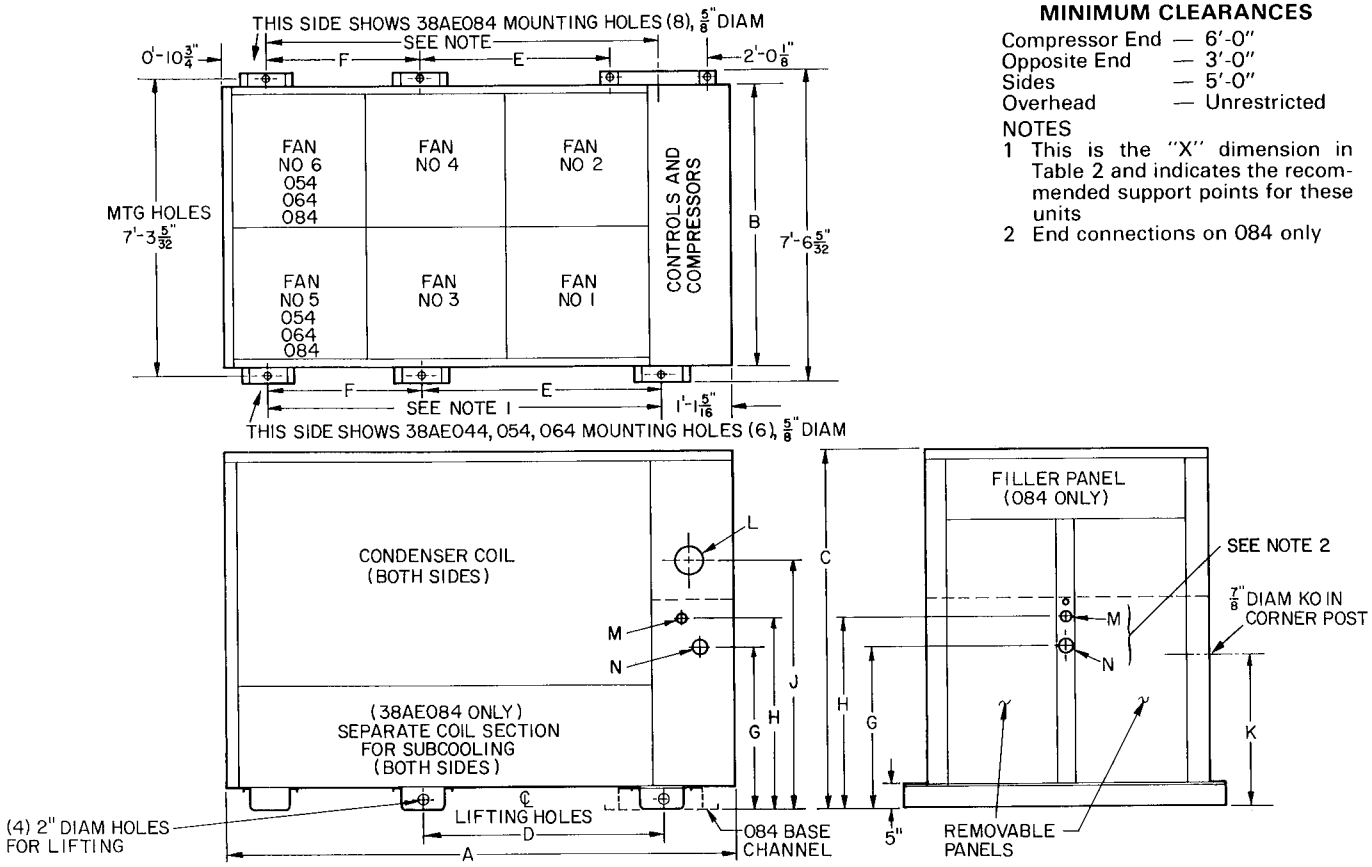
Carrier
HEATING & COOLING

38AE044,054,064,084
Air-Cooled Condensing Units

Installation, Start-Up and Service Instructions



MINIMUM CLEARANCES

Compressor End	— 6'-0"
Opposite End	— 3'-0"
Sides	— 5'-0"
Overhead	— Unrestricted

NOTES
1 This is the "X" dimension in Table 2 and indicates the recommended support points for these units
2 End connections on 084 only

Fig. 1 — Dimension Drawing (See Table 1)

Table 1 — Physical Data

UNIT 38AE		044	054	064	084
DIMENSIONS (ft-in)					
Length	A	11- 0-1/4	12-10-9/16		13-8-1/2
Width	B	7- 0-7/16	7- 0-7/16		7-0-7/16
Height	C	4- 8-5/32	5- 8-1/16		7-4-1/8
Lifting Holes ℄	D	5- 6-1/2	8-2		6-3-13/16
Mounting Holes ℄	E	5- 6-1/2	8-2		5-3-3/4
	F	3- 5-5/8	2- 8-11/32		5-0
Suction Inlet	G	2- 5-5/16	2-11-7/8		3-4-1/2
Liquid Outlet	H	2-11-1/8	3- 7-7/8		3-7-1/2
Main Power Conn	J	3- 8-13/16	4- 8-3/4		4-2-1/4
Contr Pwr Entrance	K	2- 2-1/8	3-7		3-7
APPROX WEIGHT (lb)					
Shipping		2650	3100	3650	5100
Operating		2686	3158	3682	5160
REFRIGERANT		R-22			
Approx Oper Chg (lb)*		38	57	81	110
COMPRESSOR, 06E†		Reciprocating Semi-hermetic			
No Rpm		2 1750			3 1750
No 1		4250	5275	4275	A250
No. 2		A250	A250	A275	8275
No 3		—	—	—	F275
Cyl (no 1/no 2/no 3)		4/4	6/4	6/6	4/6/6
Oil Charge (pt)		14/14	19/14	19/19	14/19/19

UNIT		044	054	064	084
COND FANS (Rpm)‡		1080			1060
No Diam (in.)		4 26	6 26	6 26	6 30
Total Airflow (cfm)		26,000	39,000	39,000	54,000
CONDENSER COILS		2 Vertical			
Rows/Coil		3	2	3	3
Total Face Area (sq ft)		76 7	115	115	153
Storage Capacity (lb)**		93 7	148 3	222 8	320
CONNECTIONS		See Fig 1			
Main Power	L	3††	3-1/2††		4††
Liquid Outlet	M	7/8 ODF	1-1/8 ODF		1-1/8 ODF
Suction Inlet	N	2-1/8 ODF	2-5/8 ODF		2-5/8 ODF
PRESSURE RELIEF		Fusible Plug			

*All units are shipped with a holding charge See Preliminary Charge
†Compressors in 38AE044,054 and 064 are numbered left to right viewed from compressor end of unit In 38AE084 units, viewed from compressor end, compressor no 1 is in the center, no 2 is on the left and no 3 is on the right
All compressors in 38AE044,054,064 units are standard; in 38AE084 units, 250 is standard, 275's are reversed-head type
Prefix: A, F = no unloader; 4, 8 = one pressure unloader; 5 = 2 pressure unloaders
‡Propeller type, direct drive
**Storage capacity at 120 F condensing temperature with condenser 80% full of liquid refrigerant
††American Standard straight pipe thread

Book 1 Tab 3a | PC 111 | Catalog No 533-825 | Printed in U S A | Form 38AE-14SI | Pg 1 | 12-87 | Replaces: 38AE-8SI

INSTALLATION

Rigging — All units are designed for overhead rigging only. For this purpose, the transverse base channels extend beyond the sides of the unit, with holes provided in end plates to attach cables or hooks. *Use a spreader frame above the unit to keep cables vertical and away from the sides.* As further protection for the coil faces, plywood sheets may be placed against the side of the unit, behind the cables. Run the cables to a central suspension point so that the angle from the horizontal is not less than 45 degrees. Raise and set the unit down carefully.

38AE044,054,064 — These sizes are shipped without a skid and all handling, from unloading to final placement, must be done with extreme care.

If it is necessary to roll the unit into position, mount unit on longitudinal rails and use a minimum of 3 rollers. *Apply force to the rails, not the unit.*

If the unit is to be skidded into position, place unit on a large pad and *drag unit by the pad. Do not apply any force to the unit.* Raise from above to lift unit from the rails or pad when it is in final position.

Placing the Unit — Locate unit so that condenser airflow is unrestricted on all sides and above. Be sure to provide clearance all around as shown in Fig. 1. Mount unit on a level pad directly on the base channels or mount on raised pads at support points. The weight distribution based on recommended support points is shown in Table 2. Bolt securely to pad(s) when unit is positioned and leveled.

If vibration isolators are required for a particular installation, the weight distribution shown in Table 2 will aid in making the proper selection.

Compressor Mounting — As shipped, the compressor is held down by special self-locking bolts and plain lockwashers. After unit is installed, remove the self-locking bolts one at a time and reassemble with flanged washers and neoprene snubbers as shown in Fig. 2. The flanged washers and neoprene snubbers are shipped in a cloth bag tied to one of the compressor feet. Tighten all 4 bolts, then loosen each until the flanged washer can be moved sideways with finger pressure.

Refrigerant Piping — These units have generously sized suction lines to minimize friction losses. This, plus the ability of the unit to operate at low capacity, means that care must be given to suction piping in general, and especially to suction risers, to ensure proper compressor oil return under all operating conditions. Size suction risers in accordance with the recommendations in Part 3 of the Carrier System Design Manual.

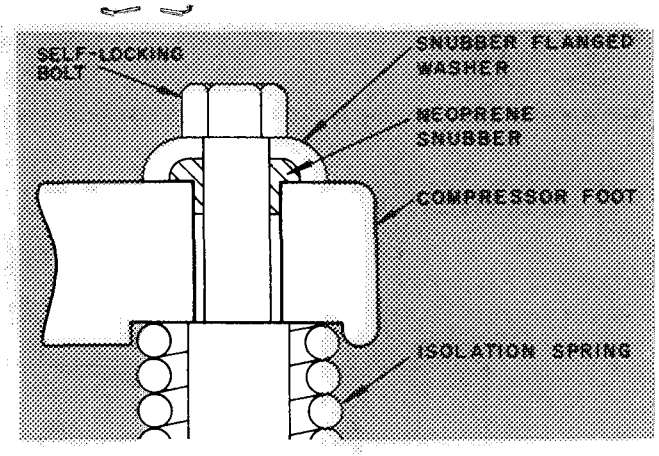


Fig. 2 — Compressor Mounting

Determine the lengths and sizes of piping required between the condensing unit and the evaporator. If the lengths of interconnecting piping exceed 125 ft, install unit with solenoid drop control and solenoid shutoff valves in the liquid lines. Refer to Part 3 of the Carrier System Design Manual for line sizing information and to Fig. 3 for recommended piping details.

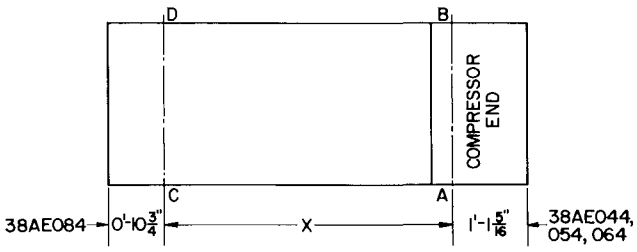
→ SINGLE PUMPOUT CONTROL — All units are factory wired to operate on single pumpout control. A field-supplied liquid line solenoid valve is required, sized for minimum pressure drop, to be installed immediately ahead of each expansion valve. If unit is to be used with a chiller, wiring modifications may be necessary.

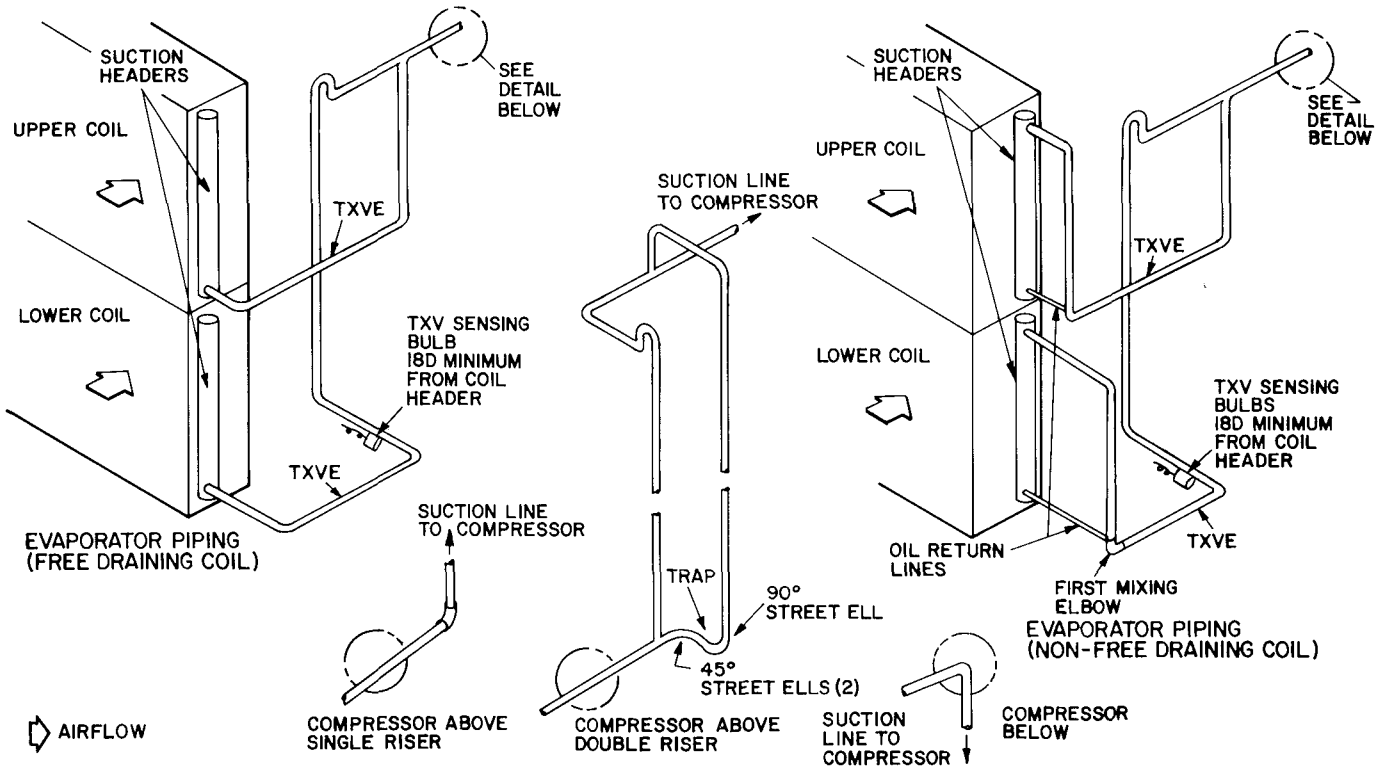
To achieve good mixing of the refrigerant leaving the evaporator suction header for proper sensing by the TXV bulb:

1. Install a minimum of two 90-degree elbows upstream of expansion valve bulb location.
2. The TXV sensing bulb should be located on a vertical riser where possible. If a horizontal location is necessary, secure the bulb at approximately the 4 o'clock position.
3. Size the suction line from the evaporator thru the riser for high velocity. Enter the suction pipe

Table 2 — Weight Distribution

UNIT 38AE	APPROX OPER WT (lb)	WEIGHT (lb) Support Point A	B	C	D	DIM. BETWEEN SUPPORTS (ft-in.) X
044	2686	906	906	437	437	9- 0-1/8
054	3158	1047	1047	542	542	10-10-11/32
064	3682	1174	1174	667	667	
084	5160	1828	1828	752	752	11- 3-11/16





NOTES:
1 Lower split first on, last off.
2 D as used in 8D etc , indicates the pipe diameter size as a measure of length
3 TXVE indicates Thermostatic Expansion Valve Equalizer Connection

Fig. 3 — Typical Piping Connections for Face Split Coils

sizing charts in the Carrier System Design Manual at design tons and equivalent length (for 2 F loss). If reading falls between 2 sizes on chart, choose the smaller pipe size.

Suction piping for the high velocity section should be selected for about 0.5 F friction loss. If a 2 F loss is allowed for the entire suction line, 1.5 F is left for the balance of the suction line and it should be sized on that basis. Check that the high-velocity sizing is adequate for oil return up the riser.

If an oil return connection at the bottom of the suction header is supplied with an evaporator, this connection must be teed in ahead of first mixing elbow (Fig. 3). When the compressor is below the evaporator, the riser at the evaporator does not have to extend as high as the top level. After the 15 diameter riser has been installed, the suction line may elbow down immediately.

Install a field-supplied filter-drier and sight glass in each unit. Select filter-drier for maximum unit capacity and minimum pressure drop. Figure 4 shows recommended locations for filter-drier(s) and sight glass. Complete the refrigerant piping from the evaporator to the condenser before opening the liquid and suction lines at the condensing unit.

On 38AE084 units, remove the guard covering the liquid and suction lines projecting thru the center post.

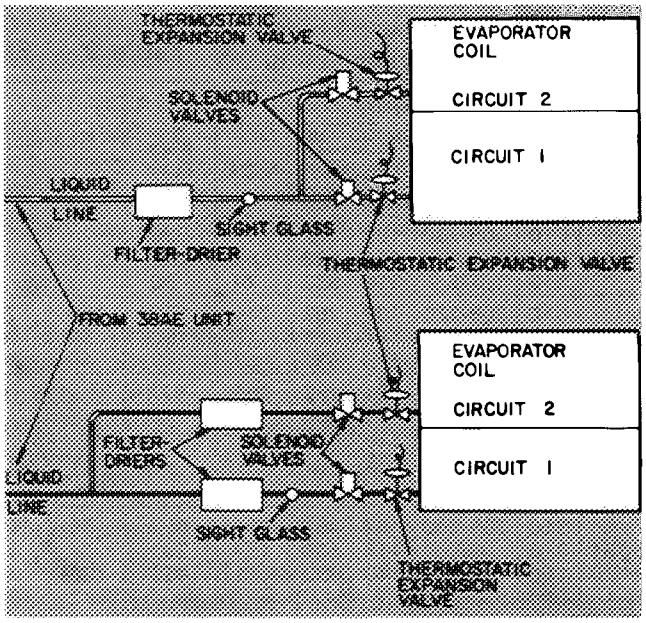


Fig. 4 — Recommended Filter-Drier(s) and Sight Glass Locations

On all units, relieve the pressure caused by the holding charge. Break the sweat connections and remove the run-around loop connecting the liquid and suction lines for shipping. Now sweat-connect the liquid and suction lines from the evaporator. The run-around loop is factory connected with silver solder. When the run-around loop is removed, the field connections should be silver soldered.

Leak Test the entire system by the pressure method described in the Carrier Standard Service Techniques Manual, Chapter 1, Section 1-6. Use R-22 at approximately 25 psig backed up with an inert gas to a total pressure not to exceed 245 psig.

Evacuate and Dehydrate — For 38AE044,054, 064 units, the entire system must be evacuated and dehydrated before charging. On 38AE084 units, evacuate and dehydrate the system if a leak is detected. Follow methods described in the Carrier Standard Service Techniques Manual, Chapter 1, Section 1-7.

Power Supply — Electrical characteristics of available power supply must agree with the unit nameplate rating. Voltage supply must be within the range shown in Table 3. *Operation of unit on improper supply voltage or with excessive phase unbalance constitutes abuse and may void the Carrier Warranty.*

Power Wiring — All power wiring must comply with applicable local and national codes. Install a field-supplied branch circuit fused disconnect of a type that can be locked "Off" or "Open." Run power wires from the disconnect thru opening provided and connect to unit power terminal block (see Fig. 1, 6 and 7). See Table 4 for maximum field wire sizes for all voltages.

Control Circuit Wiring — The internal control circuit is 120 volts, from a transformer in the control box. The transformer primary is unit voltage. For 208/230-volt units, the transformer primary is factory wired for 208 volts. If the unit is to be applied to a 230-volt system, the transformer must be reconnected to the 230-volt terminal. All control circuit wiring must comply with applicable local and national codes. Remote control wiring enters the unit thru an opening (knockout) in the side of the right front corner (see Fig. 6 for all units).

Be sure this opening is sealed watertight after the wires are thru. The control wires enter the control box thru the bottom, at the right end and connect to terminals on TB2.

Install field-supplied low-voltage accessories as shown in Fig. 5.

Table 4 — Maximum Field Wire Sizes

UNIT 38AE	VOLTS			
	200	230	460	575
	Wire Size			
044	500 MCM	350 MCM	2/0 AWG	2/0 AWG
054	500 MCM	500 MCM	350 MCM	2/0 AWG
064	1000 MCM	500 MCM	350 MCM	2/0 AWG
084	1000 MCM	1000 MCM	350 MCM	2/0 AWG

Table 3 — Electrical Data (60-Hz)

Model 38AE		UNIT Volts Nameplate	UNIT Volts Supplied* Min	UNIT Volts Supplied* Max	MCA	Max Fuse Amps	COMPRESSORS RLA (ea) No. 1	RLA (ea) No. 2	LRA (ea) No. 1	LRA (ea) No. 2	CB1 Poles/MTA†	CB2	Total Fans	FAN MOTORS (See Notes) FLA (ea) No. 1 & 2	FLA (ea) No. 3,4,5,6‡	MTA (FCB)
044	510	208-230	187	253	187	250	76		345		6/53		4	4 6	4 6	21
	610	460	414	508	89	125	36		173		3/50			2 3	2 3	14
	110	575	518	632	74	80	30		120		3/42			1.8	1.8	14
054	510	208-230	187	253	241	350	119	76	506	345	6/83	6/53	6	4 6	4 6	21
	610	460	414	508	111	150	53	36	253	173	3/73	3/50		2 3	2 3	14
	110	575	518	632	93	100	45	30	176	120	3/63	3/42		1.8	1.8	14
064	510	208-230	187	253	284	400	119		506		6/83		6	4 6	4 6	21
	610	460	414	508	128	175	53		253		3/73			2 3	2 3	14
	110	575	518	632	108	125	45		176		3/63			1 8	1 8	14
							No. 1	No. 2, 3	No. 1	No. 2, 3	CB 2**	CB 1, 3**				
084	510	208-230	187	253	371	450	76	119	345	506	6/53	6/83	6	7 7	6 2	33
	610	460	414	508	167	200	36	53	173	253	3/50	3/73		3 3	3 3	18
	110	575	518	632	141	150	30	45	120	176	3/42	3/63		2 6	2 6	14

CB — Circuit Breaker (compressor)
FCB — Fan Circuit Breaker
FLA — Full Load Amps, for fan motors
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps Complies with National Electrical Code (NEC) Section 430-24
MTA — Must Trip Amps (factory-installed circuit breakers)
RLA — Rated Load Amps, for compressor motors

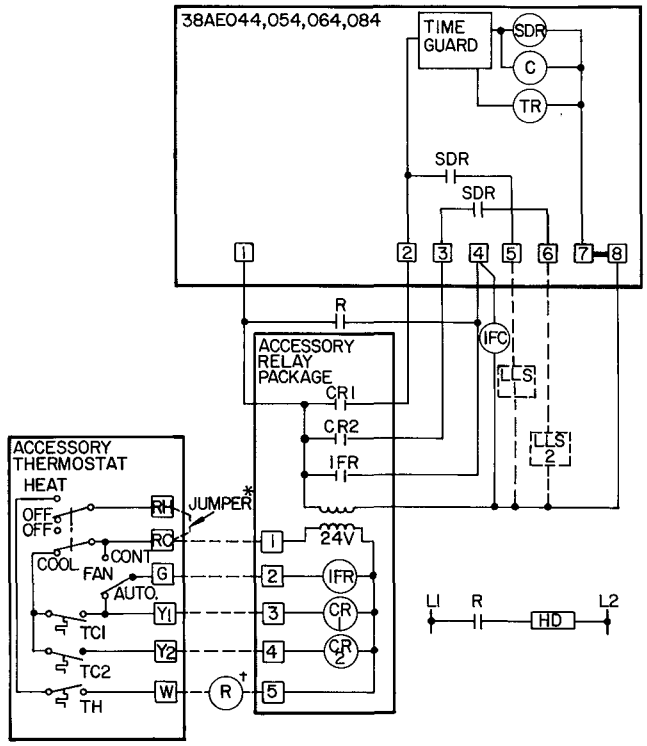
*Units suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed limits

†For 6-pole breakers, the listed MTA values are for each 3-pole section

‡Only no 3 and 4 on 38AE044

**CB2 is for compressor no 1, CB1 is for compressor no 2; CB3 is for compressor no 3

NOTES
1 In each unit, all condenser fan motors are wired thru a single circuit breaker
2 In all units, all fan motors are single-phase
3 The 2 fans adjacent to the compressor section (no 1 and 2) have speed control motors on 208/230- and 460-volt units, for use with head pressure control On 575-volt units, these motors must be changed for this application
4 Fuse only



C — Compressor Contactor
CR — Control Relay
HD — Heating Device
IFC — Indoor Fan Contactor
IFR — Indoor Fan Relay
LLS — Liquid Line Solenoid
R — Heating Relay (field-supplied 24-v sealed coil, 10 VA maximum rating)
SDR — Solenoid Drop Relay
TC — Thermostat, Cooling
TH — Thermostat, Heating
TR — Timer Relay
——— Factory Wiring
– – – – – Field Wiring

*Jumper removed only when separate 24-volt power sources are available for heating and cooling.
†To control heating device and provide automatic indoor fan operation on heating.
→ NOTE: Liquid line solenoid must be installed on all units in order for single pumpout to be functional

Fig. 5 — Control Circuit Wiring with 24-V Accessory

START-UP

Crankcase heaters must be on for 24 hours before starting unit. To energize the crankcase heaters set the space thermostat above ambient so there will be no demand for cooling. Close the field disconnect and turn the fan circuit breaker on. Leave the compressor circuit breakers off. The crankcase heaters are now energized.

Preliminary Checks

1. Each compressor must float freely on its mounting springs.
2. Electric power supply must agree with unit nameplate data.
3. Crankcase heaters must be securely in place.
4. Crankcase heaters must have been on at least 24 hours.
5. Compressor oil level must be visible in sight glass. Observed oil level will be the same for all compressors because they are connected thru an equalizer pipe.
6. Recheck for leaks using same procedure as previously.
7. If any leaks are detected, evacuate and dehydrate as previously.

Preliminary Charge — Refer to Carrier Standard Service Techniques Manual, Chapter 1, Section 1-8. By the liquid charging method and charging by weight procedure, charge the units with approximately the following amounts of R-22: 38AE044, 20 lb; 38AE054, 45 lb; 38AE064, 55 lb; 38AE084, 70 lb.

Start the Unit — The field disconnect is closed, the fan circuit breaker is closed and the space thermostat is set above ambient so that there is no demand for cooling. Only the crankcase heaters are energized. After the heaters have been on for 24 hours, the unit can be started.

Close the compressor circuit breakers, and reset the space thermostat *below* ambient, so that a call for cooling is ensured.

NOTE: Do not use circuit breakers to start or stop compressors, except in an emergency.

Depending on the position of the Time Guard® timer, start-up of the lead compressor will be delayed from 12 seconds to 8 minutes from the time the control circuit is energized. The minimum time lag before the second compressor can start is approximately 2.5 minutes after lead compressor starts.

Adjust the Refrigerant Charge — Block condenser coils to maintain 123 F condensing temperature, add refrigerant to a clear sight glass if necessary (see Fig. 4 for sight glass location).

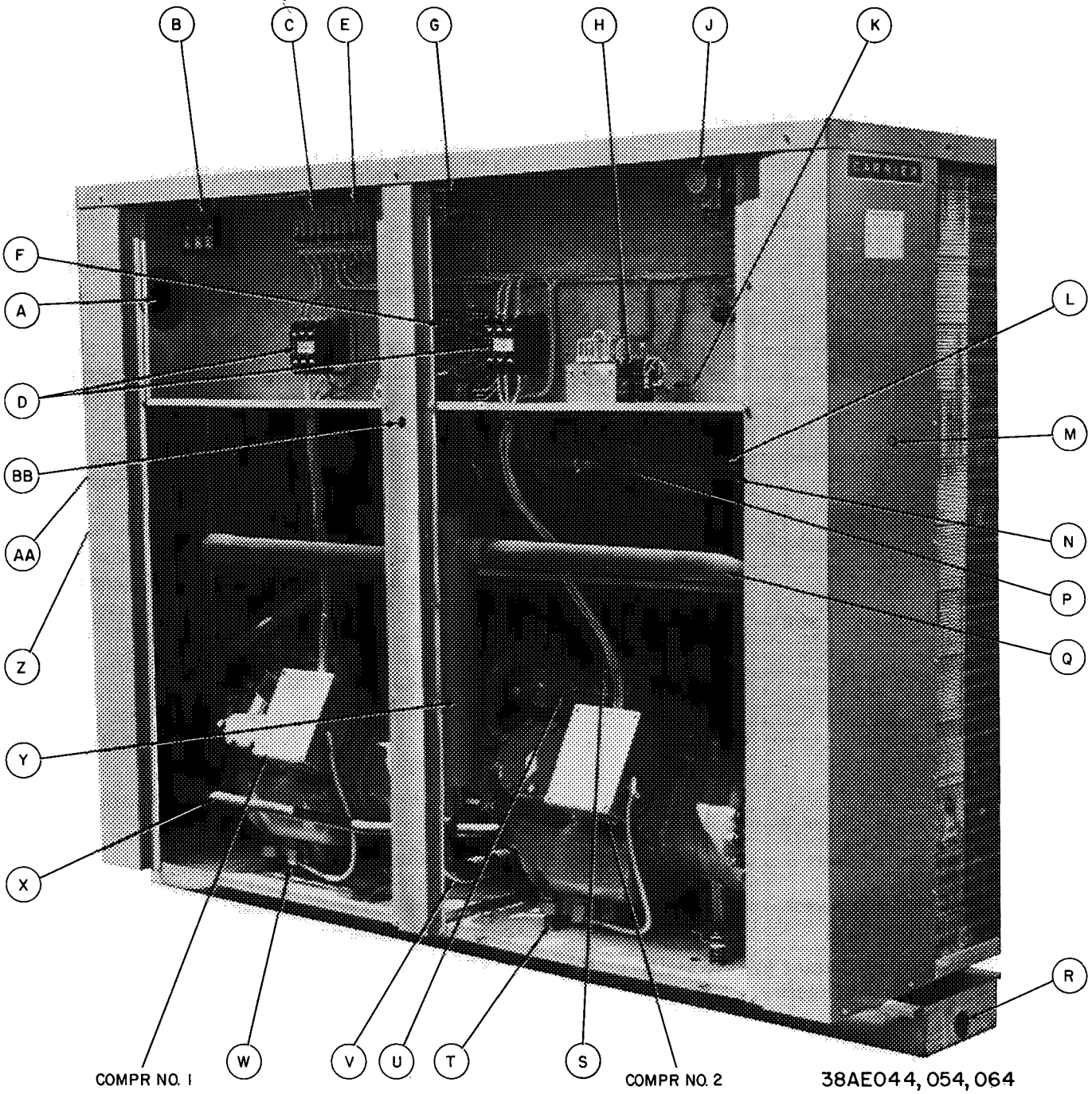
NOTE: If long liquid lines or vertical lifts greater than 25 ft are used, install a liquid line sight glass at the condensing unit for charging.

When the sight glass has cleared, charge additional refrigerant (see Table 5) to flood subcooler circuit in the condensers.

Table 5 — R-22 Charging Data*

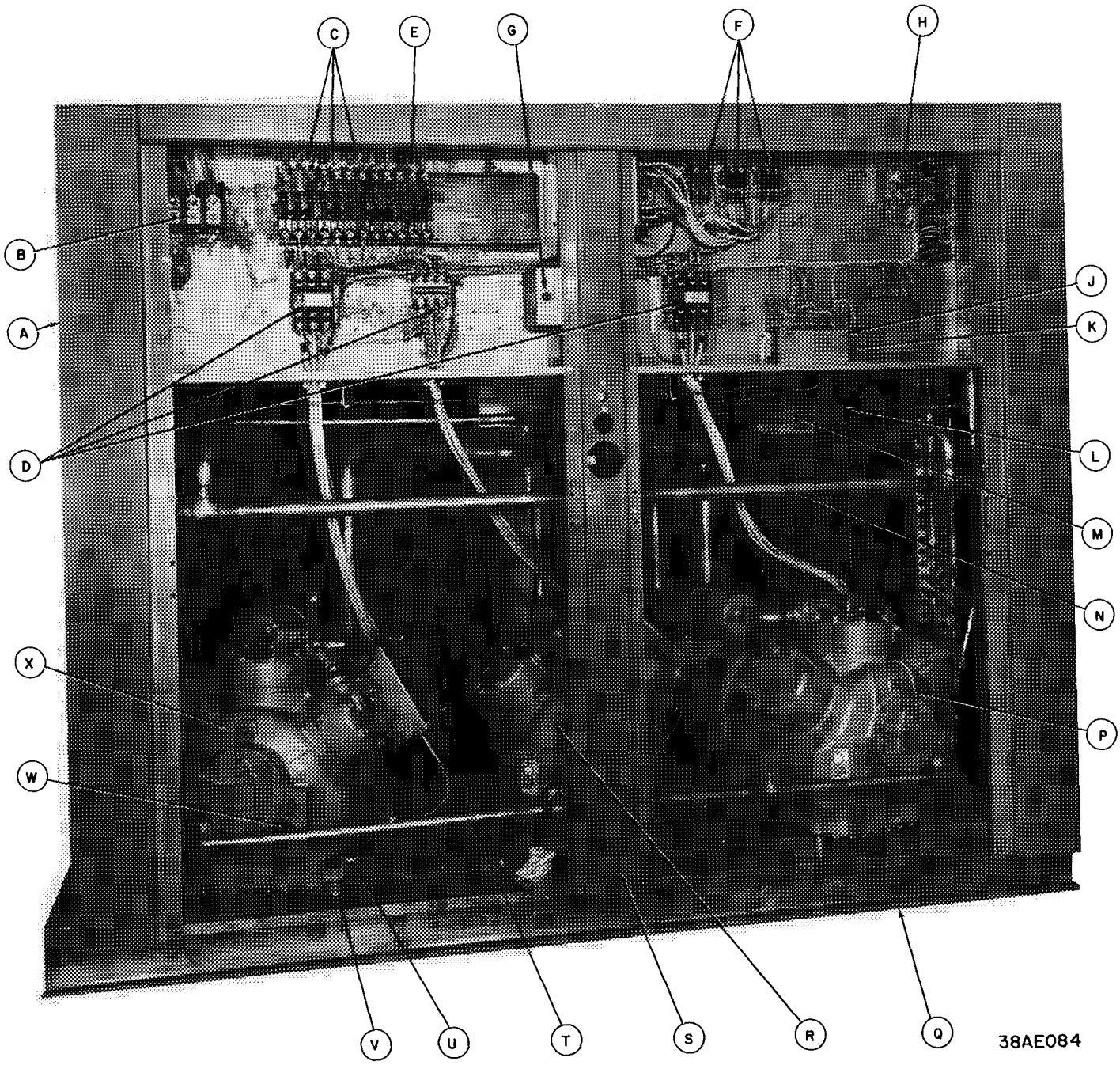
UNIT 38AE	CHARGE TO FLOOD SUBCOOLER CIRCUITS (lb)
044	12
054	8
064	20
084	36

*Above a clear sight glass



A — Field Unit Power Supply
B — Unit Power Terminal Block
C — Compressor Circuit Breakers
D — Compressor Contactors
E — Fan Circuit Breaker
F — Fan Contactors
G — Transformer (Control Power)
H — High and Low Pressurestats
J — Time Guard® Timer
K — Oil Pressure Safety Switch
L — Pressure Sensor (Fan Cycling, All Units)
M — Knockout for Remote Control Wiring
N — Highside Pressure Relief
P — Liquid Line Service Valve (one for each condenser)
Q — Suction Line to Compressor No 2
R — Base Channel
S — High Pressurestat Connection
T — Compressor Mounting (typical)
U — Discharge Gas Thermostat (each compressor)
V — Suction Line to Compressor No 1
W — Crankcase Heater (each compressor)
X — Oil Level Equalizer Pipe
Y — Accumulator
Z — Suction Line Connection (capped for shipping)
AA — Liquid Line Connection (on side of units)
BB — Opening to Outdoor Air Temperature Sensor (for cyling fans 5 and 6 on units 054 and 064)

Fig. 6 — General View of Compressor End with Service Panels Removed



A — Field Unit Power Supply (Side Corner)
B — Unit Power Terminal Block
C — Compressor Circuit Breakers
D — Compressor Contactors
E — Fan Circuit Breaker
F — Fan Contactors
G — Control Circuit Fuse
H — Time Guard® Timer
J — High and Low Pressurestats
K — Oil Pressure Safety Switch
L — High Side Pressure Relief (Liquid Line)
M — Pressure Sensor (Fan Cycling, No 3 and 4)
N — Hot Gas Discharge Line
P — Compressor No 3
Q — Base Channel
R — Compressor No 1
S — Center Post
T — Oil Level Equalizer Pipe
U — Crankcase Heater (Each Compressor)
V — Compressor Mounting (Typical)
W — Oil Sight Glass (Each Compressor)
X — Compressor No 2

Fig. 7 — General View of Compressor End with Service Panels Removed

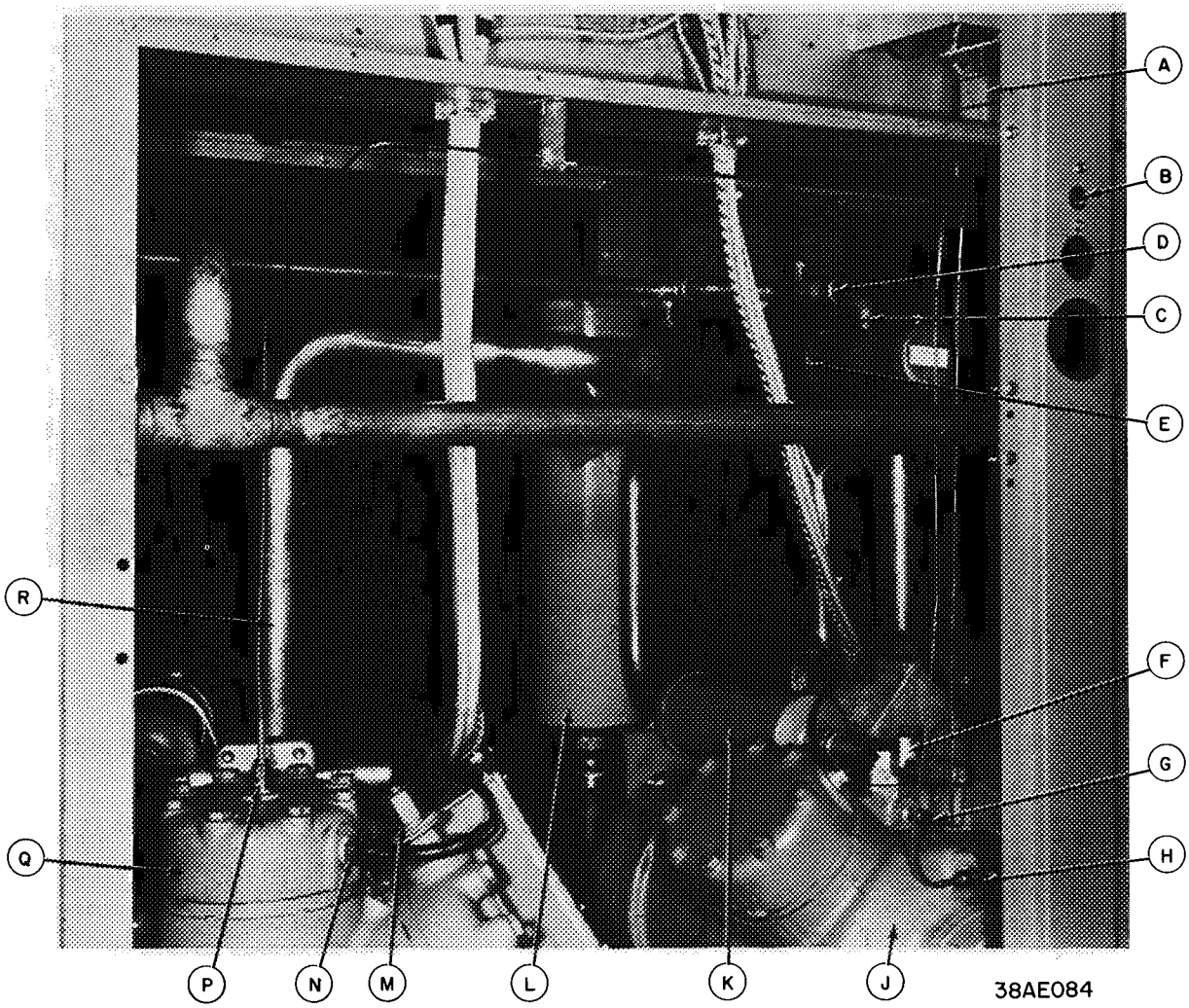
Check Compressor Oil Level — After adjusting the refrigerant charge, allow unit to run about 20 minutes. Running oil level should be 1/8 to 1/3 up in the sight glass. Stop the compressors *at field supply disconnect* and check crankcase oil level (the level in all compressors will be the same because of the equalizer pipe). Add oil only if necessary to bring oil into view in sight glass. If oil is added, run unit for additional 10 minutes; stop unit and check level. If level is low again, check the piping system for proper design for oil return; also, check the system for leaks.

When the above checks have been completed, the procedure should be repeated with the unit operating at minimum load conditions. For 38AE044, 054 and 064 units, no. 2 (lag) compressor is off and no. 1 (lead) compressor is unloaded to its minimum operating cylinders. For 38AE084 units, only compressor no. 1 is running.

If the checks are satisfactory, add enough oil to be visible in sight glass and restart the unit. With unit running, oil level should be approximately 1/8 to 1/3 up in the sight glass.

If the initial check shows excessive oil (too high in sight glass) remove oil to the proper level. See Oil Charge for proper procedure for adding or removing oil.

Final Checks — Be sure all safety controls are operating. Be sure control panel covers are on and the service panels are in place.



A — Transformer (Control Power)
B — Opening to Outdoor Air Temperature Sensor (for cycling fans No 5 and 6)
C — Run-around loop between Liquid and Suction Lines (for shipping only)
D — Liquid Line Connection
E — Suction Line Connection
F — Discharge Valve (each compressor)
G — High Pressurestat Connection (4-cylinder compressor)
H — Low Pressurestat Connection (Compressor No 1 only)
J — Compressor No 1
K — Muffler (each compressor)
L — Accumulator
M — Capacity Control Valve (Compressor No 2 only)
N — Discharge Gas Thermostat (each compressor)
P — High Pressurestat Connection (6-cylinder compressor)
Q — Compressor No 2
R — Suction Line to Compressor No 2

Fig. 8 — Compressor Compartment Connections

SERVICE

Service Access — At the compressor end of the unit, there are 2 removable panels for easy access to the compressor and control compartments. On 38AE084 units, the lower part of the center post can be removed for access to the center compressor.

CAUTION: When the lower part of the center post is out, the sharp corners and edges on the end of the upper part can be hazardous. Wrap the end with padding to avoid injury.

UNIT CONTROL BOX

CAUTION: Disconnect all power supply before removing or replacing the control box covers.

Figures 6 and 7 show the compressor end of the unit with all the covers and service panels removed. When the covers are on, only the circuit breaker toggles and the control circuit fuse holder are exposed.

CONDENSER FANS — Each fan is supported by a formed-wire mount bolted to the fan deck and covered with a wire guard. The exposed end of the motor shaft is covered with a rubber boot. When a fan motor must be repaired or replaced, put the rubber boot back on when the fan is reinstalled and be sure the fan guard is in place before starting the unit. Figure 9 shows the proper position of the mounted fan. Fan motors have permanently lubricated bearings.

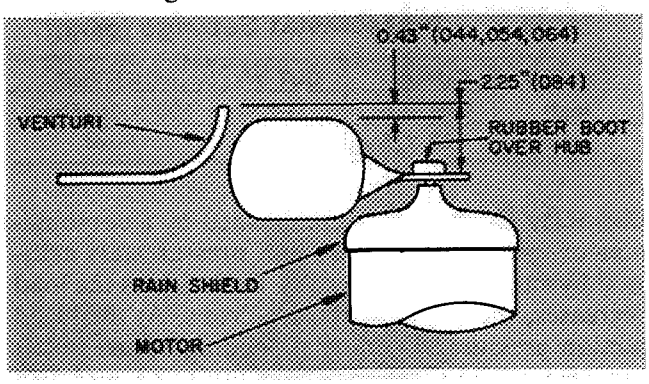


Fig. 9 — Condenser Fan Adjustment

Oil Charge — Each compressor is factory charged with oil (see Table 1). When oil is checked at start-up, it may be necessary to either remove or add oil to bring it to the proper level. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Section 1-11. One recommended method is as follows:

ADD OIL — Close suction shutoff valve and pump down crankcase to 2 psig. (Low-pressure cutout must be jumped.) Wait a few minutes and repeat until pressure remains at 2 psig. Remove oil-fill plug above bull's-eye, add oil thru plug hole and replace plug. Run compressor for 20 minutes and check the oil level.

NOTE: Use only Carrier-approved compressor oil. Approved sources are: Sun Oil Co. (Suniso 3GS); Texaco, Inc. (W.F. 32); and E.I. DuPont Co. (DuPont Synthetic Refrigeration Oil, 150 SSU). Do not reuse oil that has been drained out, or oil that has been exposed to atmosphere.

REMOVE OIL — Pump down compressor to 2 psig. Loosen the 1/4-in. pipe plug in compressor base and allow the oil to seep out past the threads of the plug.

NOTE: The crankcase will be under slight pressure. Be careful not to remove the plug; the entire oil charge may be lost.

Small amounts of oil can be removed thru oil pump discharge connection while compressor is running.

Oil Pressure Safety Switch (OPS) in lead compressor circuit will stop the compressor, and unit, if proper oil pressure differential is not established at start-up or maintained during operation. If OPS stops the unit, determine the cause and correct before restarting unit. Failure to do so will constitute abuse. *Equipment failure due to abuse could affect the Warranty.*

Compressor Motor Protection

CIRCUIT BREAKER — One manual reset calibrated trip magnetic circuit breaker for each compressor protects against overcurrent. Do not bypass connections or increase size of breaker for any reason. If trouble occurs, determine cause and correct before resetting the breaker. Circuit breaker Must Trip Amps (MTA) are listed in Table 3, Electrical Data.

DISCHARGE GAS THERMOSTAT — A sensor in the discharge gas of each compressor (Fig. 6 and 8) reacts to excessively high discharge gas temperature and shuts off the compressor.

CRANKCASE HEATER (Fig. 6 and 7) — Each compressor has an electric heater located in the bottom cover, held in place by a clip and bracket. Heater must be tight to prevent backing out (heater will burn out if exposed to air). Each heater is wired into the compressor control circuit thru a relay which energizes only when the compressor is off. This keeps the oil at a temperature that prevents excessive absorption of refrigerant during shutdown periods.

Energize crankcase heaters when unit is not running, except during prolonged shutdown or servicing. Energize heaters 24 hours before unit is restarted.

TIME GUARD® function prevents compressors from short cycling.

Fan Motor Protection — Fan motors are inherently protected, grouped on a single circuit breaker.

Head Pressure Control reduces condensing capacity under low-ambient conditions.

FAN CYCLING — All 38AE units have standard provision for fully automatic intermediate season head pressure control thru fan cycling (see Table 6). On all units, fans no. 3 and 4 are cycled by pressure control. The pressure sensor is located in the liquid line, above compressor on the right (see Fig. 6 and 7). On units 38AE054,064 and 084, cycling of fans no. 5 and 6 is controlled by outdoor air temperature. The temperature sensor is located behind a small hole in the center post at the compressor end of the unit (see Fig. 6 and 8). To ensure that sufficient air passes over the sensor, the front service panels must be on during operation.

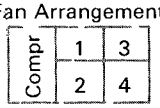
NOTE: Fans 3 and 4 function as a unit and 5 and 6 function as a unit.

Table 6 — Fan Cycling Control

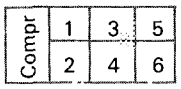
CONTROL BY	SWITCH OPENS	SWITCH CLOSES
Temp* (±3 F)	70	80
Pressure† (±5)	160 psig	260 psig

*Fans 5 and 6 on 38AE054,064,084
†Fans 3 and 4 on all units *(for R-22, non-adjustable)*

Fan Arrangement



38AE044



38AE054,064,084

NOTES:
1 Fans 3 and 4 operate as a unit; 5 and 6 operate as a unit
2 Fans 1 and 2 are non-cycling

Winter Start Control — Contacts D-D1 in the 4-function timer bypass the low-pressure switch (LPS) for 2-1/2 minutes at unit start-up to prevent nuisance LPS trips at low ambient.

DEFROST THERMOSTAT (optional, field supplied)

NOTE: Use a defrost thermostat on systems operating with outdoor temperatures below 45 F.

Thermostat is set to cut out at 25 F and cut in at 55 F. Contact rating is 16 amps and 230 volts. As evaporator coil frosts, coil fin temperature drops to thermostat cutout setting, and stops compressor. Evaporator fans keep running to defrost coil with room air. As indoor coil defrosts, fin temperature will rise to thermostat cut-in setting. Compressor starts when cooling is required.

Position switch so that moisture cannot enter switch insulator. Install control with approximately 2 in. of top of thermostat capillary passing thru lower part of evaporator coil. Insert remainder of capillary between fins on entering air side of coil. Connect thermostat electrical contacts into indoor cooling thermostat circuit in series with compressor holding coil.

Pressure Relief — High-side pressure relief is provided by a fusible plug in the liquid line (see Fig. 6 and 7.) For low-side relief, a fusible plug is inserted in the side of the accumulator.

High Pressurestat has fixed, nonadjustable settings. Figures 6 and 8 show connection on 6-cylinder compressor. On 4-cylinder compressor, connection is shown in Fig. 8.

TO CHECK — Slowly close discharge shutoff valve until compressor shuts down. This should be at approximately 364 psig. Open valve. When the pressure drops to approximately 264 psig, the pressurestat will cut in. To re-energize the control circuit, manually switch the fan circuit breaker off, then on. The compressor(s) will start under Time Guard control.

Low Pressurestat has fixed, nonadjustable settings. Location is at the pump end of the compressor, above the bearing head.

TO CHECK — Slowly close suction shutoff valve and allow compressor to shut down. This should be when suction pressure drops to approximately 29 psig. The compressor will restart, under Time Guard control, when pressure builds to approximately 44 psig (Table 7).

Table 7 — Pressurestat Settings (psig)

SWITCH	CUTOUT	CUT-IN	DIFF (psi)
High	364 ± 5	—	100 ± 15 (Fixed)
Low	29 ± 5	44 ± 5	Fixed

Capacity Control is accomplished by a combination of cylinder unloaders and pressurestats actuated by suction pressure. (See Table 8.) As the load decreases, the suction pressure drops. At the listed suction pressures, cylinder unloading occurs in left compressor (one step for 38AE044,064 and 084 units and 2 steps for 054). If the load continues to decrease, right compressor will stop when the suction pressure drops to the indicated pressurestat cutout point. On load increase, with accompanying suction pressure rise, left compressor will load at the pressures shown. Right compressor will not start until left compressor is fully loaded. Two pressurestats in the control circuit of right compressor prevent fast cycling. On 38AE084 units, the center compressor (no. 1) runs continuously.

CAPACITY CONTROL VALVE (cylinder unloader). See Fig. 10.

Control Set Point (cylinder load point) is adjustable from 0 to 85 psig. To adjust turn control set point

adjustment nut clockwise to bottom stop. In this position, set point is 85 psig. Turn adjustment counterclockwise to desired control set point. Every full turn clockwise decreases set point by 7.5 psig.

Pressure Differential (difference between cylinder load and unload points) is adjustable from 6 to 22 psig. To adjust, turn pressure differential adjustment screw counterclockwise to back stop position. In this position, differential is 6 psig. Turn adjustment clockwise to desired pressure differential. Every full turn clockwise increases differential by 1.5 psig.

Table 8 — Capacity Control Operation

COMPRESSOR		SEE NOTE 2					
Type Control		Cylinder Unloader*			Pressurestat†		
Actuated By		Suction Pressure (Psig)					
Function		Unload		Load	Cutout		Cut-in
38AE	044	1	56	76	CCP1	77	83
					CCP2	53	80
	054	1	58	74	CCP1	77	83
			56	76	CCP2	53	80
	064	1	56	76	CCP1	77	83
					CCP2	53	80
	084	2	66	75	CCP1	54	74
					CCP2	60	80
					CCP3	77	83

▒ Compressor number

*One unloader on 044,064,084; 2 on 054 Each unloader controls 2 cylinders (one bank)

†Compressor no 2 on 044,054 and 064 starts on CCP1 and cycles on CCP2 Compressor no 2, on 084, cycles on CCP1 and compressor no 3 starts on CCP3 and cycles on CCP2

NOTES

1 Unloaders are factory set but may be field adjusted

2 Compressor numbers, viewed from compressor end of unit
38AE044,054,064 — Compressor no 1 is on the left; no 2 is on the right
38AE084 — Compressor no 1 is in center; no 2 is on the left, no 3 is on the right

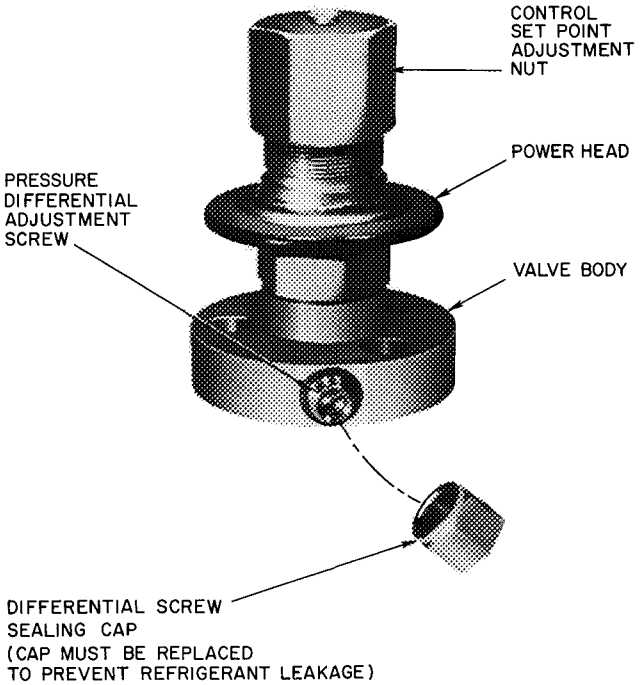


Fig. 10 — Capacity Control Valve

Timer Functions (See Timer Cycle, Fig. 11.)

Switch A — The timer motor is energized thru contacts A-A1 or A-A2. This established the Time Guard® function, which prevents compressor short cycling. The lead compressor cannot restart in less than 5-1/2 minutes after shutoff. The second compressor cannot restart in less than 8 minutes after shutoff (not less than 2-1/2 minutes after lead compressor starts). The minimum time between starts of either compressor is approximately 8 minutes.

Switch B — The lead compressor is energized thru contacts B-B1.

Switch D — Contacts D-D1 provide a 2-1/2 minute bypass of the low-pressure switch at start-up for winter start control. The second compressor is energized thru contacts D-D2, which provides a 2-1/2 minute delay between start-up of the lead and second compressors.

Switch E — Contacts E-E1 provide approximately 40-second bypass of the oil pressure switch at start-up. If oil pressure does not build up sufficiently in 40 seconds, compressor no. 1 shuts off and the control circuit locks out. Contact position E-E2 is the "Off" position.

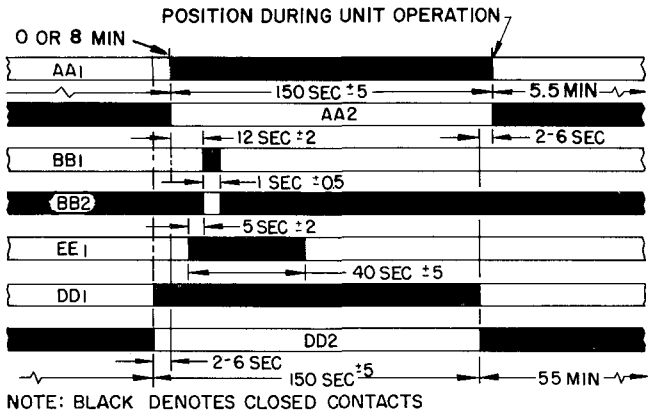


Fig. 11 — Timer Cycle

Control Circuit Reset — Control circuit locks out if unit shuts down on low oil pressure (OPS), high discharge gas temperature (DGT) or excessive high-side pressure (HPS). To reset the control circuit, open the fan circuit breaker (FCB), then close to start the timer motor. The unit will restart under Time Guard control. If, at start-up, the low-pressure switch (LPS) is not made after 2-1/2 minutes, the unit will shut down. When the pressure comes up enough to LPS to cut in (see Table 7), the control circuit will be energized automatically and start-up will proceed under Time Guard control.

Coil Cleaning — Clean coils with a vacuum cleaner, compressed air, water or a bristle brush (not wire).

CONTROL

Sequence of Operation (Refer to Timer Cycle, Fig. 11, and Wiring Diagrams.) — On call for cooling, first stage cooling thermostat (TC1) closes. Condenser fans and timer motor (TM) are energized. After approximately 7 seconds, timer contacts E-E1 close. Approximately 12 seconds after TC1 closes, normally open timer contacts B-B1 close for one second. Compressor no. 1 contacts (C) are energized and the compressor starts. At the same time, solenoid drop relays (SDR) close, no. 1 liquid line solenoid valve (LLS1) opens and timer relay no. 1 (TR1) is energized. Normally open TR1 contacts close, completing a circuit around the normally open B-B1 contacts and thru compressor no. 1 contactor to keep the comrpessor running when B-B1 contacts open. Contacts E-E1 remain closed for 40 seconds, bypassing the oil safety switch (OPS). If sufficient oil pressure to close OPS does not come up before contacts E-E1 open, the compressor stops, the timer cycles off and the control circuit locks out.

Approximately 2-1/2 minutes after TC1 closes, timer contacts D-D2 close and circuit thru compressor no. 2 contactor is completed. Compressor no. 2 can start if compressor no. 1 is running and capacity control pressure switches are closed (as a result of the suction pressure exceeding their setpoint). Stage 2 cooling thermostat (TC2) energizes no. 2 liquid line solenoid valve (LLS2).

When compressor no. 2 on 38AE084 starts, a time delay circuit is energized thru a second timer. After approximately 5 minutes, compressor no. 3 starts if the capacity control system is calling for more unit capacity. After stopping because of safety device action, compressor no. 3 cannot restart for a minimum of 5 minutes.

On all units, whenever compressor no. 1 is shut down because the thermostat is satisfied, or because any safety switch is open, the entire unit shuts down. Only the crankcase heaters are energized. The timer provides a delay of approximately 5-1/2 minutes before compressor no. 1 can restart, to ensure against short cycling.

When fan switch is set for automatic operation (AUTO.), indoor fan contactor (IFC) is cycled with the lead compressor. If fan switch is set at continuous (CONT), IFC is energized as long as unit power is on.

Restart After Stoppage by Safety Device — The high-pressure switch, compressor discharge gas thermostats and oil pressure switch must be reset manually by momentarily breaking the control power supply at any of the following points: control circuit fuse, fan motor circuit breaker or the thermostat. The compressor motor overcurrent protectors are manual-reset circuit breakers.

Required Modification When Compressor No. 1 is Out — To maintain unit operation, compressor no. 1 must be operable, if it is not operable the following *temporary* modifications must be made to keep the unit running:

1. Change the oil pressure switch connections from compressor no. 1 to compressor no. 2.
2. *All units prior to Serial No. D796499:* Connect a charging line *with a valve depressor at each end* between the furnished fittings at the bottom of the accumulator outlet line and in the oil equalizer line.

   After Serial No. D796499, only 38AE084 units require the above charging line. Units 38AE044, 054,064 now have a factory-installed permanent oil return line.
3. Connect compressor no. 2 into the Time Guard® circuit as compressor no. 1 was originally.

NOTE: Make sure the crankcase heaters are energized when compressors are off.