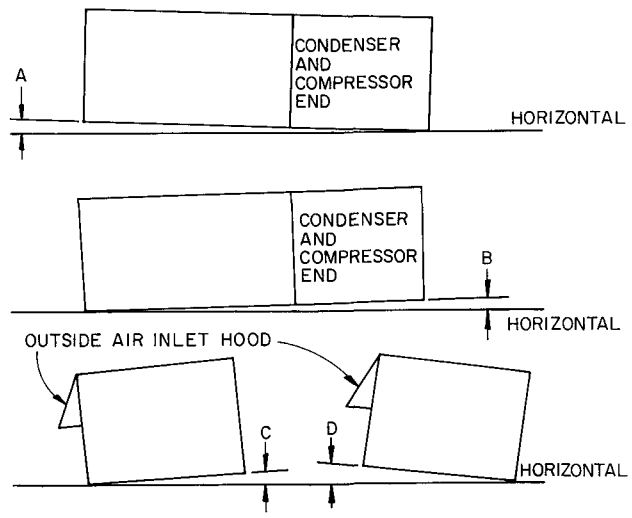
Modifications are required to convert unit for through-the-side duct connections.

Do not use side duct connections on units with optional power exhaust packages or accessory barometric relief dampers.

To convert unit for through-the-side duct connection, refer to Fig. 6 and perform the following procedure. (Units without optional economizer):

1. Remove return air filter access panel.
2. Remove side air opening panels. Save sheet metal screws.
3. Remove return air filters.
4. Remove slant baffle that separates bottom flow supply and return air paths. Save screws.
5. Reinstall baffle on top of horizontal plenum deck so that deck opening is covered. Face insulation side of baffle down. Drill holes in horizontal plenum deck using baffle holes as location guide Use sheet metal screws removed in step 4 to secure baffle to deck.
6. Install side air opening panels in bottom air openings. Face insulation side up Drill holes in unit basepan, using panel holes as location guide. Use sheet metal screws removed in step 2 to secure panels to basepan.
7. Reinstall return air filters. Be sure all relocated components are secure.
8. Open manual outdoor air inlet hood as described below.

Manual Damper Hood Adjustment — Loosen hood adjustment bolts, pull hood open to desired setting. Tighten bolts. See Fig. 4.



UNIT 50DF	DIMENSIONS (degrees and inches)							
	A		B		C		D	
	deg	in.*	deg	in.*	deg	in.*	deg	in.*
034	0.50	1 11/16	0 75	2½	0 50	1/16	1 00	1⅜

*From edge of unit to horizontal

Fig. 3 — Unit Leveling Tolerances

Economizer Section

ECONOMIZER HOOD INSTALLATION (Fig. 7) — The economizer mechanism and all electrical connections are factory installed and adjusted except as noted below. Hood assembly, outdoor air inlet screens and required hardware are shipped separately and must be field installed.

Install economizer hood and enthalpy control as follows:

1. Loosen unit top panel sheet metal screws above outdoor air inlet opening.
2. Assemble hood top panel, side panels and support channel.
3. Insert hood flange between unit top panel flange and unit. Slots are provided in hood flange to clear sheet metal screws. Tighten sheet metal screws. To insure water tightness, apply RTV to edges as indicated by shaded portions of Fig. 7.
4. Secure hood side panels to outdoor air opening flanges, using screws provided.
5. Install hood support bracket(s) between U-channel and support channel.
6. Install screen retainer on support channel, using screws in the slots. Do not tighten.
7. **⚠ CAUTION**

   Shut off main power to unit before installing enthalpy control assembly.
8. Remove enthalpy control assembly from shipping location on horizontal deck in return air filter compartment.
9. Using 4 no. 10-1/2 screws from envelope in control assembly junction box, mount enthalpy control assembly to inside of economizer hood side panel nearest condenser section (Fig. 4).
10. Route the red and yellow wires through knockout in side plate. Wrap end of blue wire with electrical tape. Using wire connectors from envelope in junction box, wire enthalpy control assembly as shown in Fig. 8. Use strain reliefs from envelope on side plate and junction box. Refer to Fig. 9 for Psychrometric Chart for enthalpy control.
11. Install outdoor air screens.
12. Push retainer snugly against screens and tighten screws.

Exhaust Air Hood Installation — The optional power exhaust hood and damper assemblies and required sheet metal screws are shipped in the compartment at right of indoor air fan motor compartment. Using screws provided, install a hood damper assembly over each exhaust air opening as shown in Fig. 4. Power exhaust is applied only to economizer units using bottom duct connections. Exhaust fan and motor assembly is factory wired and adjusted. Refer to Service, Power Exhaust Air Fan Adjustment if required.

Indoor Air Fans — The fan belt and pulleys are factory installed and adjusted. If required, adjust as described in Service, Indoor Air Fan Adjustment.

Condensate Drains — See Fig. 4 for drain locations. Condensate drain is open to atmosphere and must be trapped. Install a trapped drain line at connection to be used. Trap must be at least 3 in. deep and made of flexible material or be installed to prevent freeze-up.

Condensate drain pan under unit is fitted with a one-in. FPT coupling. A gasket is shipped taped to this drain. Install gasket in unit basepan opening or alternate opening on end of unit.

Field Power Supply — Unit is factory wired for voltage shown on nameplate. The main power terminal block is suitable for use with aluminum or copper wire. See Fig. 10 and 11. Units have circuit breakers for compressors, fan motors and control circuit. If required by local codes, provide an additional disconnect switch.

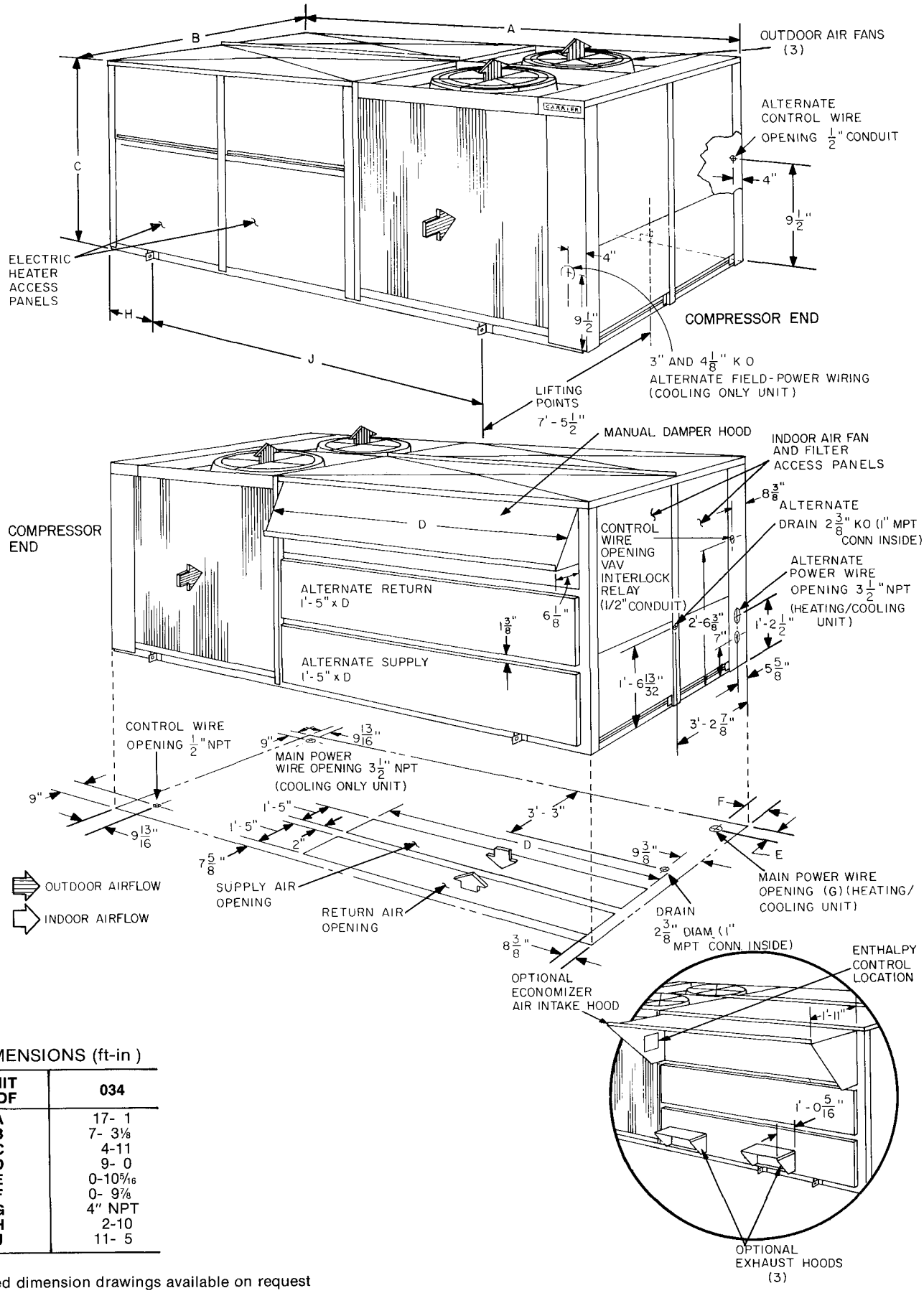
If an external electrical source is used, unit must be electrically grounded in accordance with local codes, or in the absence of local codes, with the National Electrical Code, NFPA 70.

All field wiring must comply with National Electrical Code and local requirements.

Install conduit connector in unit basepan or side panel openings provided as shown in Fig. 4. Route power lines through connector to terminal connections in control box as shown in Fig. 10 and 11.

Affix crankcase heater sticker to unit disconnect switch.

Voltage to compressor terminals during compressor operation must be within voltage range indicated on unit nameplate. Also, see Table 2. Phases must be balanced within 2% Contact local power company for correction of improper voltage or phase unbalance. Failure due to operation of unit on improper line voltage or with excessive phase unbalance constitutes abuse and may cause damage to unit electrical components.



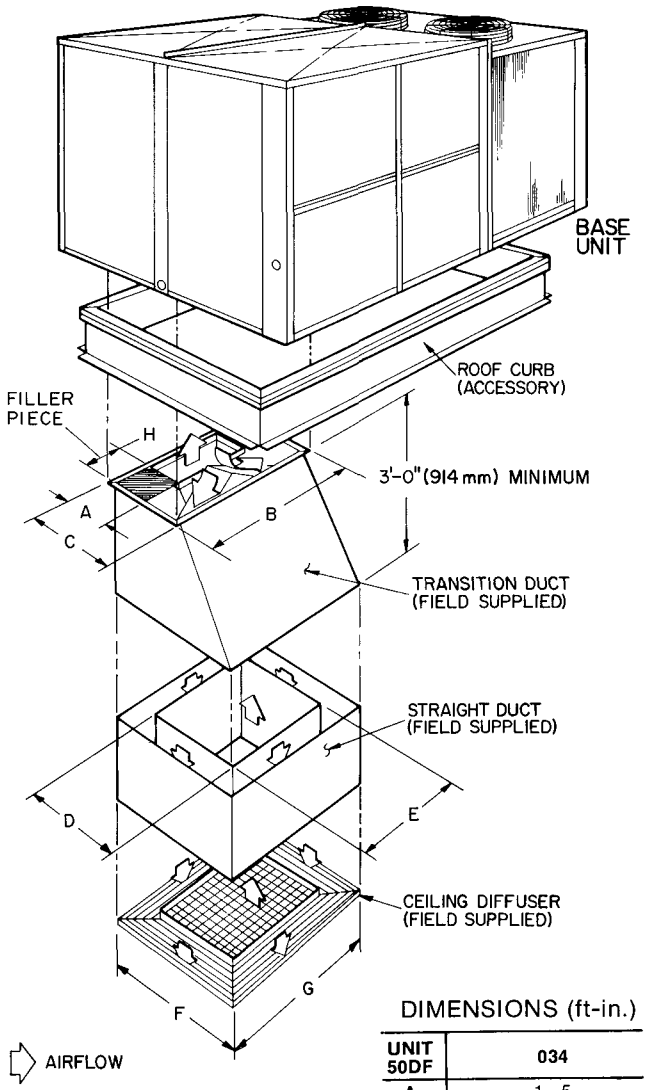
DIMENSIONS (ft-in)

UNIT 50DF	034
A	17- 1
B	7- 3⅛
C	4-11
D	9- 0
E	0-10 5/16
F	0- 9⅞
G	4" NPT
H	2-10
J	11- 5

Certified dimension drawings available on request

NOTES:
1. Allow 12 ft above unit, 8 ft on filter access panel end and 4 ft on remaining sides of unit for airflow and service clearance
2. For smaller clearances, contact manufacturer.
3. Refer to Roof Curb Dimensions for details of roof openings

Fig. 4 — Base Unit Dimensions



DIMENSIONS (ft-in.)

UNIT 50DF	034
A	1- 5
B	9-10
C	3- 0
D, E, F, G	Determined by size of diffuser selected
H	Determined by size of return air duct

NOTE V-shaped spoiler is field designed as applicable.

Fig. 5 — Concentric Duct Details

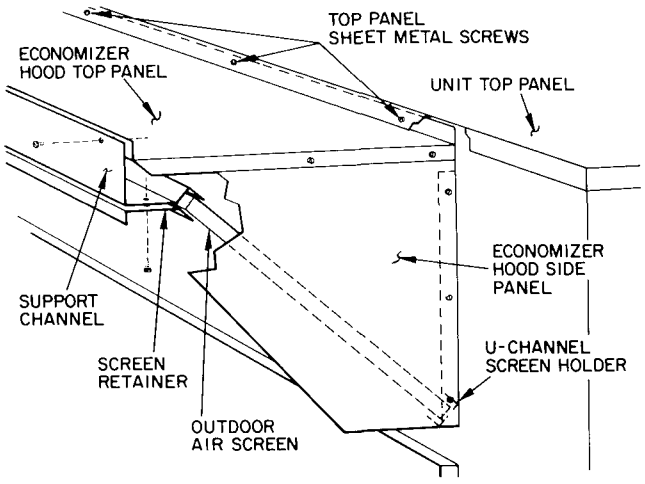


Fig. 7 — Economizer Outdoor Air Inlet Hood Assembly

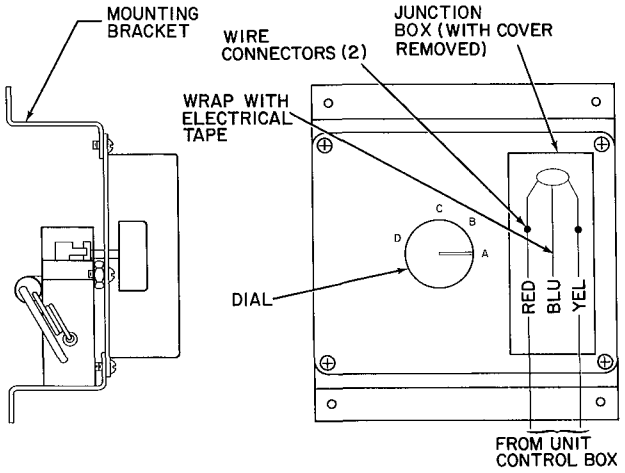


Fig. 8 — Enthalpy Control Assembly

CONTROL CURVE	CONTROL POINT (Approx Deg) AT 50% RH
A	73
B	68
C	63
D	58

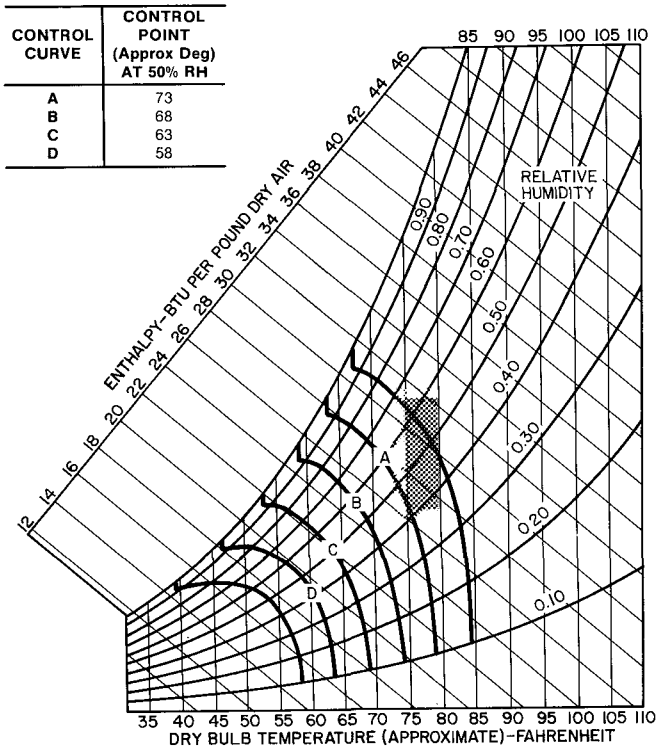


Fig. 9 — Psychrometric Chart for Enthalpy Control

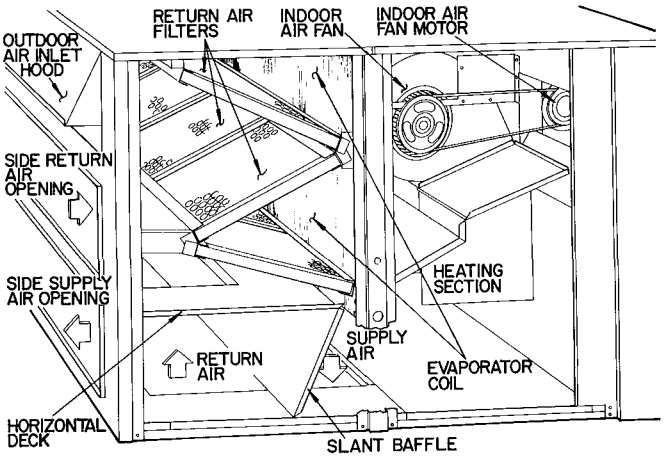
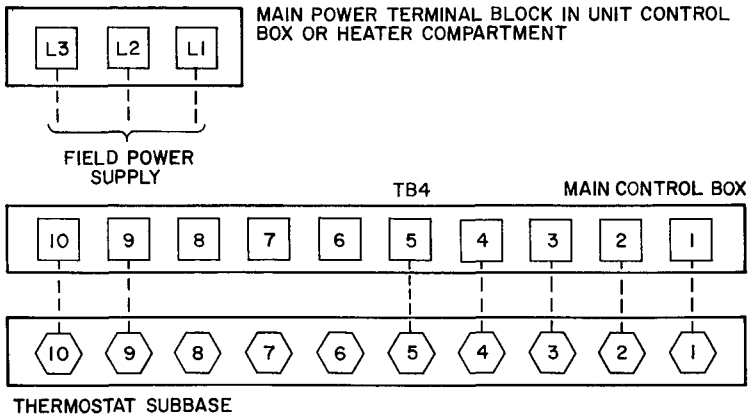
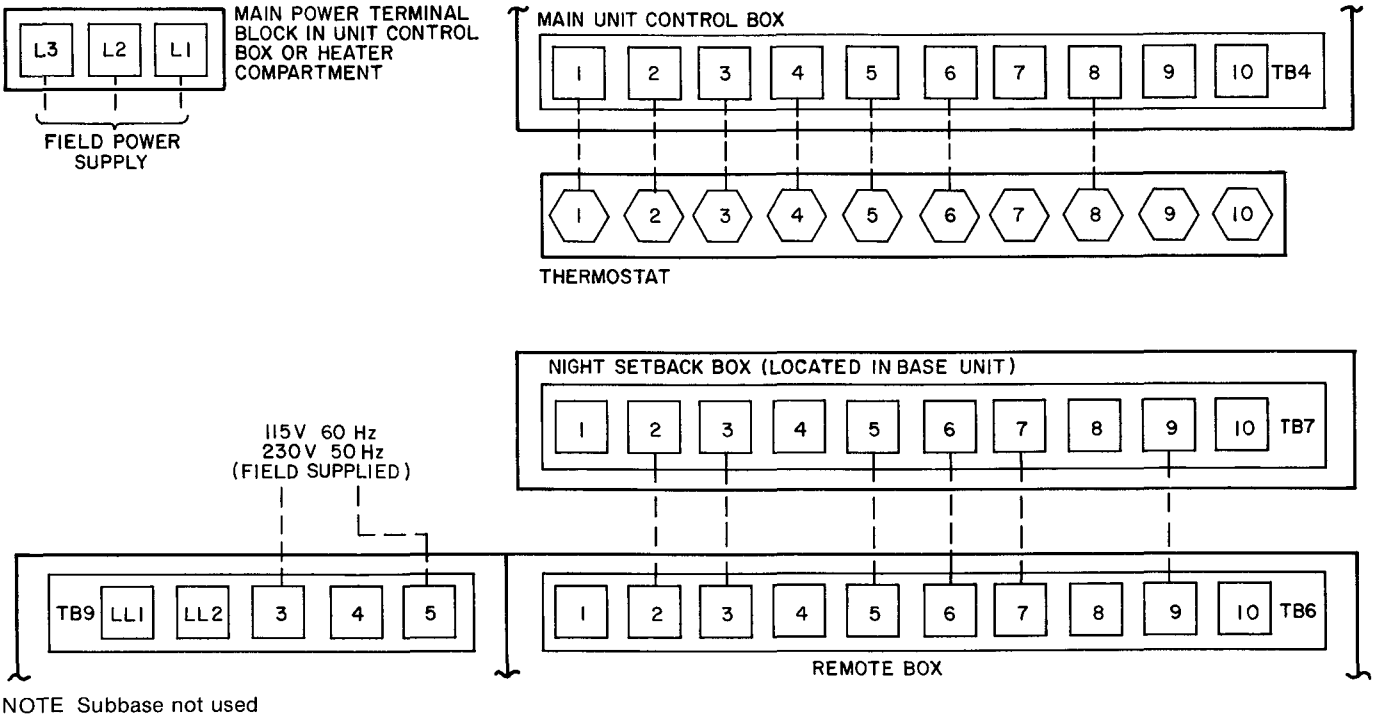


Fig. 6 — Manual Damper Unit Indoor Air Section



NOTE. Thermostat subbase required

Fig. 10 — Field Wiring Connections — Without Energy Management Accessory



NOTE Subbase not used

Fig. 11 — Field Wiring Connections — With Energy Management Accessory

Table 1 — Physical Data

UNIT 50DF	034
OPERATING WEIGHT (lb)	
Base Unit (includes heaters)	4400
Base Unit with Economizer	4600
COMPRESSOR	Serviceable, Reciprocating Hermetic
Quantity...Model	2...06DA
Oil (3GS or B1) (pts)	10 (ea)
REFRIGERANT CHARGE (R-22)	
System 1...System 2 (lb)	29.0...29.0
OUTDOOR AIR FANS	Direct Drive, Propeller
Number...Hp	3 .1
Frame (NEMA)	56
Rpm	1050
INDOOR AIR FANS*	Fixed-Speed Centrifugal
Single-Speed Motor Hp...Shaft Diameter (in.) 1750 Rpm	15 . 1⅝
Single-Speed Motor Frame Size	254T
Motor Pulley Pitch Diameter (in.) A...B	5 3 5 6
Fan Pulley Pitch Diameter (in.)	8.0
Fan Speed (rpm) A...B	1159 1225
Fan Shaft Diameter (in.)	1 11/16
Maximum Allowable Fan Speed (rpm)	1300
ELECTRIC HEATERS	Refer to Electrical Data table
HIGH-PRESSURE SWITCH	
Cutout (psig)	400 ±5
Cut-in (psig)	300 ±5
LOW-PRESSURE SWITCH	
Cutout (psig)	27 ±4
Cut-in (psig)	67 ±7
INDOOR AIR FILTERS (in.)	2
Standard; Quantity...Size (in.)	
Throwaway	9 20 x 25 12 16 x 25
Optional; Bag Type, 12 in.	5 12 x 24 5...24 x 24
AIR INLET SCREENS	
Economizer; Quantity...Size (in.)	5. 20 x 25

*Pulley A is installed in unit, pulley B is shipped with unit

Table 2 — Electrical Data

NOMINAL VOLTS/PH/HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OUTDOOR FAN MTR		INDOOR FAN MTR		EXHAUST FAN MTR		HEATERS		POWER SUPPLY*			
															Circuit 1		Circuit 2	
	Min	Max	RLA	LRA	RLA	LRA	Qty	FLA	Hp	FLA	Hp	FLA	kW	FLA	MCA	MOCP	MCA	MOCP
208-230/3/60	187	254	63 5	266	63 5	266	3	7 6 (ea)	15	46 0	—	—	—	—	212	250	—	—
									15	46 0	3	11	—	—	223	250	—	—
									15	46 0	—	—	45-54 9	125-138	214-230	300-300	—	—
									15	46 0	3	11	45-54 9	125-138	223-230	300-300	—	—
									15	46 0	—	—	75-91 5	208-230	212-212	250-250	156-173	175-200
									15	46 0	3	11	75-91 5	208-230	223-223	250-250	156-173	175-200
460/3/60	414	508	27 5	120	27 5	120	3	3 3 (ea)	15	21 0	—	—	—	—	93	110	—	—
									15	21 0	3	4 8	—	—	98	125	—	—
									15	21 0	—	—	54 9	69	113	150	—	—
									15	21 0	3	4 8	54 9	69	113	150	—	—
									15	21 0	—	—	91 5	115	170	175	—	—
									15	21.0	3	4.8	91.5	115	170	175	—	—
575/3/60	518	660	22	96	22	96	3	2 7 (ea)	15	—	—	—	—	—	75	90	—	—
									15	—	3	3 9	—	—	79	100	—	—

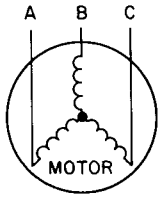
Compr — Compressor
FLA — Full Load Amps
Hp — Nominal Horsepower
kW — Kilowatts
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
RLA — Rated Load Amps

*Fuse only

NOTES:
1 All outdoor fan motors are single-phase motors
2 All heaters are 3-phase assemblies
3 Circuit no. 2 is provided as indicated; total unit MCA is the sum of circuit no 1 MCA and circuit no 2 MCA
4 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 % voltage unbalance

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

Example: Supply voltage is 460-3-60



AB = 452 volts
BC = 464 volts
AC = 455 volts

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

Determine maximum deviation from average voltage:

(AB) 457 - 452 = 5 volts
(BC) 464 - 457 = 7 volts
(AC) 457 - 455 = 2 volts
Maximum deviation is 7 volts

Determine % 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%

Field Control Wiring

STANDARD UNIT (WITHOUT ENERGY MANAGEMENT ACCESSORY) — Install a Carrier-approved accessory electronic thermostat on a subbase (or a transmitter on subbase if remote sensor is used) per installation instructions included with the accessory. Note that the subbase must be used on constant volume units without night setback. Locate thermostat, or remote sensor, if used, in the conditioned space where it will sense average temperature.

Route thermostat cable or equivalent single leads of no 18 AWG colored wire from subbase terminals through connector on unit to low-voltage connections in main control box as shown on unit wiring diagram and in Fig. 10.

UNITS WITH ENERGY MANAGEMENT ACCESSORY — In addition to the standard control box, units with energy management accessory are also equipped with a remote box and a night setback box. The remote box contains a 7-day time clock, a bypass switch that can manually bypass the time clock for up to 5 hours, 6 indicator lights and 2 terminal blocks for field wiring connections. Mount this box remote from the unit in an indoor or weathertight space. The night setback box contains a terminal block for field wiring connections, a morning warm-up thermostat and the setback/setup module. The night setback box remains in the unit. Shipping locations of remote box and permanent location of night setback box are shown in Fig. 12.

1. Remove remote box and mount in a restricted access area (indoors or in a weathertight space).
2. Run separate 115-volt, 60-Hz (230-volt, 50-Hz) power to the remote box per Fig. 11. Use no. 14 AWG wire or larger and a proper field-supplied electrical connector.
3. Install a Carrier-approved accessory electronic thermostat or transmitter if remote sensor is used (subbase not required) according to the installation instructions included with the accessory. Note that the subbase is *not* used on units with the energy management accessory. Locate the thermostat or remote sensor, if used, in the conditioned space where it will sense average temperature.

   Route thermostat cable or equivalent single leads of no. 18 AWG colored wire from thermostat or transmitter terminals through connector on unit to low-voltage (TB4) connections in main control box as shown on unit label wiring diagram and in Fig. 11.
4. Run 24-volt wires between the remote box and night setback box per Fig. 11. Use no 18 AWG wire for lengths up to 1000 feet. Local codes may dictate use of conduit for low voltage. Knockouts are provided in the night setback box and in the fan deck separating heating section from section containing the night setback box (Fig. 12). A watertight connector is installed in side of unit. Two rubber grommets are taped inside the night setback box. Use grommets in knockouts in fan deck and night setback box.

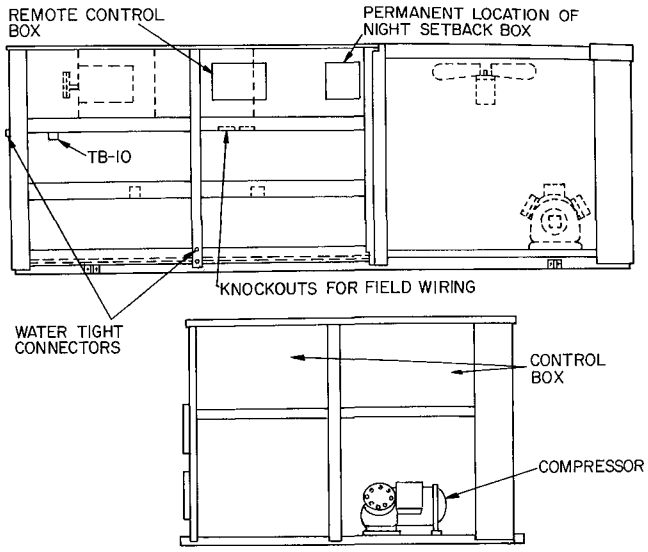


Fig. 12 — Shipping Locations — Remote Box

Return Air Filters — Check that return air filters are of the correct type and size and installed in unit filter racks. Filter data is shown in Table 1 Do not operate unit without return air filters

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

Compressor(s) — Loosen compressor holddown bolts until sidewise movement of the washer under each holddown bolt head occurs Do not loosen completely as bolts are self-locking and will maintain their adjustment.

Open the compressor discharge and suction service valves. Replace and tighten valve caps to prevent leaks.

Liquid Line Service Valve — Open the liquid line service valve Replace and tighten valve cap to prevent leaks.

Low Ambient Compressor Lockout (Fig. 13) — All units are equipped with an adjustable low ambient lockout thermostat to lock off the compressor(s) at low outdoor air ambients. Thermostat is located in the main control box. Setting will depend on specific installation but should be approximately 55 F on constant volume units.

Convenience Outlet — All units are equipped with a 115-volt convenience outlet for handling small power load or service light. See Fig. 13.

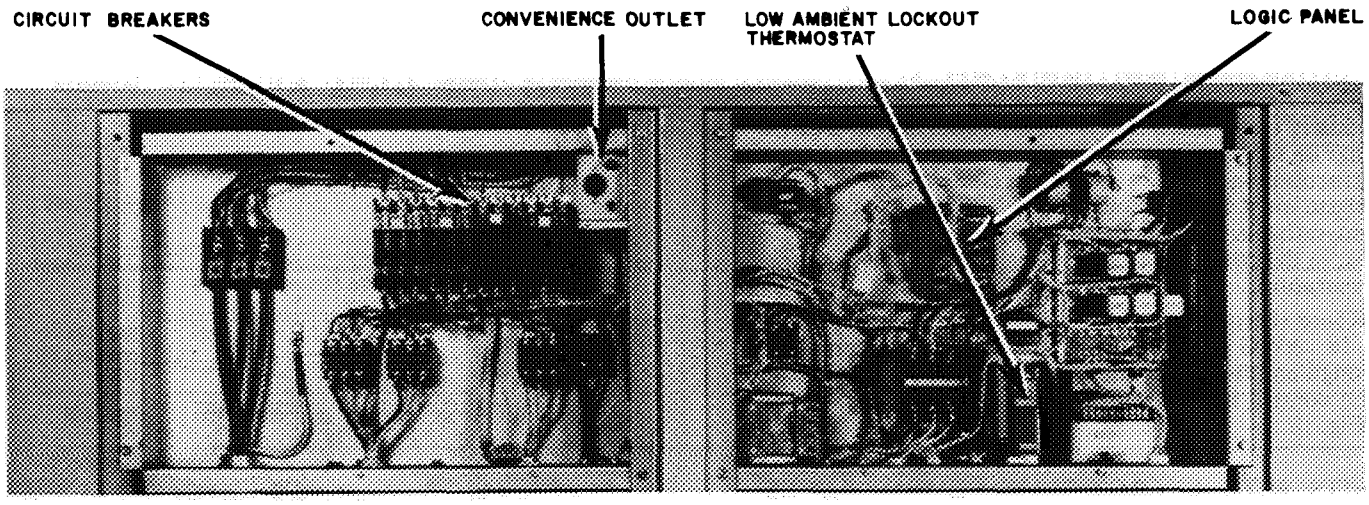
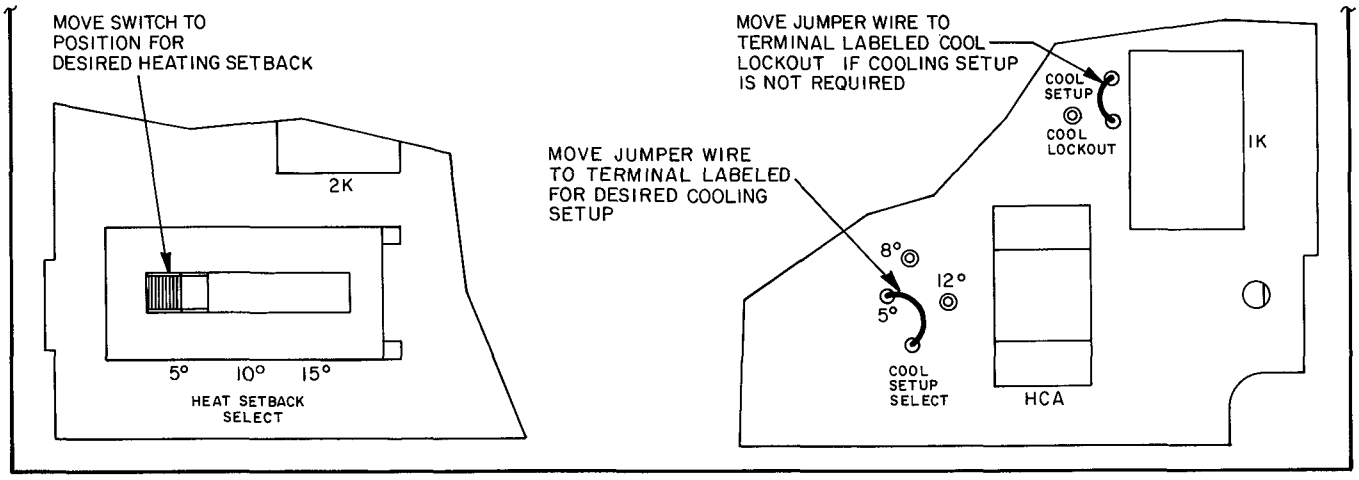


Fig. 13 — Control Box



(A) HEATING SETBACK

(B) COOLING SETUP OR LOCKOUT

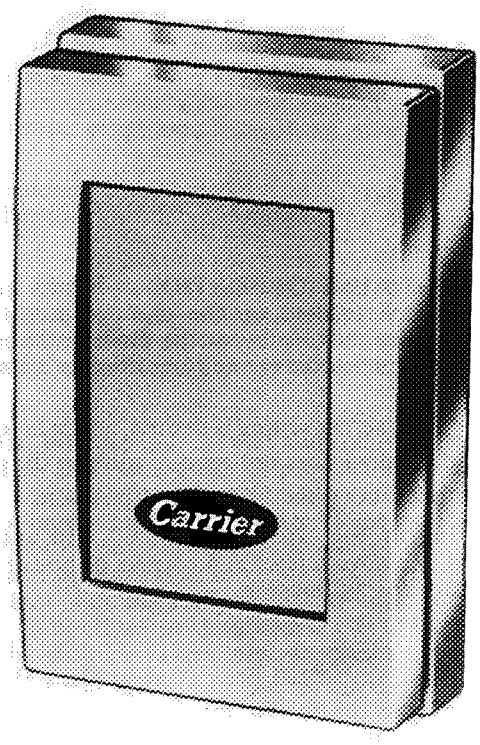
Fig. 14 — Accessory Setback/Setup Module (Partial)

START-UP

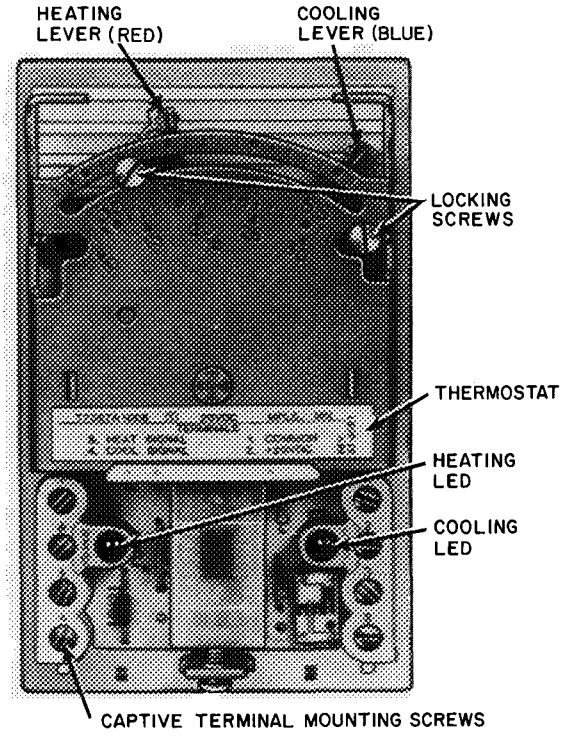
Constant Volume Units

COOLING (WITH OR WITHOUT ENERGY MANAGEMENT ACCESSORY)

1. Open compressor service valves. Make sure the crankcase heater has been on for at least 24 hours to remove liquid refrigerant from compressor crankcase. Check compressor oil level. Oil sight glass should be half full.
2. Be sure that the liquid line service valve is open and that high- and low-side refrigerant service ports are closed as applicable.
3. On units equipped with the energy management accessory, move the COOL SETUP SELECT jumper wire to the desired setting (5°, 8°, or 12°). If cooling is not desired during the unoccupied periods, move jumper wire from COOL SETUP to COOL LOCKOUT. See Fig 14.
4. Turn on power to unit. On standard units, set the subbase selector switch to COOL. On units with the energy management accessory, set the 7-day time clock as required. Refer to 7-Day Time Clock Adjustment. Check that compressor low ambient lockout contacts and morning warm-up contacts (on units with energy management accessory) are closed.
5. Remove cover from thermostat (or from transmitter if a remote sensor is used); note the red diagnostic light-emitting diodes (LED's). See Fig. 15.
6. To call for cooling, move the thermostat or transmitter cooling set point (blue lever) below room temperature. Cooling LED on the right-hand side of thermostat or transmitter should begin to glow. Check the cooling effect at supply duct outlets If the mechanical cooling does not come on, see Service, Electronic Component Checkout.
7. Move the thermostat or transmitter cooling set point above room temperature. The cooling equipment should cycle off and the cooling LED intensity should decrease to a faint glow or go off completely. The economizer should move to minimum position.



COVER



THERMOSTAT/TRANSMITTER

Fig. 15 — Electronic Thermostat/Transmitter (without subbase) (Which must be ordered as an accessory)

To Shut Off Unit — For standard units, set the subbase selector switch to OFF or set the cooling temperature selector lever above room temperature. For units with energy management accessory, set the cooling temperature selector switch above room temperature.

Do not shut off unit circuit breakers except when unit is serviced. *Crankcase heater is energized only when unit power is on.*

HEATING (Electric Heat Units)

1. Turn on unit power; set circuit breakers at ON.
2. On units with energy management accessory, position the HEAT SETBACK SELECT switch in the setback/setup module to the desired position (5°, 10°, 15°). See Fig 14
3. Move the thermostat or transmitter heating set point (red lever) above room temperature The heating LED on the left-hand side of thermostat or transmitter should begin to glow. Electric heat should cycle on. Check supply duct outlets for heat. If heating equipment does not cycle on, see Service, Electronic Component Checkout.
4. Move the heating set point below room temperature. The heating equipment should cycle off and the heating LED intensity should decrease to a faint glow or go off completely.
5. Return the heating and cooling set points to desired settings and lock in place. On standard units, return subbase switch to desired position. On units with energy management accessory, an adjustable morning warm-up thermostat is used to hold dampers closed until return air reaches the setting on the thermostat located in the night setback box.

To Shut Off Unit — Standard units, set the subbase selector switch to OFF or set the heating temperature selector lever below room temperature. For units with energy management accessory, set the heating temperature selector switch below room temperature

AUTOMATIC CHANGEOVER — Standard units automatically switch from heating to cooling mode when the subbase selector switch is set at AUTO. and the temperature of the conditioned space rises to the cooling selector lever setting When the temperature of conditioned space falls to heating selector lever setting, the unit automatically changes from cooling mode to heating mode.

The thermostat and unit are so connected that cooling and heating systems do not operate simultaneously.

On units with energy management accessory, with dual set point thermostat or transmitter, changeover is also automatic. There is a minimum 3 F deadband between the heating and cooling set points

ECONOMIZER OPERATION — If unit is equipped with modulating outdoor air control (economizer), set enthalpy control (Fig. 4 and 8) at "A." Unit capability to integrate economizer with mechanical cooling allows for a higher changeover point than conventional economizer systems. Because of this, outside air is desired whenever its enthalpy (total heat content) is below return air enthalpy. Typical return air conditions, shaded portion of Fig. 9, indicate that setting "A" should be used for maximum operating economy.

OPERATING SEQUENCE WITH ECONOMIZER (without energy management accessory) using thermostat with subbase.

Cooling — System switch set at AUTO. or COOL, fan switch at ON or AUTO. (indoor air fan runs intermittently). Thermostat set at desired setting.

When thermostat calls for cooling and outdoor air enthalpy is below setting of enthalpy controller, the economizer modulates open. (If outdoor air enthalpy is

above enthalpy set point, the outdoor air dampers remain at minimum position.) Economizer acts as the first stage of cooling, providing "free cooling" with outside air. If outside air alone cannot satisfy the cooling requirements of conditioned space, economizer cooling is integrated with mechanical cooling.

Compressor(s), working simultaneously with economizer, will come on in stages to meet the cooling load.

As the conditioned space temperature approaches the thermostat's cooling set point, stages cycle off, last stage first. After all stages of mechanical cooling are off, economizer modulates to minimum position.

During the cooling cycle, a discharge air sensor senses discharge air temperature. If discharge air temperature drops below 62 F, economizer starts to modulate toward minimum position. At 50 F discharge temperature, the economizer will be at minimum position.

Heating — System switch set at HEAT or AUTO., fan switch at ON or AUTO., thermostat set at desired setting. When thermostat calls for heating, one or 2 stages of heat energize to satisfy heating demand.

As space temperature approaches the heating temperature set point, heating stages cycle off.

During heating, economizer is limited to the minimum position to provide outdoor air for ventilation requirements.

OPERATING SEQUENCE WITH ECONOMIZER AND ENERGY MANAGEMENT ACCESSORY (using electronic thermostat or transmitter).

Clock in remote control box switches controls to OCCUPIED mode. Indoor air fan runs continually while in OCCUPIED mode

If return air temperature is below the adjustable setting of morning warm-up thermostat, outdoor air dampers remain closed.

When return air temperature goes above setting of morning warm-up thermostat, economizer goes to adjustable minimum position.

When thermostat calls for cooling and outdoor air enthalpy is below setting of enthalpy controller, economizer modulates open. (If outdoor air enthalpy is above enthalpy set point, economizer remains at minimum position.) The economizer acts as the first stage of cooling, providing "free cooling" with outside air. If outside air alone cannot satisfy cooling requirements of the conditioned space, economizer cooling is integrated with mechanical cooling.

Compressor(s), working simultaneously with economizer, will come on in stages to meet the cooling load.

As the conditioned space temperature approaches the thermostat's cooling set point, stages cycle off, last stage first. After all stages of mechanical cooling are off, economizer modulates to minimum position.

During the cooling cycle, a discharge air sensor senses discharge air temperature. If discharge air temperature drops below 62 F, the economizer modulates toward minimum position. At 50 F discharge temperature, the economizer will be at minimum position.

At the end of the DAY (OCCUPIED) mode on the clock, unit controls enter the NIGHT (UNOCCUPIED) mode Economizer closes. Indoor air fan runs only on a call for heating or cooling. Temperature controls go into HEATING SETBACK, COOLING SETUP or COOLING SHUTDOWN mode.

HEATING SETBACK is field selectable at the unit for 5°, 10°, or 15° below set point on room thermostat.

COOLING SETUP is field selectable at the unit for 5°, 8°, or 12° above set point on room thermostat.

During the UNOCCUPIED mode, unit continues to use economizer cooling first and then integrates economizer cooling with mechanical cooling to meet cooling requirements.

A 5-hour bypass timer is located in the remote control box to provide air conditioning during normally unoccupied hours

POWER EXHAUST OPERATION — Units have an auxiliary switch located on the damper motor. This switch is factory set to prevent the power exhaust fans from operating when the economizer damper is less than 30% open.

If other than factory setting is desired, adjust as follows:

NOTE. Adjustment does not require running the motor

1. Motor must be in the fully closed position.
2. Referring to Fig. 16, take off "C" clip and drive bracket. Remove screws at 4 corners of housing. Pull off return spring housing.

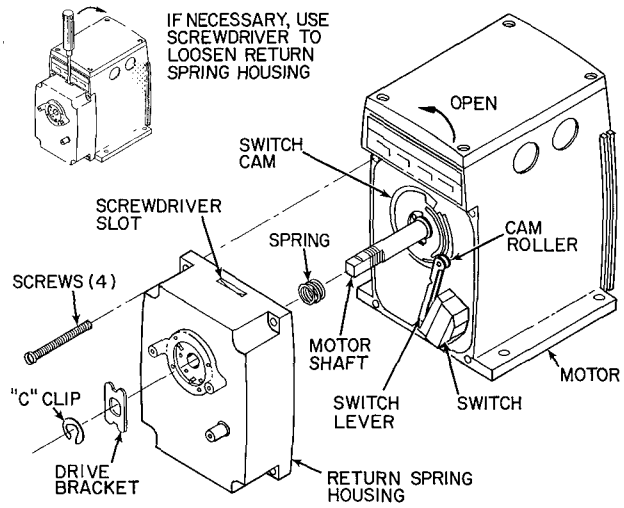
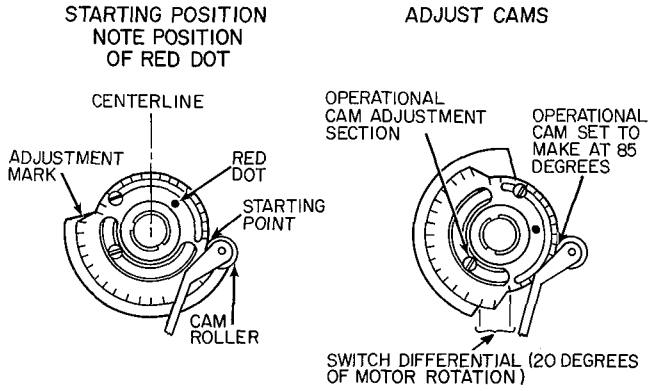


Fig. 16 — Removing Return Spring Mechanism



Each adjustment mark represents 10 degrees of motor rotation Use marks and center of cam roller as adjustment guide

Loosen operational cam adjustment screw Rotate both cams clockwise the number of degrees motor must travel before switch makes Tighten screw.

Red dot will be to right of centerline if switch is properly adjusted

Fig. 17 — Adjusting Switch Make and Break Points

3. Remove spring on motor shaft.
4. Adjust switch as shown in Fig. 17.
5. After adjustment, replace spring on motor shaft and reassemble return spring housing.

CAPACITY CONTROL, HEATING — Stages 1 and 2 of heaters are controlled by heating relays HR1 and HR2, respectively. Using a suitable ammeter, check heater current draw for heating assemblies or elements. When checking second-stage heater operation, be sure heating thermostat is set high enough to activate second-stage heaters Also, check operation of outdoor air thermostats if additional staging is provided

TIME GUARD® CIRCUIT — Timer sequence for a particular unit depends on unit and compressor arrangement. The Time Guard device provides a delay in compressor start-up after thermostat closes. On normal unit start-up, outdoor air fans energize 15 seconds before the compressor. If compressor/shutdown is due to satisfied thermostat or automatic resetting of a safety device, the compressor automatically restarts after a 5-minute interval. If compressor shutdown is due to tripped overloads, the circuit breakers must be manually reset before compressor will start.

Timer (Time Guard) for second compressor has a 6-minute interval to prevent compressors from starting simultaneously.

Refer to unit label diagram for specific timer sequence.

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

HEAD PRESSURE CONTROL — Each unit has a fan cycling thermostat to shut off outdoor fan motors at 55 F. This permits unit to operate with correct condensing temperatures down to 35 F outdoor air temperature.

SERVICE

Electronic Component Checkout

⚠ CAUTION

Control circuit must be checked with system power on. Disconnect power before checking wiring and use care to avoid electrical shock and prevent equipment damage.

The checkout procedures in this section will determine whether·

1. The logic panel is controlling the heating and cooling equipment properly.
2. System components are correctly wired to the logic panel.

Prior to checking out control circuit, establish setting on the low ambient lockout thermostat. Compressors will not start below this setting (cooling mode only). Recommended setting is approximately 50-55 F.

NOTE: To complete the electronic component checkout, a volt-ohmmeter (Simpson 260 is recommended) is required.

LOGIC PANEL (Fig. 18)

1. Check that 24 vac is supplied to logic panel Connect meter to terminals TR.
2 Check thermostat supply voltage at STAT terminals 1 and 2. Reading should be 20 vdc.

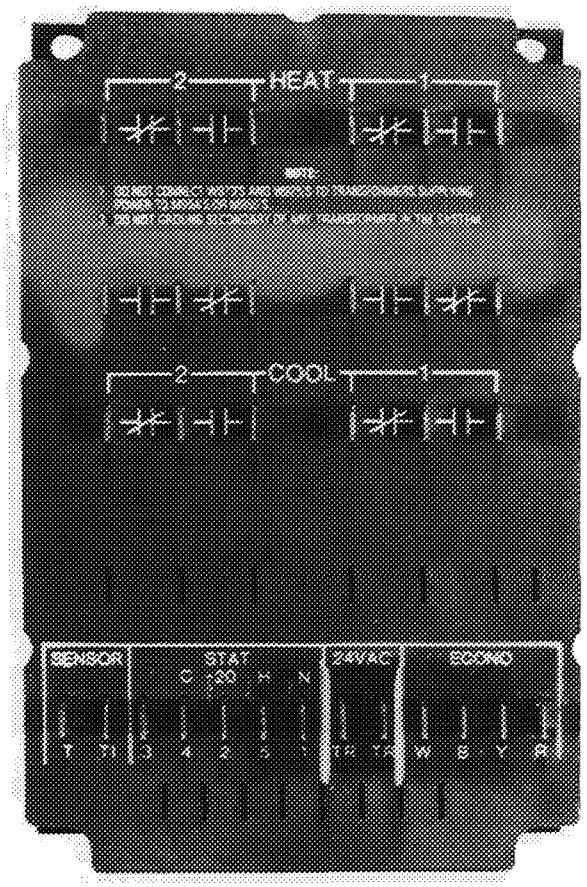


Fig. 18 — Logic Panel (Standard Unit)

3 Remove thermostat supply wires from STAT terminals 1 through 5 on logic panel.
4. Set meter to volts ac scale equal to relay switching voltage (50-volt scale for 24 vac).
5. To simulate a call for cooling, jumper between STAT terminals 2 and 4. Normally open logic panel contacts (COOL 1 and 2) should close and cooling equipment should cycle on.
6. Connect meter leads to the normally open cooling contacts 1 and 2 on logic panel. Meter should read zero if contacts have closed and contacts are made.

   If meter is reading zero and cooling equipment has not cycled on, logic panel is not at fault.
7. To simulate a call for heating, jumper between STAT terminals 2 and 5. Normally open logic panel contacts (HEAT 1 and 2) should close and heating equipment should cycle on.
8. Connect meter leads to the normally open heating contacts on logic panel. Meter should read zero if contacts have closed.

   If meter is reading zero and heating equipment has not cycled on, logic panel is not at fault.
9. Replace thermostat wiring to terminals 1 through 5.

DISCHARGE SENSOR

1 Set resistance on meter to R x 100.
2. Disconnect lead from SENSOR terminal T1 on logic panel.

3. Connect one meter lead to logic panel terminal T and the other meter lead to the loose lead wire from the sensor.
4. Meter readings depend on temperature. Discharge sensor readings should be between 1500 and 4500 ohms. See Fig. 19.

THERMOSTAT/TRANSMITTER (Fig. 15)

1. Set meter to 20 vdc scale.
2. Check for power to thermostat. Connect negative (–) lead to terminal 1 and positive (+) lead to terminal 2. Meter should read 20 vdc.
3. Connect the negative (–) lead to terminal 1 and the positive (+) lead to terminal 4.
4. Slowly move the cooling lever below room temperature to simulate a call for cooling. Meter reading should gradually increase to about 16 vdc. (See Fig. 20.)
5. Move the cooling lever above room temperature. Meter reading should drop to less than 2 vdc.
6. Remove the (+) meter lead from terminal 4 and connect it to terminal 5.
7. Slowly move the heating lever above room temperature to simulate a call for heating. Meter reading should gradually increase to about 16 vdc. (See Fig. 20.)
8. Move the heating lever below room temperature. The meter reading should drop to less than 2 vdc.

ECONOMIZER (Motor Operation) — Check to see 115 v is at the economizer motor. Remove wire from the W terminal on damper motor. Dampers should go fully open.

Short between R-W on motor terminals. Dampers should go fully closed.

Logic Panel Economizer Signal

1. Disconnect terminal W on logic panel.
2. Connect meter (2.5 vdc scale) with negative (–) lead to R and the positive (+) lead to W.
3. Set thermostat for a call for cooling. Meter reading should rise to 1.5 vdc. If thermostat was already calling for cooling, reading will be 1.5 v when meter is connected.
4. Turn thermostat up so that no cooling is called for. Voltage should fall from 1.5 vdc to 0.

   Conduct the above test with air temperature at the discharge sensor (located at unit air discharge) above 62 F. If air is below 50 F, there will be no voltage signal. If air is between 50 and 62 F, voltage will be in the same proportions.

⚠ CAUTION

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

Cleaning — Inspect unit interior at the beginning of each heating and cooling season and during each season as operating conditions require. Remove unit top panel(s) and/or side panels as required to expose unit interior.

EVAPORATOR COILS — Clean with a stiff brush, vacuum cleaner or compressed air.

CONDENSER COILS — Clean with a stiff brush or vacuum cleaner. When cleaning with compressed air or low-pressure water or steam, guard against damaging

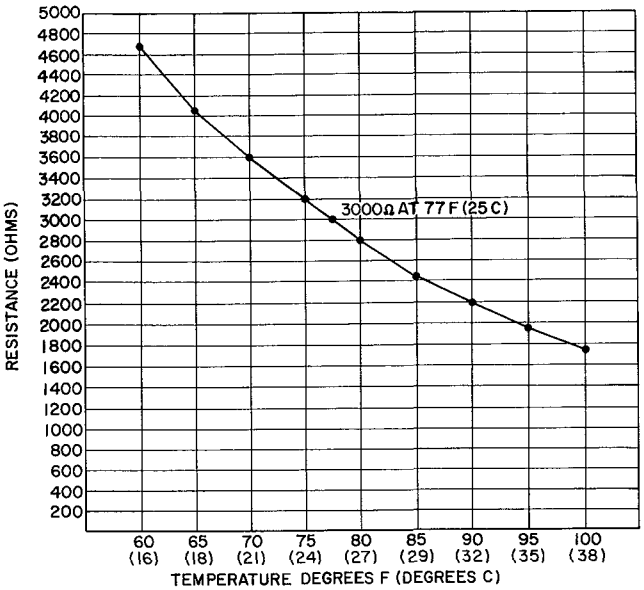
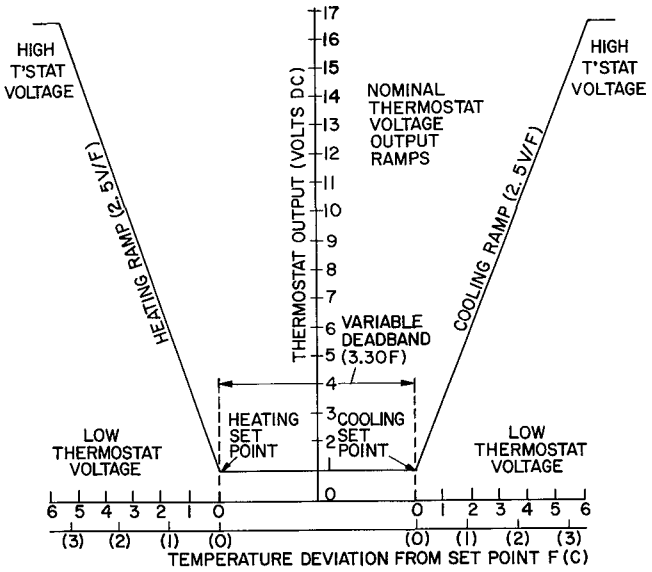


Fig. 19 — Resistance Range of the Discharge Sensor



VOLTAGES NECESSARY TO ACTIVATE LOGIC PANEL

HEAT STAGE	VOLT DC	COOL STAGE	VOLT DC
1	4 63	1	5 00
2	5 88	2	5 88

Differential 63 ±.07 volts Tolerance· ± 25 volts

Fig. 20 — Thermostat/Transmitter Output Voltage Ramps

compressor wiring and nearby controls. Condenser fan motor(s) is drip-proof but not waterproof.

CONDENSER SECTION DRAIN — Check that area under coil is clear and drains freely.

CONDENSATE DRAIN — Check and clean annually at start of cooling season. In winter, keep drain and trap dry or protect against freeze-up.

FILTERS — Replace filters at start of each heating and cooling season or as often as necessary during each season, depending on operating conditions. Refer to

Table 3 — Indoor Air Fan Data

UNIT 50DF	CFM	EXTERNAL STATIC PRESSURE (in. wg)																					
		0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60		1.80		2.00		2.20	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
034	9,000	690	2 86	755	3 40	812	3 91	865	4 42	916	4 94	960	5 42	1006	5 94	1052	6 48	**1094**	**7.02**	**1133**	**7.57**	**1173**	**8.18**
	9,500	720	3 29	784	3 88	839	4 42	891	4 95	940	5 49	985	6 03	1026	6 54	1071	7 10	**1114**	**7.67**	**1153**	**8.24**	**1190**	**8.81**
	10,000	751	3 76	813	4 40	867	4 97	917	5 53	964	6 09	1010	6 67	1051	7 22	**1091**	**7.77**	**1133**	**8.36**	**1174**	**8.97**	**1211**	**9.56**
	10,500	782	4 28	842	4 96	895	5 57	943	6 16	990	6 75	1034	7 35	1076	7 96	**1114**	**8.51**	**1152**	**9.10**	**1193**	**9.73**	**1232**	**10.37**
	11,000	814	4 80	871	5 60	923	6 20	971	6 80	1016	7 50	1059	8 10	**1100**	**8.70**	**1139**	**9.30**	**1174**	**9.90**	**1212**	**10.50**	**1250**	**11.20**
	11,500	845	5 50	901	6 20	952	6 90	999	7 60	1042	8 20	**1085**	**8.90**	**1125**	**9.50**	**1164**	**10.20**	**1200**	**10.80**	**1233**	**11.40**	**1270**	**12.10**
	12,000	877	6 10	931	7 00	981	7 70	1027	8 40	1069	9 00	**1110**	**9.70**	**1150**	**10.40**	**1188**	**11.10**	**1225**	**11.80**	**1258**	**12.40**	**1291**	**13.10**
	12,500	909	6 80	962	7 70	1010	8 50	1055	9 20	**1097**	**9.90**	**1136**	**10.60**	**1176**	**11.30**	**1213**	**12.00**	**1249**	**12.80**	**1284**	**13.50**		
	13,000	941	7 60	992	8 50	1039	9 40	**1083**	**10.10**	**1125**	**10.90**	**1163**	**11.60**	**1201**	**12.30**	**1238**	**13.10**	**1273**	**13.80**				
	13,500	973	8 50	1023	9 40	1069	10 30	**1112**	**11.10**	**1153**	**11.90**	**1191**	**12.60**	**1227**	**13.40**	**1264**	**14.10**	**1298**	**14.90**				
	14,000	1006	9 40	1054	10 40	**1099**	**11.30**	**1141**	**12.10**	**1181**	**12.90**	**1218**	**13.70**	**1254**	**14.50**	**1290**	**15.30**						
	14,500	1038	10 30	**1085**	**11.40**	**1129**	**12.30**	**1170**	**13.20**	**1209**	**14.10**	**1246**	**14.90**	**1282**	**15.70**								
	15,000	1071	11 30	**1116**	**12.40**	**1159**	**13.50**	**1200**	**14.40**	**1238**	**15.30**	**1275**	**16.10**										

Boldface indicates alternate or field-supplied fan motor or drive is required.

Bhp — Brake horsepower
Rpm — Revolutions per minute

NOTES:
1 *Values in italics* indicate that motor larger than optional fan motor is required
2 Fan performance has deductions for unit casing losses, wet coil and clean standard filters
3 Fan motor bhp is based on minimum voltages and 80 F air across motor

Table 1 for type and size of filter used. Filter access panels are shown in Fig. 4. Return air filter tracks will accept 2 layers of one-in. thick filters if 2-in. filters are not available. Do not install bag filters in standard filter tracks. Do not install standard filters or 2-in. high-efficiency filters in bag filter tracks.

OUTDOOR AIR INLET SCREEN(S) — Clean screens with steam or hot water and mild detergent. Do not use throwaway filter in place of these screens. Loosen fastening-bracket screws and slide out screens.

Lubrication

COMPRESSORS — Each compressor is charged with correct amount of oil at the factory. Oil level should be between bottom and mid-level of sight glass when compressor is warm. Refer to 06D or 06E Compressor Service Manual if additional information regarding compressor lubrication system is required.

FAN SHAFT BEARINGS — Charge each grease fitting with a suitable bearing grease at least once a year. Do not overlubricate.

FAN MOTOR BEARINGS — No relubrication of outdoor air fan motors is necessary for first 2 to 5 years of use, depending on operating conditions Annually thereafter, open, clean and repack each bearing with a suitable bearing grease

Indoor air fan motor bearings should be cleaned and repacked with a suitable bearing grease annually after initial unit installation.

Indoor Air Fan Adjustment — Fixed fan speeds are set as shown in Table 1. If other than available fan speeds are required, select field-supplied motor or pulleys, using data from Tables 3 and 4.

PULLEY REMOVAL — Pulleys are of the fixed type and have taper-lock bushings. To remove, shut off unit power. Loosen fan motor mounting plate and remove belt. Relocate taper-lock bushing bolts in removal holes to loosen bushing. Remove pulley from shaft.

After reinstalling pulley and belt, check pulley alignment and belt tension as described below.

PULLEY ALIGNMENT — Loosen fan shaft pulley bushing and slide pulley along shaft. Make angular adjustment by loosening motor mounting plate and repositioning it as required.

BELT TENSION — Adjust belt tension by moving motor back until only a *slight bow* appears in the belts on the slack side of the drive while running under full load. Secure motor. Recheck belt tension after 24 hours of operation, adjust as necessary.

→ **Table 4 — Indoor Air Fan Pulley Data**

UNIT 50DF	FAN RPM	MOTOR PULLEY	FAN PULLEY	SINGLE-SPEED BELT
		No. Grooves-Type-In.		NO.-SIZE
034	**925**	**2-3V-5.6**	**2-3V-10.6**	**2-3V-750**
	991	**2-3V-6.0**	**2-3V-10.6**	**2-3V-750**
	1073	**2-3V-6.5**	**2-3V-10.6**	**2-3V-750**
	1093	**3-3V-5.0**	**3-3V- 8.0**	**3-3V-710**
	1141	**4-3V-4.5**	**4-3V- 6.9**	**4-3V-670**
	1159	4-3V-5.3	4-3V- 8.0	4-3V-710
	1225	4-3V-5.6	4-3V- 8.0	4-3V-710
	1300	**3-3V-6.0**	**3-3V- 8.0**	**3-3V-710**

*Remove one belt

NOTE: Values shown indicate standard or optional pulley combinations available as shown in Physical Data table All other combinations are field supplied and shown in **boldface** type

Power Exhaust Air Fan Adjustment (if fitted) — Adjust belt tension so that 1/8-in. deflection at 5- to 8-pounds pressure between pulley centers can be obtained. To change tension, loosen motor mounting bolts, reposition motor and tighten mounting bolts. Tighten locknut and bolt under motor mounting plate to secure in fixed position.

Outdoor (Condenser) Air Fan Adjustment

(Fig. 21) — Shut off unit power supply Remove fan guard and loosen fan hub setscrews Adjust fan height using a straight edge laid across venturi. Tighten setscrews and replace rubber hubcap to prevent hub from rusting to motor shaft. Fill hub recess with Permagum if hub has no rubber hubcap.

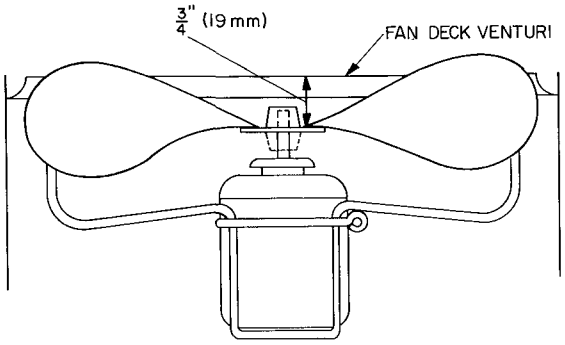


Fig. 21 — Outdoor Air Fan Adjustment

Damper Vent Position Setting

1. On constant volume units, adjust thermostat or transmitter so there is no call for cooling. On variable volume units, adjust set point knob on microprocessor so there is no call for cooling. The economizer dampers go to minimum position
2. Remove cap from vent adjustment screw on top of damper motor terminal box cover
3. Turn adjustment screw slowly until dampers assume desired vent position. *Do not manually operate damper motor. Damage to motor will result.*

POWER FAILURE — Dampers have a spring return. In the event of a loss of power, dampers close until power is restored *Do not manually operate damper motor. Damage to motor will result.*

Refrigerant Charge — Amount of refrigerant charge is shown on unit nameplate and in Table 1. When charging refrigerant system, refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants. When adding a complete charge, evacuate the system using standard evacuating procedures and weigh in specified amount of refrigerant. A charging chart (Fig. 22) is provided on unit control box door above compressor and may be used (use of sight glass not required).

When using refrigerant liquid line sight glass to charge system:

1. Install a jumper on the low-pressure switch if required.
2. Operate unit with restricted condenser airflow to achieve an operating discharge pressure of about 375 psig.
3. Slowly add refrigerant until sight glass clears.
4. Remove jumper from low-pressure switch and remove condenser air restriction.

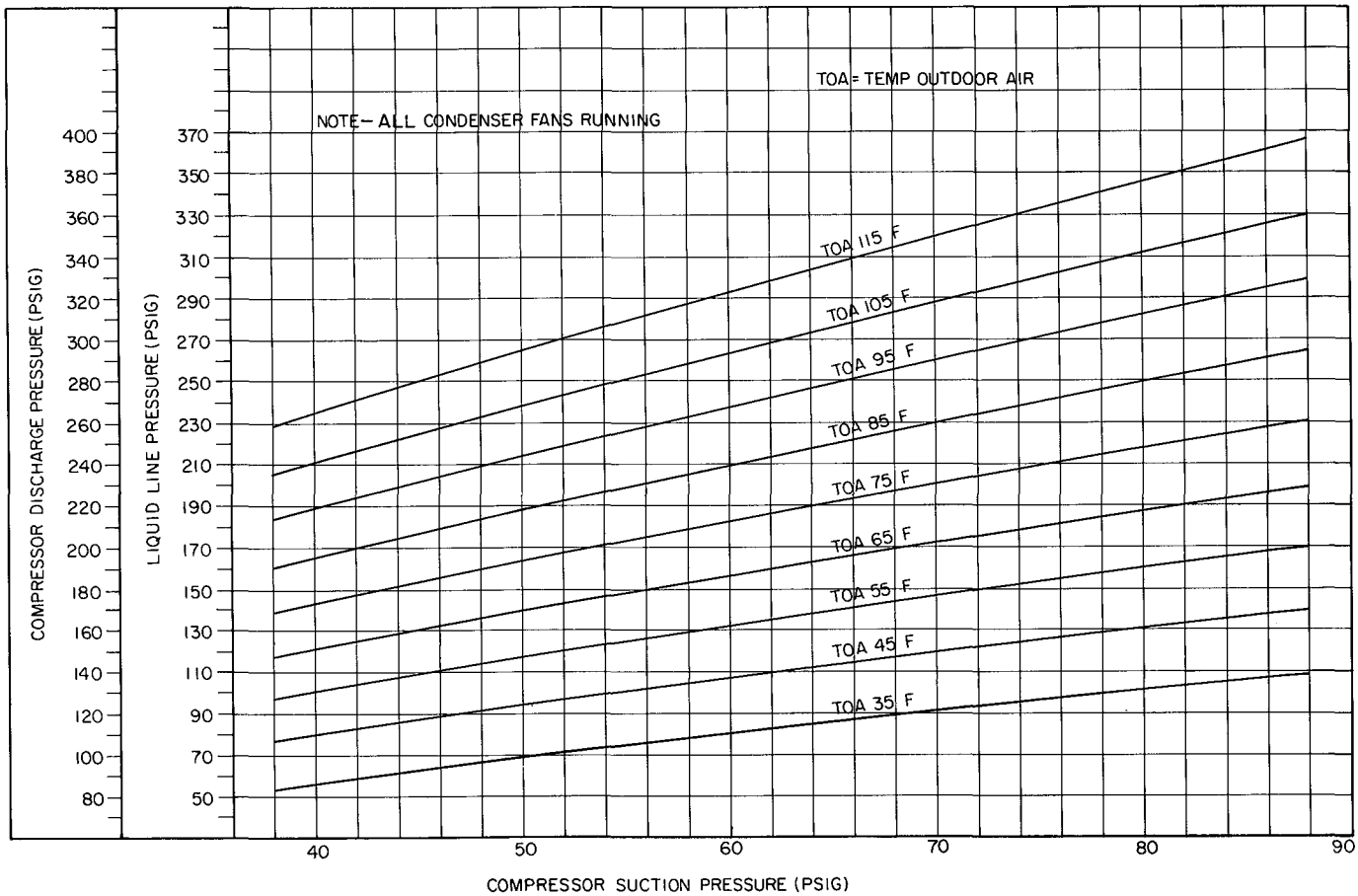


Fig. 22 — Charging Chart; 50DF034, System 1 and System 2