

Installation, Start-Up and Service Instructions

50- and 60-Hertz Air-Cooled Packages

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SAFETY CONSIDERATIONS

Installing, starting up and servicing air conditioning equipment can be hazardous due to system pressures, electrical components and equipment location (roofs, elevated structures, etc.)

Only trained, qualified installers and service mechanics should install, start-up and service this equipment (Fig. 1).

Untrained personnel can perform basic maintenance functions such as cleaning coils. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature and on tags, stickers and labels attached to the equipment.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Keep quenching cloth and fire extinguisher nearby when brazing.
- Use care in handling, rigging and setting bulky equipment.
- See Table 1 for Physical Data.

ELECTRIC SHOCK HAZARD
Open all remote disconnects before servicing this equipment.

BEFORE INSTALLATION

Rigging — Preferred method is with spreader bars from above the unit. Use 2-in. (50 mm) OD pipe or hooks in lifting holes. Rig with 4 cables and spreader bars. All panels must be in place when rigging. See rigging label on unit for details concerning shipping weights, distance between lifting holes, center of gravity and spreader bar dimensions. See Fig. 2.

If overhead rigging is not possible, place chiller on skid or pad for rolling or dragging. When rolling, use minimum 3 rollers. When dragging, pull the pad. *Do not apply force to the unit.* When in final position, raise from above to lift unit off pad.

⚠ CAUTION

All panels must be in place when rigging. Do not fork units if no skid is supplied. If unit has skid, truck from sides only.

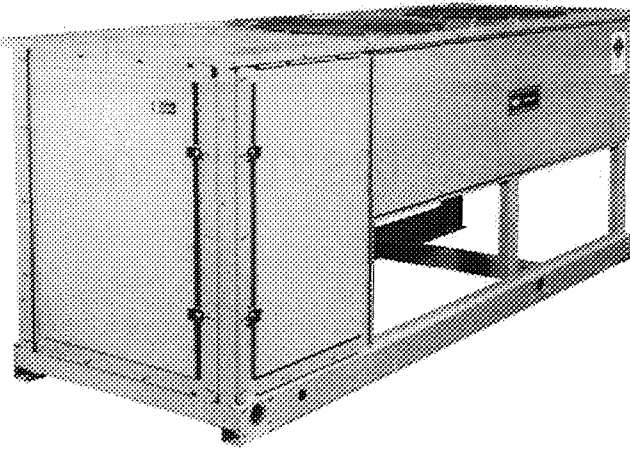
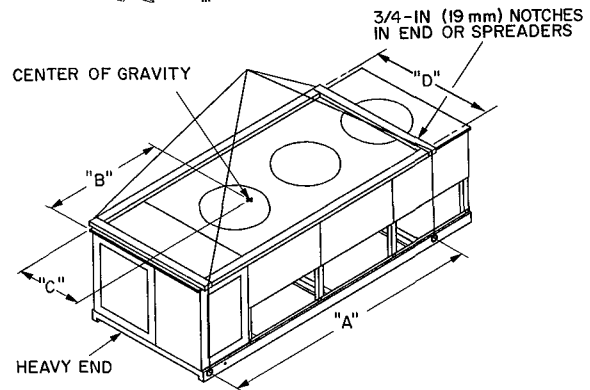


Fig. 1 — Model 38AK (024 shown)



MODEL 38AK	MAX. SHIP. WT		LIFTING HOLES "A"		CENTER OF GRAVITY				"D"	
	Lb	Kg	in.	mm	in.	mm	in.	mm	in.	mm
024	1644	746	94	2388	43.0	1092	20.5	521	49.5	1256
028	1924	872	94	2388	43.0	1092	28.0	711	73.5	1867
034	2115	960	94	2388	43.0	1092	28.0	711	73.5	1867
044	2797	1207	127	3225	49.0	1245	30.5	775	73.5	1867

Fig. 2 — Rigging with Spreader Bars (Field Supplied)

Table 1A — Physical Data — 60 Hertz

UNIT 38AK	024	028	034	044
COMPRESSOR		Reciprocating Semi-Hermetic		
No. ... Type	1 06E4250	1 06E9265	1 06E9275	1 06E9299
No. Cyls (ea) ... Speed, Rpm (r/s)	4 1750 (29)	6 1750 (29)	3 1750 (29)	3 1750 (29)
Capacity Steps	2		3	3
Oil Charge*, Pt (L)	14 (6.6)		19 (9)	19 (9)
Oil Pressure Switch Setting (psid)		9		
Crankcase Heater (watts)		180		
Protection		See Note		
Capacity Control		Suction Pressure Unloader(s)		
No. 1		Unloader Settings (psig)		
Load	76	76	76	76
Unload	58	58	58	58
No. 2		Unloader Settings (psig)		
Load	—	78	78	78
Unload	—	60	60	60
REFRIGERANT CHG., R-22				
Approximate lb (kg)	28 (12.7)	30.5 (13.8)	43.5 (19.7)	65 (29.5)
CONDENSER FANS, Type		Propeller Type, Direct Driven		
No. ... Diameter, in. (mm)		2 30 (762)		3 ... 30 (762)
Total Airflow, Cfm (L/s)	10,600 (5,000)	15,700 (7,400)		23,700 (11,200)
Speed, Rpm (r/s)		1140 (19)		
CONDENSER COIL, Type		Horizontal, Plate Fin		
Rows ... Fins/in. (Fin Spacing mm)	3 ... 17 (1.49)	2 19 (1.34)	3 17 (1.49)	3 17 (1.49)
Total Face Area, sq ft (m ²)	23.5 (2.18)	39.2 (3.64)		58.4 (5.43)

Table 1B — Physical Data — 50 Hertz

UNIT 38AK	024	028	034	044
COMPRESSOR		Reciprocating, Semi-Hermetic		
No. ... Type	1 06E4250	1 06E9265	1 06E9275	1 06E9299
No. Cyls (ea) ... Speed, Rpm (r/s)	4 1450 (24.2)	6 1450 (24.2)	3 1450 (24.2)	3 1450 (24.2)
Capacity Steps	2		3	3
Oil Charge*, Pt (L)	14 (6.6)		19 (9)	19 (9)
Oil Pressure Switch Setting (psid)		9		
Crankcase Heater (watts)		180		
Protection		See Note		
Capacity Control		Suction Pressure Unloader(s)		
No. 1		Unloader Settings (psig)		
Load	76	76	76	76
Unload	58	58	58	58
No. 2		Unloader Settings (psig)		
Load	—	78	78	78
Unload	—	60	60	60
REFRIGERANT CHG., R-22				
Approximate lb (kg)	28 (12.7)	30.5 (13.8)	43.5 (19.7)	65 (29.5)
CONDENSER FANS, Type		Propeller Type, Direct Driven		
No. ... Diameter, in. (mm)		2 30 (762)		3 ... 30 (762)
Total Airflow, Cfm (L/s)	10,600 (5,000)	15,700 (7,400)		23,700 (11,200)
Speed, Rpm (r/s)		950 (15.8)		
CONDENSER COIL, Type		Horizontal, Plate Fin		
Rows ... Fins/in. (Fin Spacing mm)	3 ... 17 (1.49)	2 19 (1.34)	3 17 (1.49)	3 17 (1.49)
Total Face Area, sq ft (m ²)	23.5 (2.18)	39.2 (3.64)		58.4 (5.43)

*See Service, Oil Charge, for Carrier-approved oil
Psid - pounds per sq in differential

NOTE: Circuit breaker in main power circuit and discharge gas thermostat in control circuit

Placing Unit — There must be 4 ft (1220 mm) for service and for unrestricted airflow on all sides of unit, and a minimum of 8 ft (2440 mm) clear air space above unit. For multiple units, allow 8 ft separation between units for airflow and service.

Mounting Unit — When unit is in proper location, use of mounting holes in base rails is recommended for securing unit to supporting structure, or for mounting unit on vibration isolators if required. Fasteners for mounting unit are field supplied. Be sure to mount unit level to ensure proper oil return to compressors.

Compressor Mounting — As shipped, compressor is held down by 4 bolts. After unit is installed loosen each bolt until the snubber washer can be moved with finger pressure. See Fig. 3.

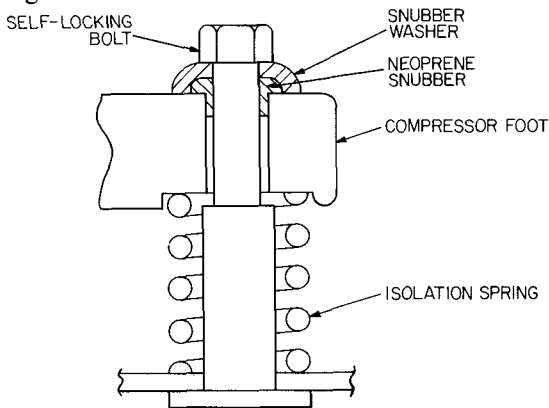
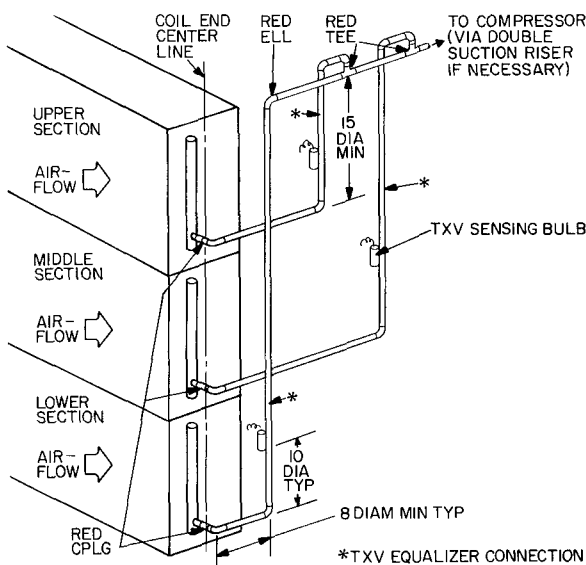


Fig. 3 — Compressor Mounting

INSTALLATION

Refrigerant Piping Connections — Line sizes depend on length of piping required between condensing unit and evaporator. See Table 2. It is important to consider liquid lift and compressor oil return. Refer to Part 3 of Carrier System Design Manual for line sizing information, and Fig. 4 for recommended piping details.



NOTES:

- 1 Suction line is connected to coil on same side as the entering air.
- 2 For coils having only one section, use upper section piping; for coils having 2 sections, use upper and middle section piping
- 3 Lower section is first on and last off.
- 4 For more complete piping information, refer to Carrier System Design Manual, Part 3

Fig. 4 — Suction Line Piping to Unit with 3 Section Coil Split

Single Pumpout Control — All units are factory wired to operate on single pumpout control. A factory-supplied liquid line solenoid valve must be installed in the liquid line ahead of the indoor coil. See Fig. 5. Wires from solenoid valve must be in conduit, and a ground wire must be provided to comply with codes.

▲ WARNING

Failure to properly install liquid line solenoid at the indoor unit as described, without Carrier authorization, may VOID warranty.

If unit is used with a chiller, wiring modifications may be required.

Filter Drier And Moisture Indicator — Every unit should have a filter drier and a sight glass (moisture indicator) field installed. Select the filter drier for maximum unit capacity and minimum pressure drop. Figure 5 shows recommended locations of 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. One filter drier may be installed at location A in Fig. 5, or 2 filter driers may be installed at locations B.

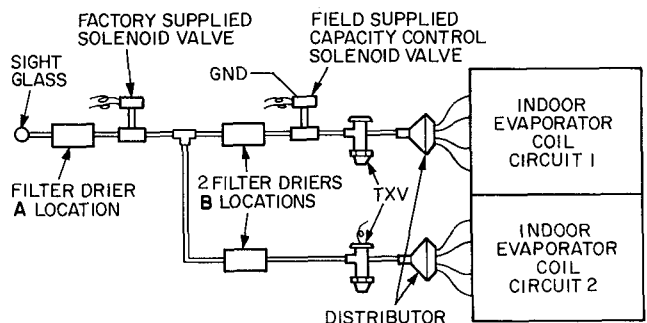


Fig. 5 — Liquid Line Solenoid Valve, Filter Drier(s) and Sight Glass Locations

Receiver — No receiver is provided with the unit; it is recommended that one *not* be used.

Piping Procedure — Do not remove run-around pipe from suction and liquid line stubs until piping connections are ready to be made. Pass nitrogen or other inert gas through piping while brazing, to prevent formation of copper oxide.

Install field-supplied thermostatic expansion valve in liquid line ahead of each evaporator section. For 2-step cooling, the field-supplied solenoid used must be wired to be opened by control from a 2-step thermostat.

For example: 2 solenoids may be used with 3 TXVs—one of the solenoids serving a liquid line feeding 2 of the TXVs.

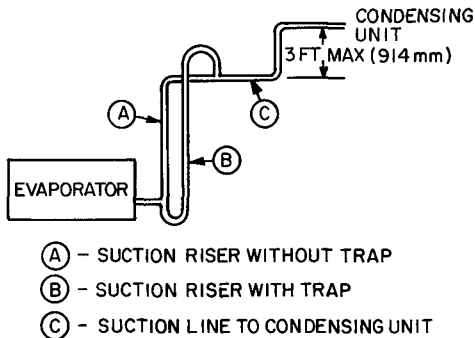
Table 2 — Refrigerant Piping Sizes
SINGLE SUCTION RISERS

MODEL 38AK	LENGTH OF INTERCONNECTING PIPING (FT)									
	16-25		26-50		51-75		76-100		101-200	
	L	S	L	S	L	S	L	S	L	S
024	5/8	1-5/8	7/8	1-5/8	7/8	2-1/8	7/8	2-1/8	7/8	2-1/8
028	7/8	1-5/8	7/8	2-1/8	7/8	2-1/8	7/8	2-1/8	7/8	2-1/8
034	7/8	2-1/8	7/8	2-1/8	7/8	2-1/8	1-1/8	*	1-1/8	*
044	7/8	2-1/8	7/8	2-1/8	1-1/8	*	1-1/8	*	1-1/8	*

L-Liquid Line S-Suction Line

* **IMPORTANT** — Requires a double suction riser, see below:

NOTE: Liquid and suction line sizes are OD (in)



MAXIMUM LIQUID LIFT

UNIT 38AK	60 Hz		50 Hz	
	Ft	M	Ft	M
024	86	26	72	21
028	76	23	66	20
034	67	20	60	18
044	76	23	66	20

DOUBLE SUCTION RISERS

MODEL 38AK	LENGTH OF INTERCONNECTING PIPING (FT)								
	51-75			76-100			101-200		
	A	B	C	A	B	C	A	B	C
034	—	—	—	1-5/8	2-1/8	2-5/8	1-5/8	2-1/8	2-5/8
044	2-1/8	1-5/8	2-5/8	1-5/8	2-1/8	2-5/8	1-5/8	2-1/8	2-5/8

NOTE: A, B, C dimensions relate to reference diagram

SUCTION PIPING AT EVAPORATOR AND TXV BULB LOCATION (See Fig. 5)

The purpose of these recommendations is to achieve good mixing of the refrigerant leaving the evaporator suction header for proper sensing by the TXV bulb.

1. A minimum of two 90° elbows must be installed upstream of the 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 through the riser for high velocity. Enter the suction pipe sizing charts in the Carrier System Design Manual at design tons and equivalent length (for 2 degree 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 degree F friction loss. If a 2 degree F loss is allowed for the entire suction line, 1.5 degree 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 this suction header is supplied with an evaporator, this connection must be teed-in ahead of first mixing elbow. When the compressor is below the evaporator, the riser at the evaporator does not have to extend as high as the top level. After a 15-diameter riser has been provided, the suction line may elbow down immediately.

SAFETY RELIEF — A fusible plug is located on unit liquid line before the liquid valve.

Power Supply — Electrical characteristics of available power supply must agree with unit nameplate rating. Supply voltage must be within limits shown in Table 3.

IMPORTANT: Operating unit on improper supply voltage, or with excessive phase imbalance, constitutes abuse and may affect Carrier warranty. See Unbalanced 3-Phase Supply Voltage, page 6.

Power Wiring — All power wiring must comply with applicable local and national codes. Install field-supplied branch circuit fused disconnect(s) per NEC (National Electrical Code) of a type that can be locked OFF or OPEN. Disconnect(s) must be within sight from and readily accessible from unit in compliance with NEC Article 440-14.

GENERAL WIRING NOTES

1. A crankcase heater is wired in the control circuit so it is always operable as long as power supply disconnect is on, even if any safety device is open or unit stop-start switch is off. It is protected by a 5-amp circuit breaker in control power.
2. *The power circuit field supply disconnect should never be open except when unit is being serviced or is to be down for a prolonged period. When operation is resumed, crankcase heater should be energized for 24 hours before start-up. If unit is to be shut down for a prolonged period, it is recommended that the suction and discharge valves be closed to prevent an excessive accumulation of refrigerant in the compressor oil.*
3. Power entry is at one end only.

Table 3 — Electrical Data
60 HERTZ

MODEL 38AK		UNIT						COMPRESSOR		FAN MOTORS†	
		Volts 3 Ph, 60 Hz	Supplied*		MCA	MOCP (Fuse)	ICF	RLA	LRA	FLA (ea)	Qty
			Min.	Max.							
024	500	208/230	187	254	92.1	150	348.6	68	345	3.6	2
	200	380	342	418	51.1	80	194.9	34.6	191	3.9	2
	600	460	414	508	46.9	80	174.8	34.7	173	1.8	2
	100	575	518	632	42.9	70	123.4	28.9	120	3.4	2
028	500	208/230	187	254	124.6	200	452.2	89.8	446	6.2	2
	200	380	342	418	64.7	110	250.9	45.5	247	3.9	2
	600	460	414	508	60.7	100	226.1	43.6	223	3.1	2
	100	575	518	632	52.5	80	167.4	36.5	164	3.4	2
034	500	208/230	187	254	145.5	250	512.2	106.5	506	6.2	2
	200	380	342	418	72.5	125	283.9	52.6	280	3.9	2
	600	460	414	508	68.7	110	256.1	50	253	3.1	2
	100	575	518	632	54.9	90	179.4	38.5	176	3.4	2
044	500	230	187	254	203.0	350	702.4	147.5	690	6.2	3
	200	380	342	418	111.1	175	389.8	79.5	382	3.9	3
	600	460	414	508	91.0	150	351.2	65.4	345	3.1	3
	100	575	518	632	81.5	125	282.8	57.1	276	3.4	3

50 HERTZ

MODEL 38AK		UNIT						COMPRESSOR		FAN MOTORS†	
		Volts 3 Ph, 50 Hz	Supplied*		MCA	MOCP (Fuse)	ICF	RLA	LRA	FLA (ea)	Qty
			Min.	Max.							
024	800	230	198	254	88.1	125	256.4	60.3	250	6.4	2
	300	346	311	380	50.5	80	204.4	33.3	200	4.4	2
	900	400	342	400	49.3	80	174.0	34.7	173	1.0	2
028	800	230	198	254	109	175	348.4	76.9	342	6.4	2
	300	346	311	380	64.9	100	263.4	44.9	259	4.4	2
	900	400	342	400	60.5	100	226.0	43.6	223	3.0	2
034	800	230	198	254	120.2	200	372.4	85.9	366	6.4	2
	300	346	311	380	76.1	125	298.4	53.9	294	4.4	2
	900	400	342	400	68.5	110	256.0	50.0	253	3.0	2
044	800	230	198	254	150.6	250	557.8	105.1	545	6.4	3
	300	346	311	380	112.6	175	408.8	79.5	400	4.4	3
	900	400	342	400	90.8	150	351.0	65.4	345	3.0	3

- FLA** — Full Load Amps
- ICF** — Maximum Instantaneous Current Flow during starting (the point in the starting sequence where the sum of the LRA for the starting compressor, plus the total RLA for all running compressors, plus the total FLA for all running fan motors is maximum).
- LRA** — Locked Rotor Amps
- MCA** — Minimum Circuit Amps (complies with National Electrical Code [NEC], Section 430-24)
- MOCP** — Maximum Overcurrent Protection
- RLA** — Rated Load Amps

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

† All fans are protected by a single circuit breaker.

- Maximum field wire sizes allowed by lugs on terminal block are:
350 MCM for models 38AK028 (208/230-3-60), 38AK034 (208/230-3-60, 230-3-50), and 38AK044 (208/230-3-60, 230-3-50) 2/0 AWG for all other models.
- Terminals for field power supply are suitable for copper, copper-clad aluminum or aluminum conductors. Insulation must be rated 167 F (75 C) minimum.

CONDENSER FANS — The fans must rotate counter-clockwise when viewed from above. If necessary, correct direction of fan rotation by interchanging any 2 power input wires at disconnect switch. Affix crankcase heater decal (located in installer's packet) to unit disconnect switch.

FIELD CONNECTIONS

- Main Power** — Bring wires from the fused disconnect switch through hole in bottom rail of unit to control box (Fig. 6, 7, 8) and connect terminals **11**, **12**, **13** on line side of terminal block TB1 (see Fig. 9). To comply with NEC Article 440-14, the disconnect must be located within sight from and readily accessible from unit.
- 24-v Control Power** — Units have single point power connections. Control circuit is directly connected internally to unit. Maximum 24-v control circuit is 3 amps.
NOTE: For wire runs up to 50 ft. use no. 18 AWG insulated wire (35 C min.). For 50 to 75 ft., use no. 16 AWG insulated wire (35 C min.). For over 75 ft. use 14 AWG insulated wire (35 C min.).
- Control Circuit Interlock** — An airflow switch may be installed in the indoor air handler to prevent unit from running when indoor air is not flowing. This switch (no. HR81JE001) is available from Service Parts Center, or equivalent can be field supplied. This should be electrically interlocked in the control circuit, between terminals **1** and **6** (for flow switch) on TB2. See Fig. 9 for field wiring. This is in the 115-v circuit. Wires must be run in conduit with ground wire.
- Transformer Connections** — See unit wiring label diagram, notes 1 and 2, located behind compressor compartment end access door.

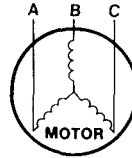
IMPORTANT: Ensure power to the crankcase heater is always on (except when servicing the unit). If circuit breakers inside unit shut down the compressor and condenser fans, crankcase heater remains on.

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 imbalance:

% Voltage Imbalance

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

Example: Supply voltage is 240-3-60.



AB = 243 volts
BC = 236 volts
AC = 238 volts

$$\text{Average Voltage} = \frac{243 + 236 + 238}{3} = 239 \text{ volts}$$

Determine maximum deviation from average voltage:

(AB) 243 - 239 = 4 volts
(BC) 239 - 236 = 3 volts
(AC) 239 - 238 = 1 volt

Maximum deviation is 4 volts. Determine % voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{239} = 1.7\%$$

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

IMPORTANT: Contact your local electric utility company immediately if the supply voltage phase imbalance is more than 2%.

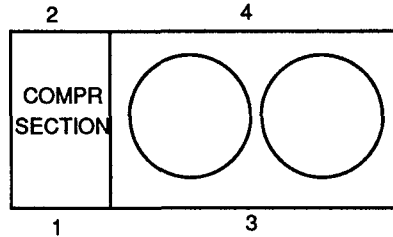
NOTES:

1. THERE MUST BE [1220 mm] 4 ft FOR SERVICE AND FOR UNRESTRICTED AIRFLOW ON ALL SIDES OF UNIT.
2. THERE MUST BE MINIMUM [2440 mm] 8 ft CLEAR AIR SPACE ABOVE UNIT.
3. THE APPROXIMATE OPERATING WEIGHT OF THE UNIT IS:

60 HZ		
UNIT	WT LBS	WT KG
38AK024	1456	661
38AK024C	1580	717

50 HZ		
UNIT	WT LBS	WT KG
38AK024	1456	661
38AK024C	1580	717

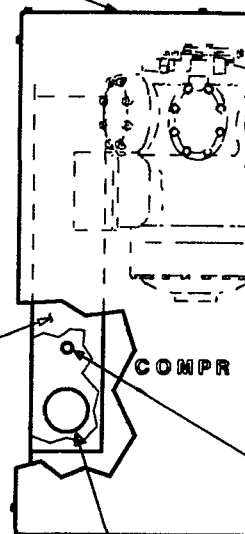
NOTE: "C" INDICATES COPPER COIL.



APPROX. OPER. WT. (LB.) AT SUPPORT POINTS

60 Hz	1	2	3	4	TOT.
024	411	501	245	299	1456
024C	448	533	273	326	1580
50 Hz					
024	587	433	486	358	1864
024c	626	462	518	382	1988

HINGED ACCESS DOOR



[63.5-92.1] 2 1/2" FIELD MAIN POWER SU

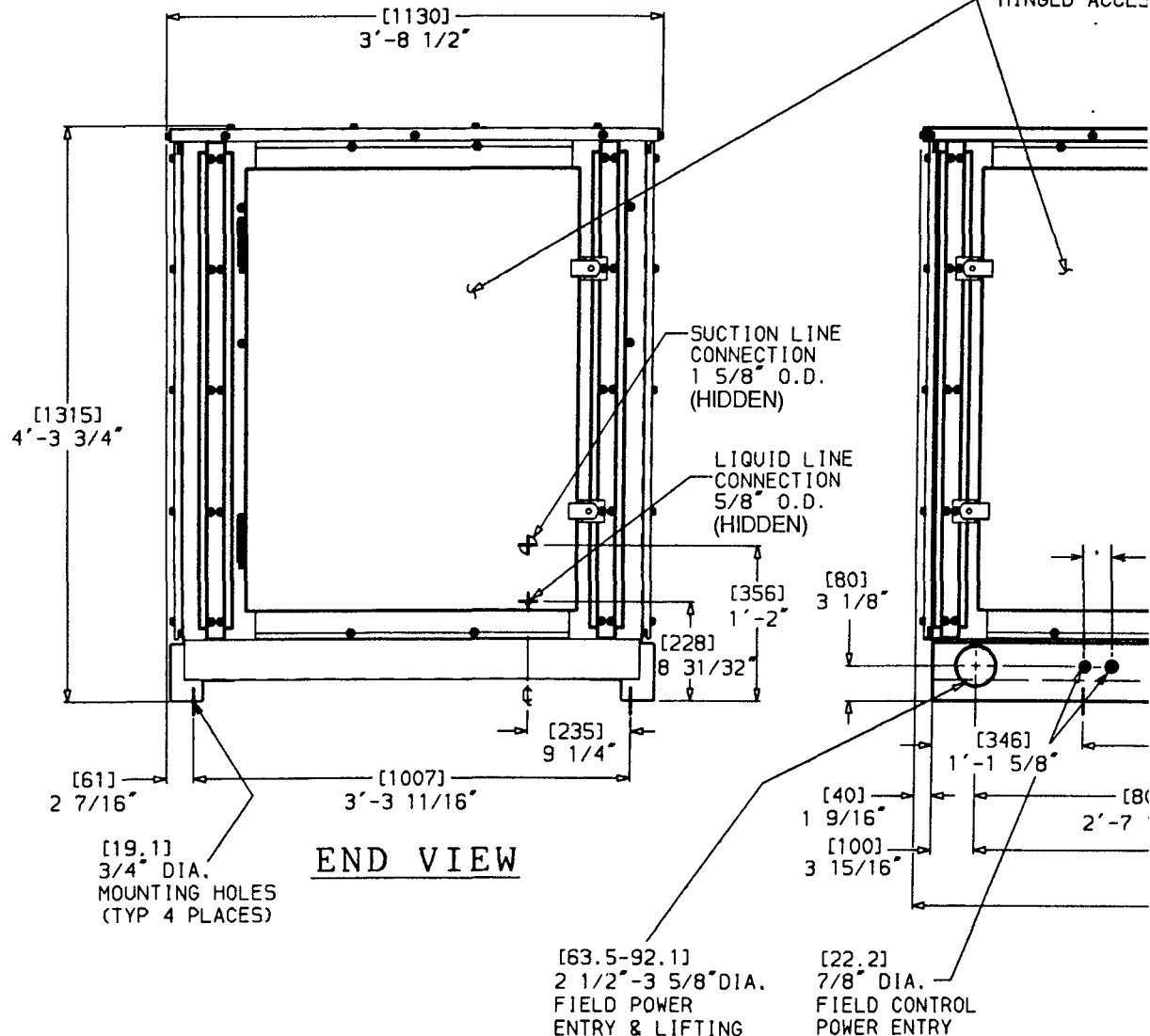
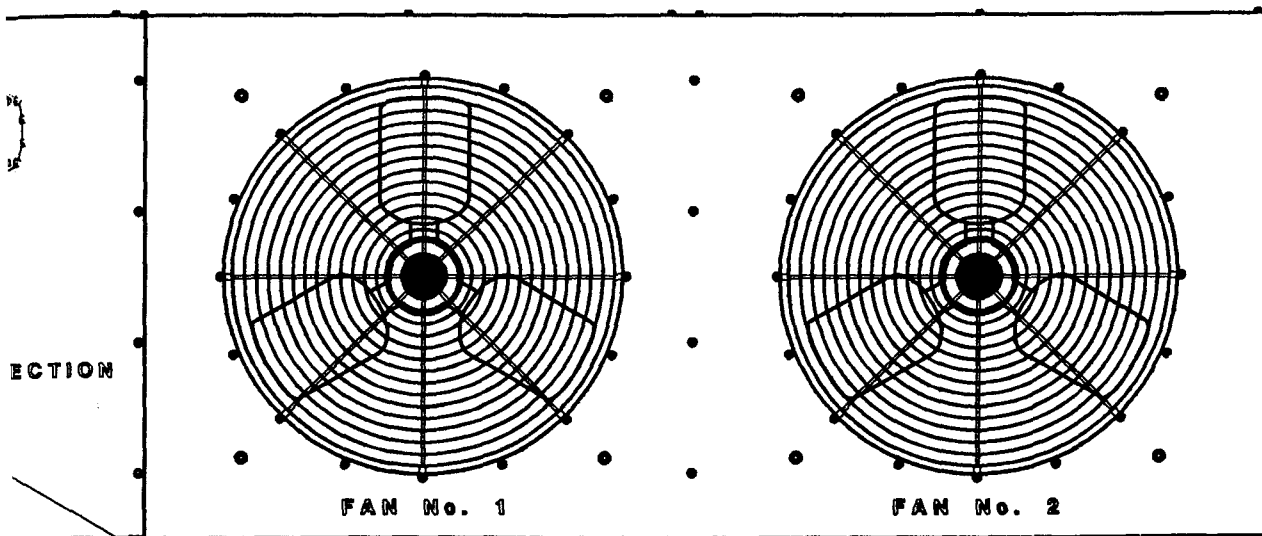


Fig. 6 — Dimension



FAN No. 1

FAN No. 2

TOP VIEW

5/8" DIA.
LY

[22.2] 7/8" DIA.
FIELD CONTROL CIRCUIT WIRING

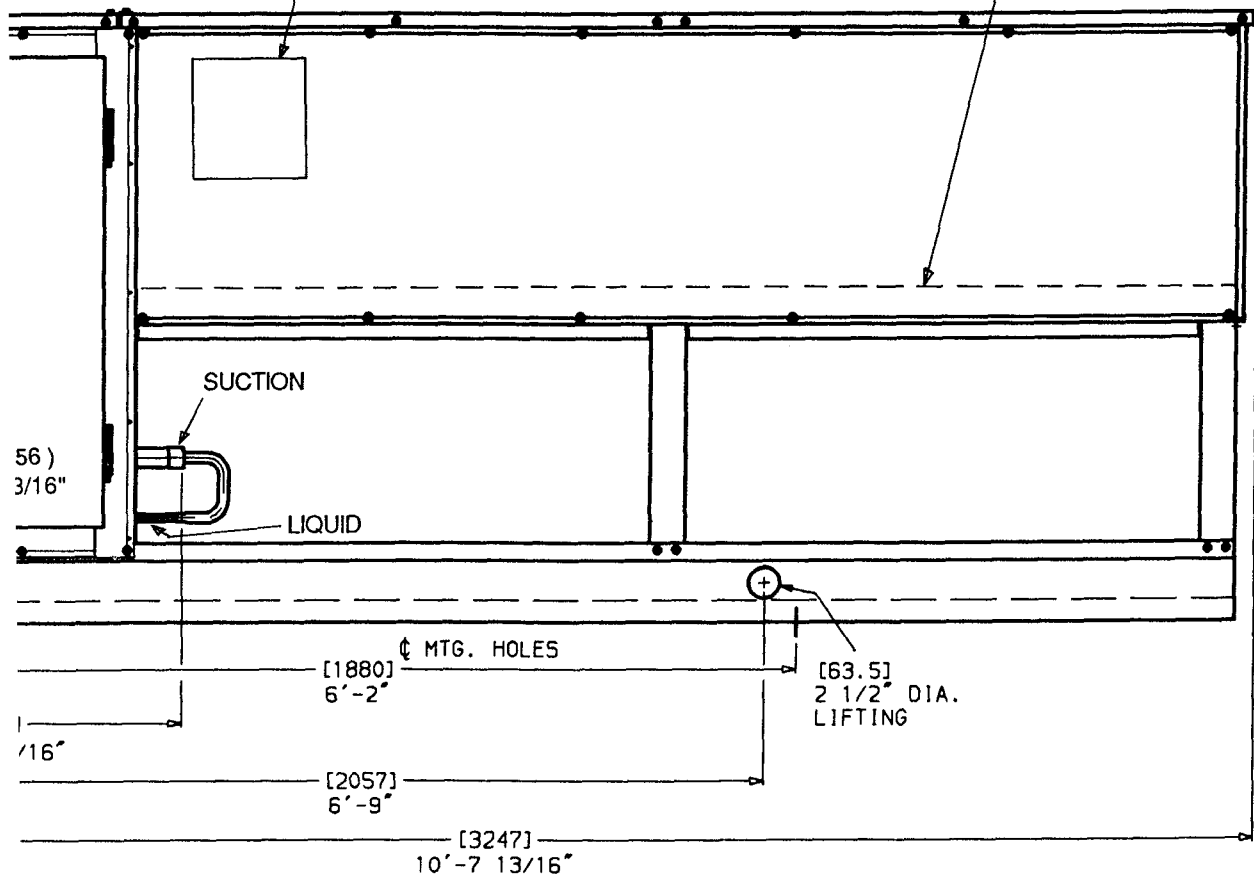
DOORS

APPROXIMATE
DISCONNECT
LOCATION



AIRFLOW THRU
CONDENSER

HORIZONTAL
CONDENSER
COIL



SUCTION

LIQUID

56)
3/16"

[1880] ⌀ MTG. HOLES
6'-2"

[63.5]
2 1/2" DIA.
LIFTING

1/16"

[2057]
6'-9"

[3247]
10'-7 13/16"

SIDE VIEW

1 Drawing, 38AK024

NOTES:

1. THERE MUST BE [1220 mm] 4 ft FOR SERVICE AND FOR UNRESTRICTED AIRFLOW ON ALL SIDES OF UNIT.
2. THERE MUST BE MINIMUM [2440 mm] 8 ft CLEAR AIR SPACE ABOVE UNIT.
3. THE APPROXIMATE OPERATING WEIGHT OF THE UNIT IS:

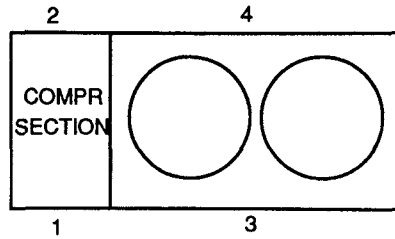
HINGED AC

60 HZ		
UNIT	WT LBS	WT KG
38AK028	1650	748
38AK028C	1804	818
38AK034	1803	818
38AK034C	2009	911

50 HZ		
UNIT	WT LBS	WT KG
38AK028	1650	748
38AK028C	1804	818
38AK034	1803	818
38AK034C	2009	911

[22.2] 7/8
FIELD CONTROL CII

[63.5-92.1] 2 1/2"-3
FIELD MAIN POWER :



NOTE: "C" INDICATES COPPER COIL.

APPROX. OPER. WT. (LB.)
AT SUPPORT POINTS

CONTRC

60 Hz	1	2	3	4	TOT.
028	418	626	242	364	1650
028C	462	666	276	400	1804
034	459	673	272	399	1803
034C	518	719	323	449	2009
50 Hz					
025	590	507	590	506	2193
025C	632	542	632	541	2347
030	628	538	628	538	2332
030C	683	586	683	586	2538

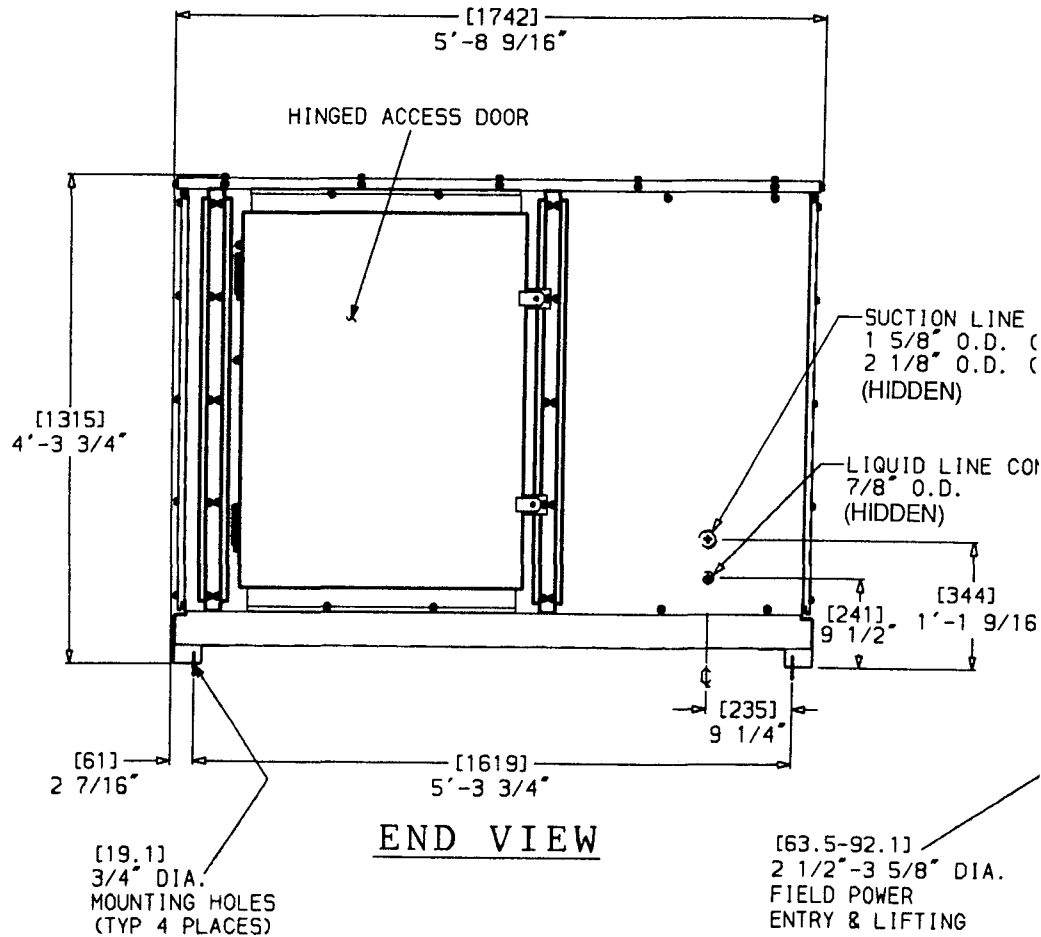
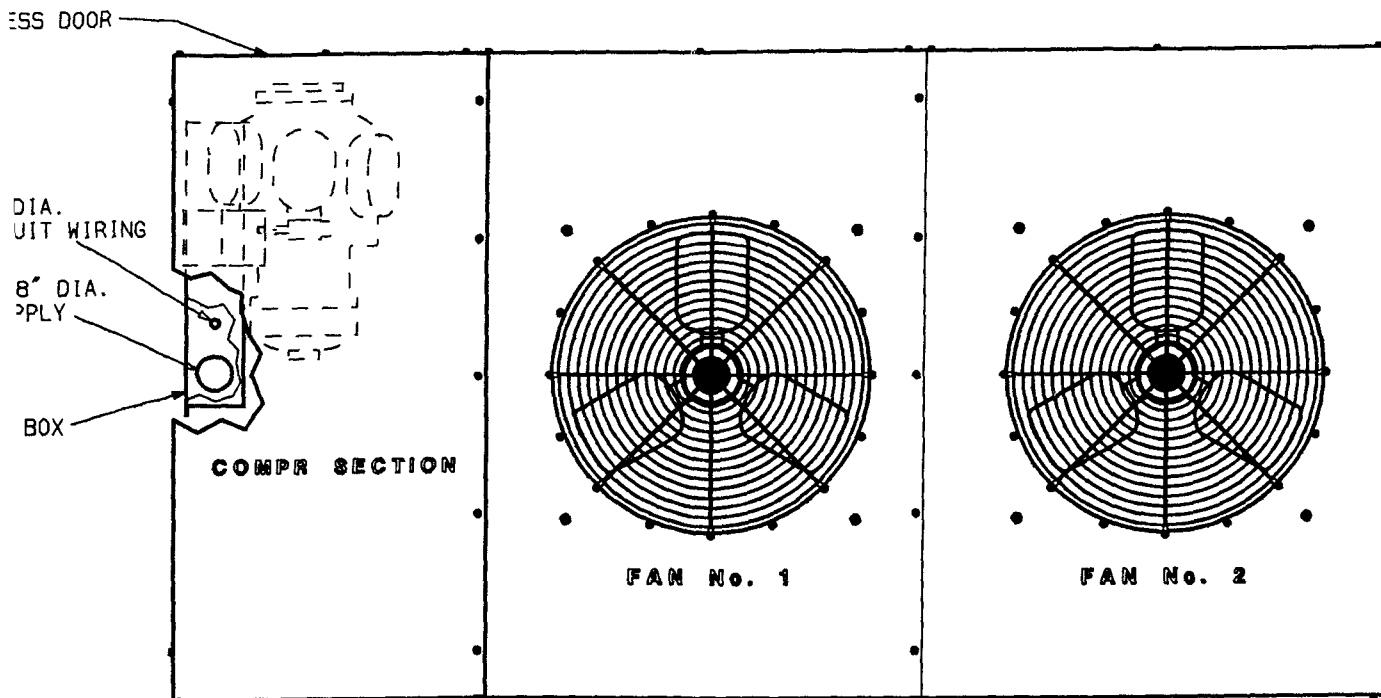
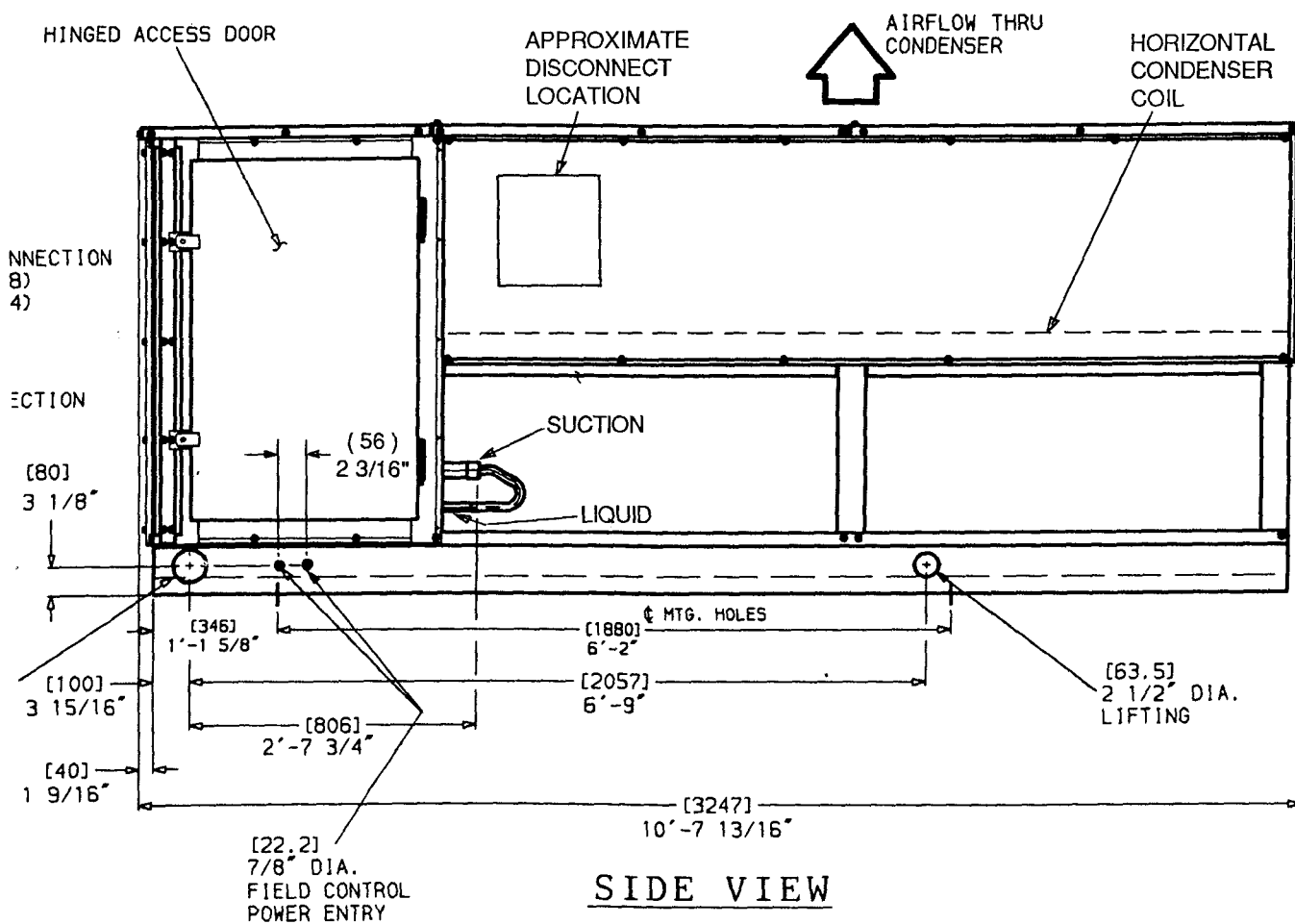


Fig. 7 — Dir



TOP VIEW



SIDE VIEW

Dimensional Drawing, 38AK028,034

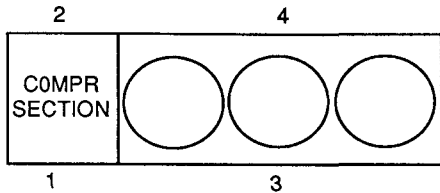
NOTES:

1. THERE MUST BE [1220 mm] 4 ft FOR SERVICE AND FOR UNRESTRICTED AIRFLOW ON ALL SIDES OF UNIT.
2. THERE MUST BE MINIMUM [2440 mm] 8 ft CLEAR AIR SPACE ABOVE UNIT.
3. THE APPROXIMATE OPERATING WEIGHT OF THE UNIT IS:

50 HZ & 60 HZ

UNIT	WT LBS	WT KG
38AK044	2437	1106
38AK044C	2745	1246

NOTE: "C" INDICATES COPPER COIL.



APPROX. OPER. WT. (LB.)
AT SUPPORT POINTS

60 Hz	1	2	3	4	TOT.
044	722	924	347	444	2437
044C	808	995	422	520	2745

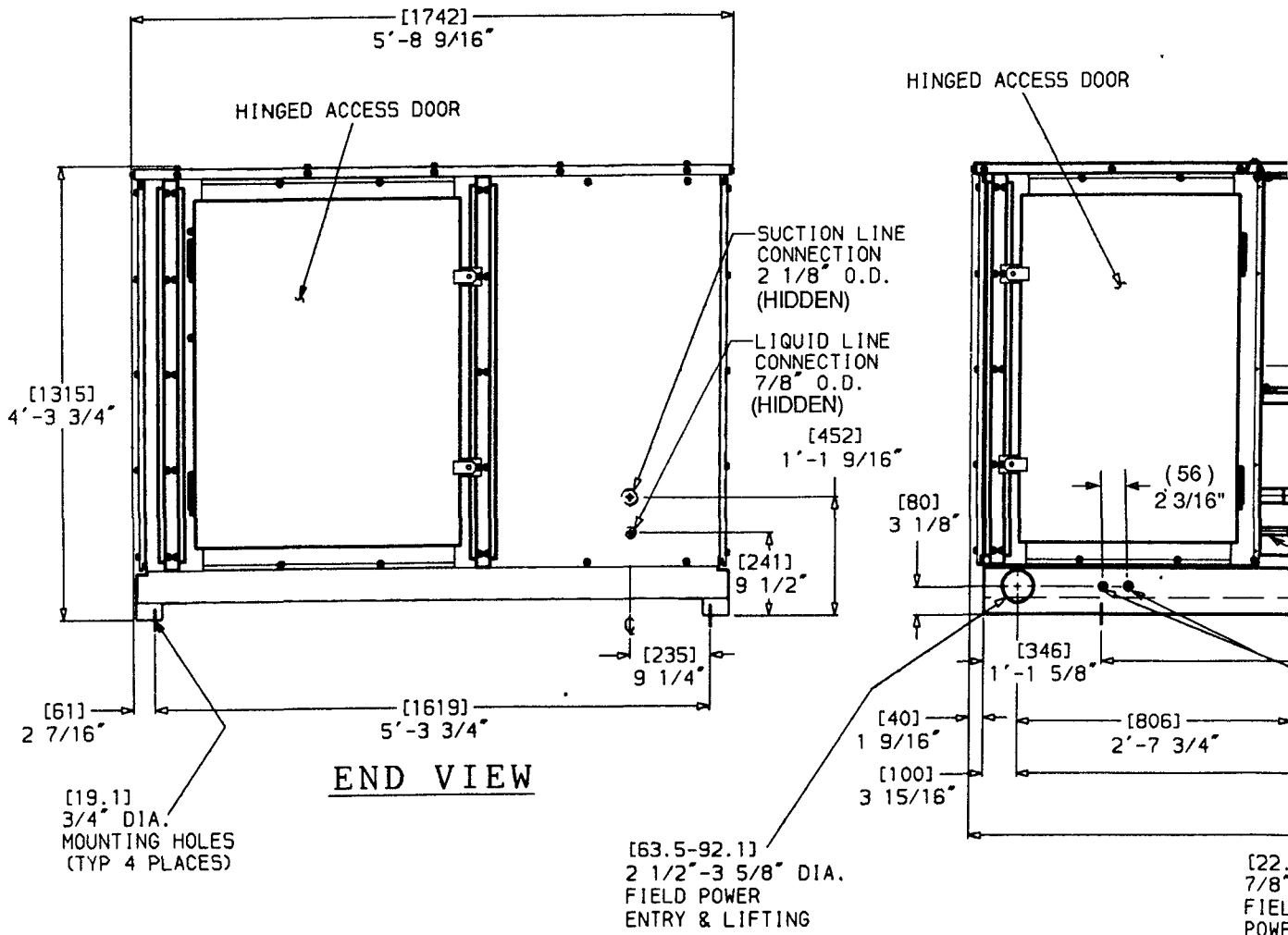
HINGED ACCESS DOOR

CONTROL BOX

[22.2] 7/8" DIA.
FIELD CONTROL CIRCUIT WIRING

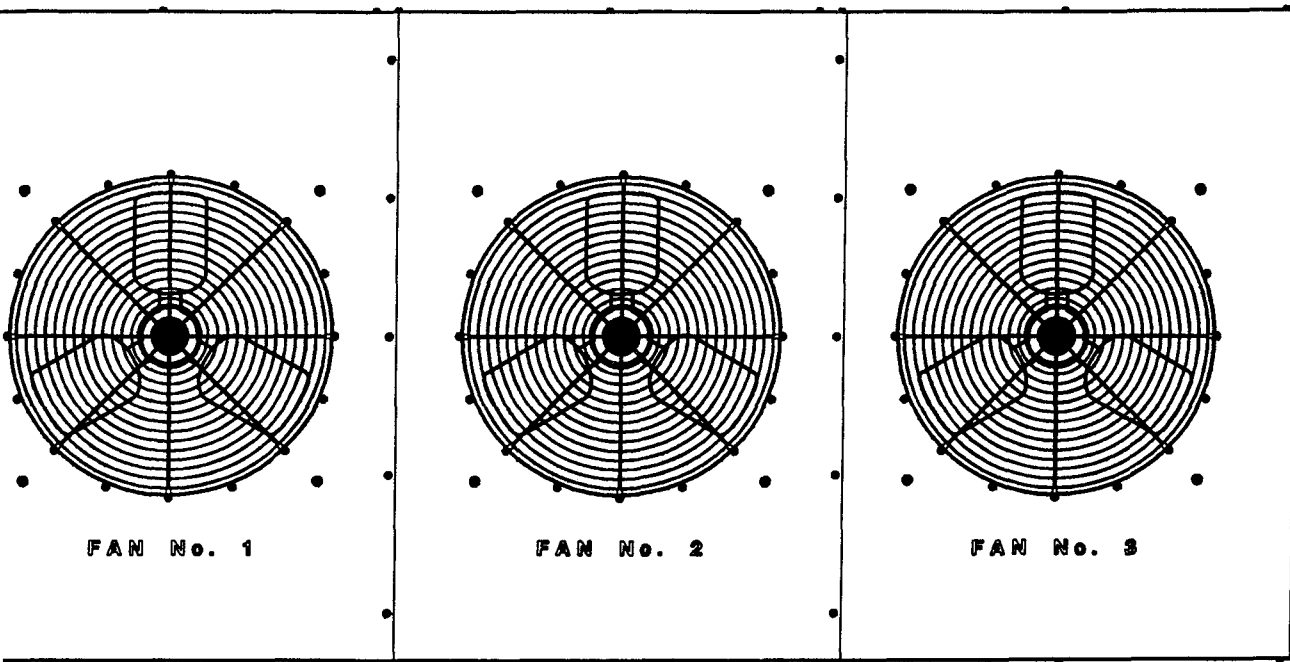
[63.5-92.1] 2 1/2"-3 5/8" DIA.
FIELD MAIN POWER SUPPLY

COMPR SECTION

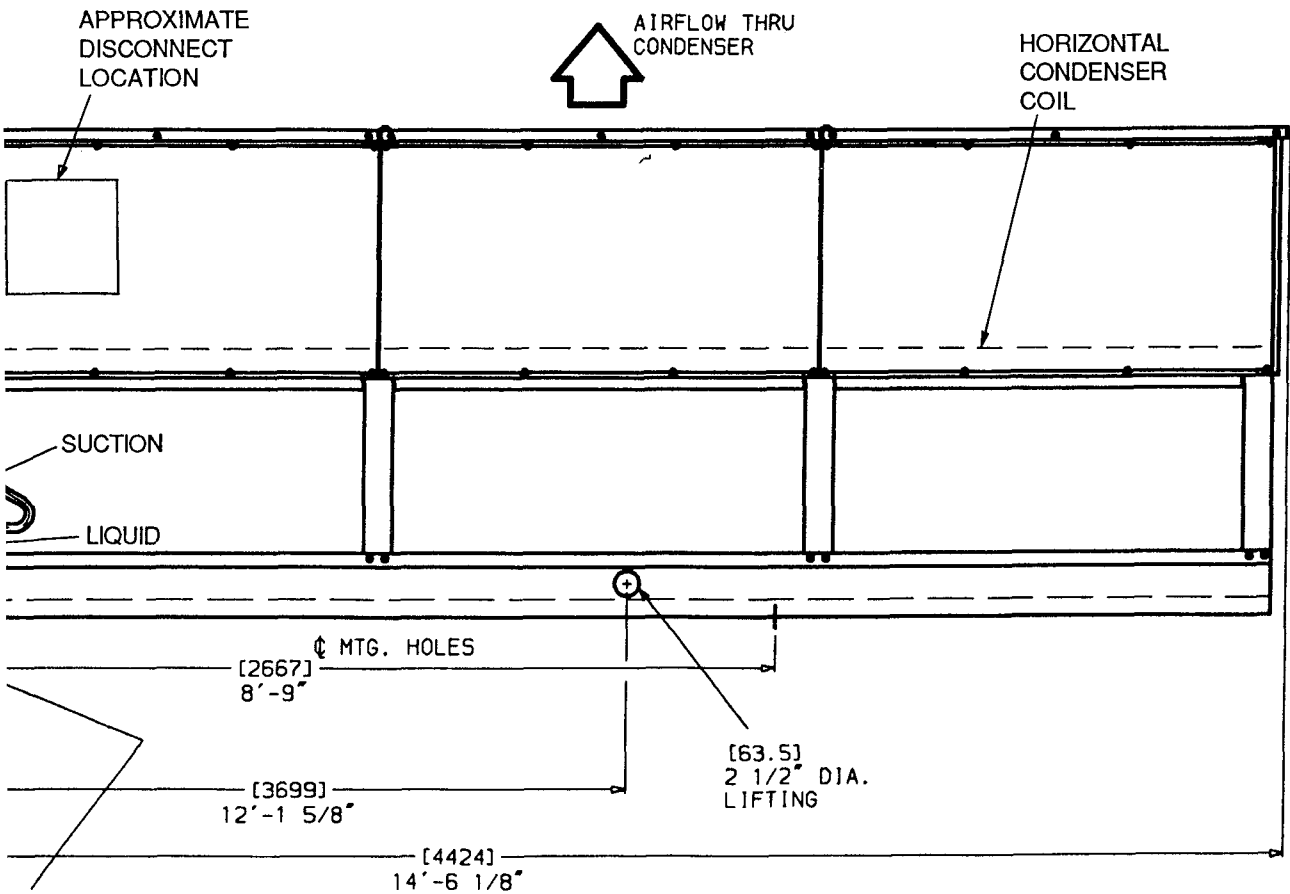


END VIEW

Fig. 8 — Dimensional Dra

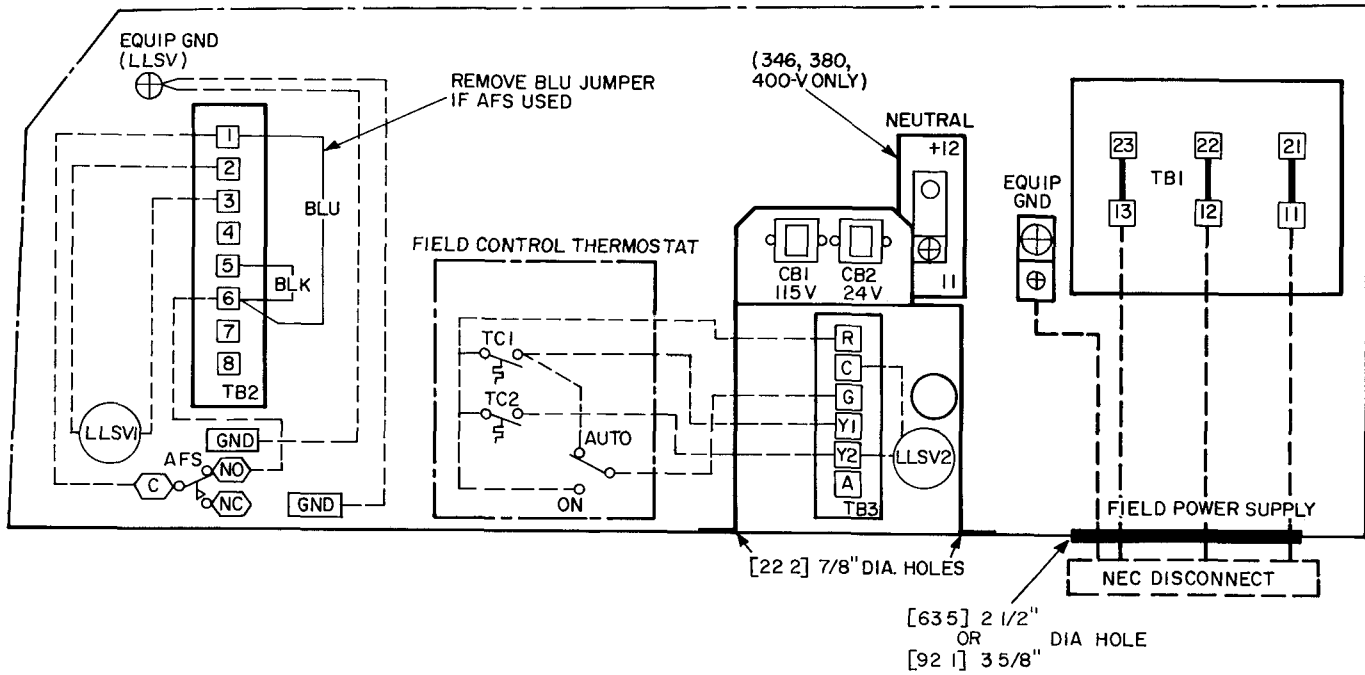


TOP VIEW



SIDE VIEW

CONTROL ENTRY
ing, 38AK044



NOTES:

- 1 Factory wiring in accordance with National Electrical Code (N E C) Any field modifications or additions must be in compliance with all applicable codes
- 2 All field interlock contacts in the 115-v control circuit must have minimum rating of 180 va pilot duty plus capacity required for field-installed equipment All field interlock contacts in the 24-v control circuit must have minimum rating of 70 va pilot duty plus capacity required for field-installed equipment Remove wire between terminals TB2-1 and 6 when airflow switch is field installed
- 3 For internal unit wiring, reference wiring book TB2 is 115-1-60, TB3 is 24-1-60

LEGEND

- AFS** — Airflow Switch
- GND** — Ground
- LLSV1** — Liquid Line Solenoid Valve for Pumpout
- LLSV2** — Liquid Line Solenoid Valve for Capacity Control
- TB** — Terminal Block
- Field Power Wiring
- - - - - Field Control Wiring
- Factory Installed Wiring

Fig. 9 — Typical Wiring Schematic

START-UP

Initial Check

⚠ CAUTION

Do not attempt to start the condensing unit, even momentarily, until the following steps have been completed. Compressor damage may result.

1. Check all auxiliary components such as air handling equipment, and other equipment. Consult the manufacturer's instructions regarding any other equipment connected to the condensing unit. If used, air flow switch must be properly installed. See Fig. 9.
2. Backseat (open) compressor suction and discharge valves. Close valves one turn to allow pressure to reach test gages.
3. Open liquid line service valve.
4. Set thermostat.
5. Check tightness of all electrical connections.
6. Compressor oil level should be visible in sightglass. See Service, Oil Charge.
7. Be sure unit is properly leak checked, dehydrated and charged. See below.
8. Electrical power source must agree with nameplate rating.
9. Crankcase heater must be firmly locked into compressor crankcase. Be sure crankcase is warm (heater should be on for 24 hours before starting compressor).
10. Be sure compressor floats freely on the mounting springs. See Compressor Mounting and Fig. 3 for loosening compressor bolts.

Leak Test and Dehydration — Leak test the entire refrigerant system by the pressure method described in the Carrier 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 200 psig.

Preliminary Charge — Refer to Carrier Standard Service Techniques Manual, Chapter 1, Section 1-8 for charging methods and procedures. Charge system with approximately 25 lbs of R-22 by the liquid charging method and charging by weight procedure.

Start Unit — Close field disconnect, fan circuit breaker and set thermostat above ambient temperature so that there is no demand for cooling. Now, only the crankcase heater is energized. After the heater has been on for 24 hours, the unit can be started. If no time has elapsed since the preliminary charge step has been completed, it is unnecessary to wait the 24-hour period.

Close the compressor circuit breaker, then reset the indoor thermostat below ambient temperature, so that a call for cooling is ensured.

NOTE: Do not use the compressor circuit breaker to start and stop compressor, except in an emergency.

Depending on the position of the Time Guard timer, start-up of the compressor occurs within 12 seconds and 8 minutes from the time the control circuit is energized.

Charge System — Actual start-up should be done only under supervision of a qualified refrigeration mechanic. Refer to charging charts.

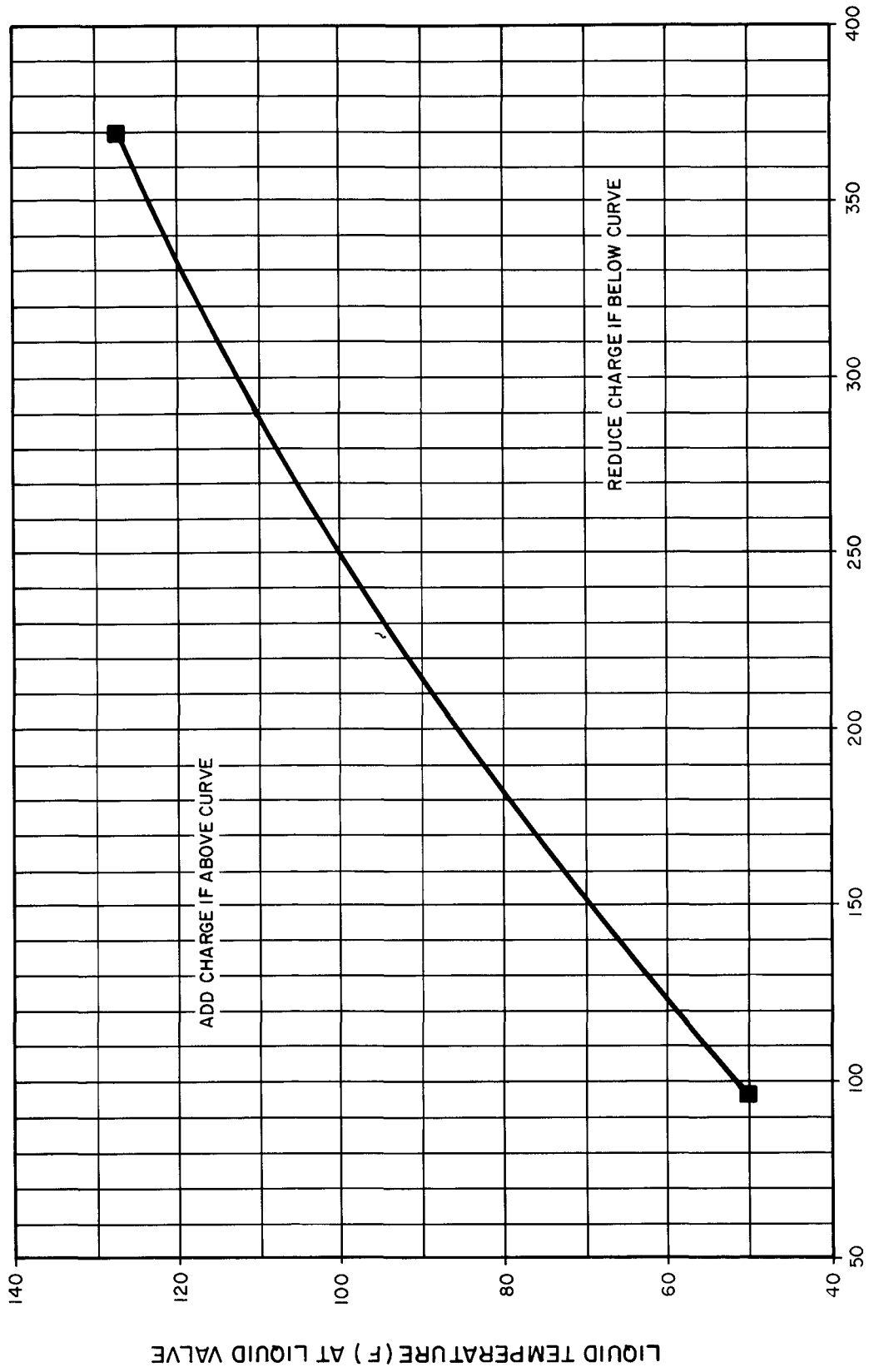
See Fig. 10 through 13 for the particular unit being charged. Measure pressure at the liquid line service valve, being sure a Schrader depressure is used if required. Also, measure liquid line temperature as close to the liquid service valve as possible. Add charge until the pressure and temperature conditions of the charging chart curve are met. If liquid pressure and temperature point fall below curve, add charge. If liquid pressure and temperature point fall below curve, reduce the charge until the conditions match the curve.

⚠ CAUTION

Never charge liquid into the low-pressure side of system. Do not overcharge. During charging or removal of refrigerant, be sure indoor fan system is operating.

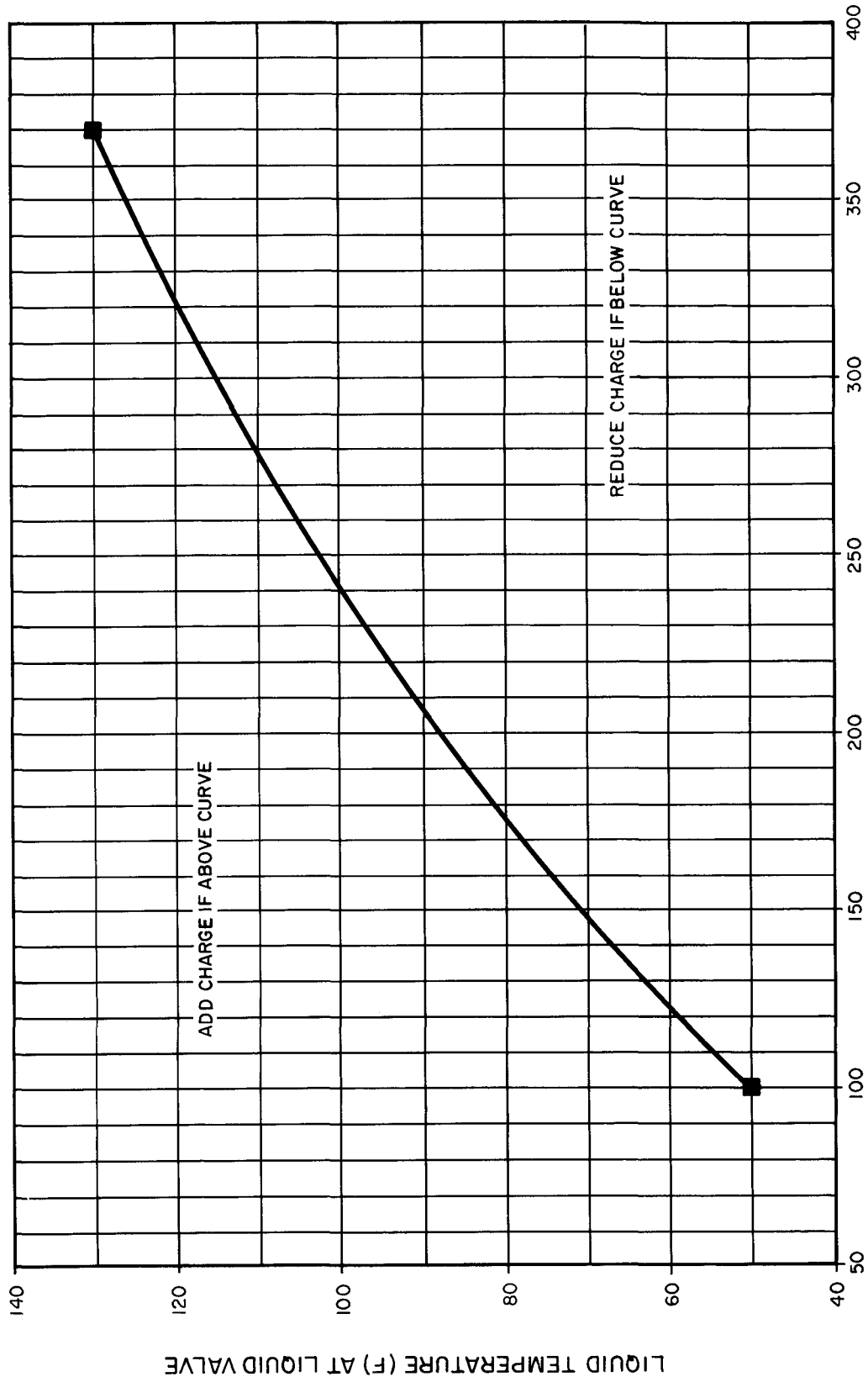
Operation — Refer to control circuit diagram on the unit, or in the unit wiring book.

BOTH OUTDOOR FANS MUST BE OPERATING



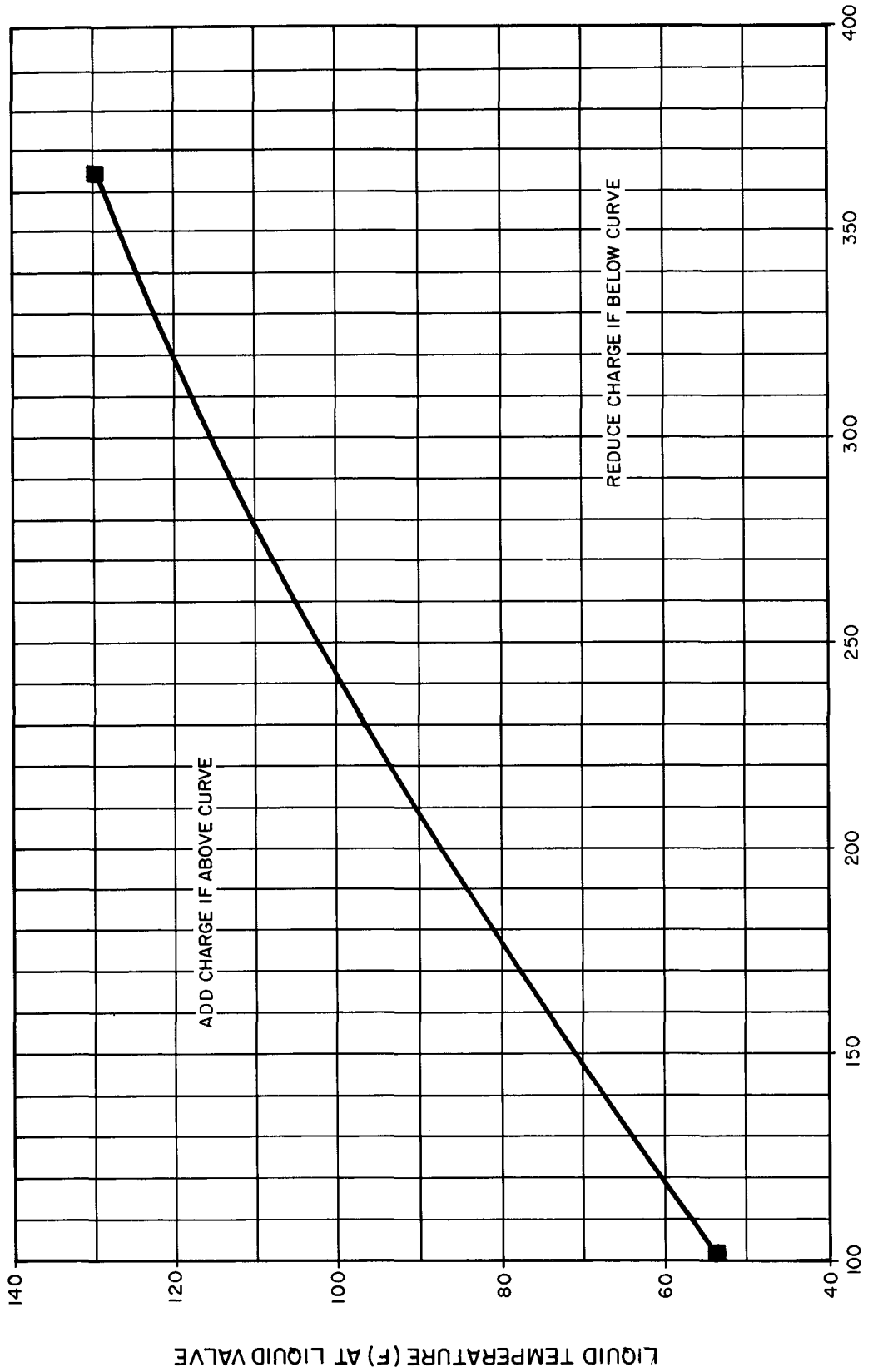
LIQUID PRESSURE (PSIG) AT LIQUID VALVE
Fig. 10 — 38AK024 Charging Chart, 50/60 Hz

BOTH OUTDOOR FANS MUST BE OPERATING



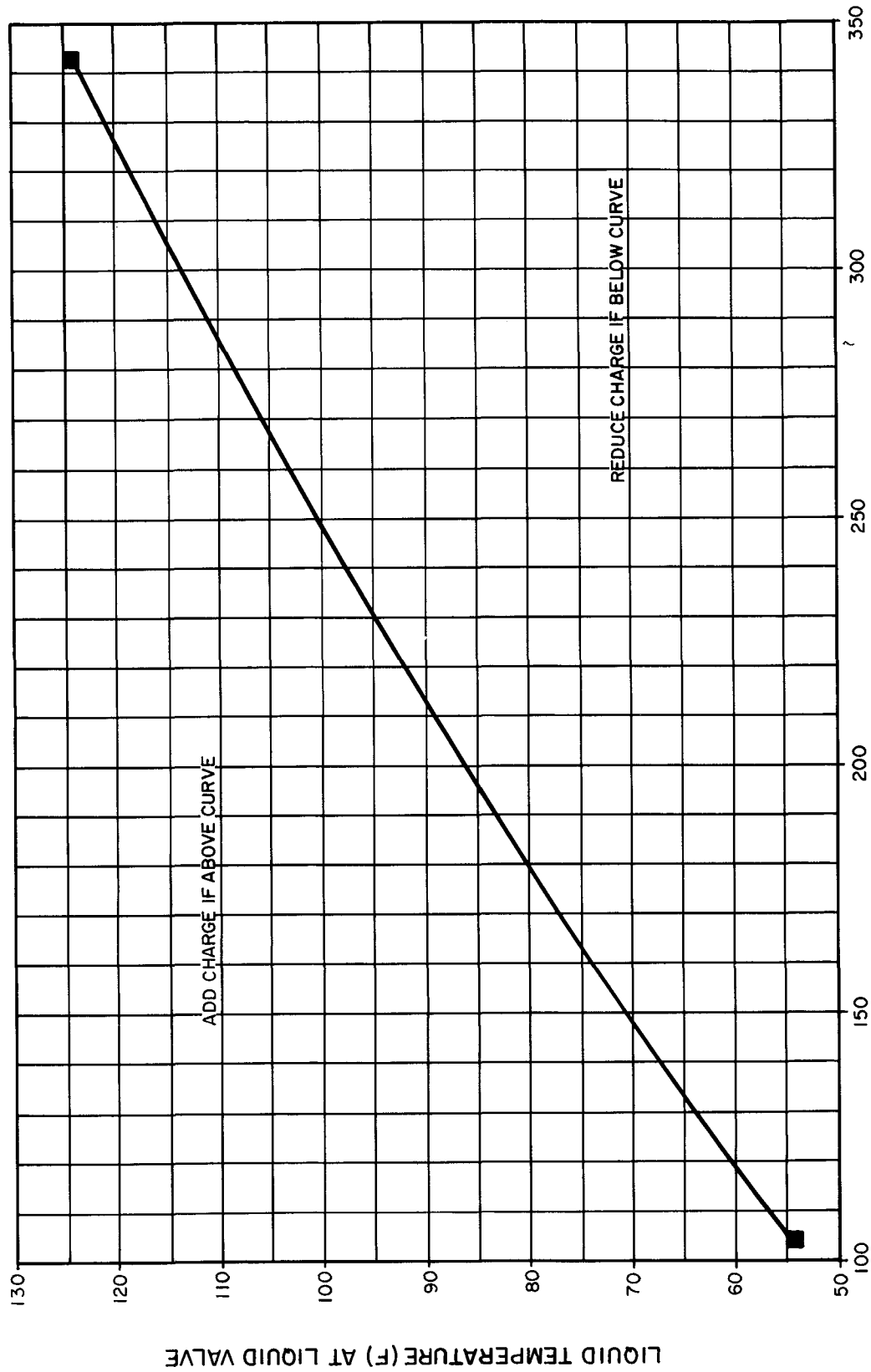
LIQUID PRESSURE (PSIG) AT LIQUID VALVE
Fig. 11 — 38AK028 Charging Chart, 50/60 Hz

BOTH OUTDOOR FANS MUST BE OPERATING



LIQUID PRESSURE (PSIG) AT LIQUID VALVE
Fig. 12 — 38AK034 Charging Chart, 50/60 Hz

ALL OUTDOOR FANS MUST BE OPERATING



L. LIQUID PRESSURE (PSIG) AT LIQUID VALVE
Fig. 13 — 38AK044 Charging Chart, 50/60 Hz

Timer Functions — (See Fig. 14)

1. Switch A (contacts A-A1 and A-A2) provides Time Guard® Control Circuit function. Start of compressor is delayed approximately 5.5 minutes after shut-off. The minimum time between starts of compressor is 8 minutes.
2. Switch B (contacts B-B1 and B-B2) starts compressor.
3. Switch D (contacts D-D1) bypasses the low-pressure switch (LPS) for 2.5 minutes at start-up for winter start control.

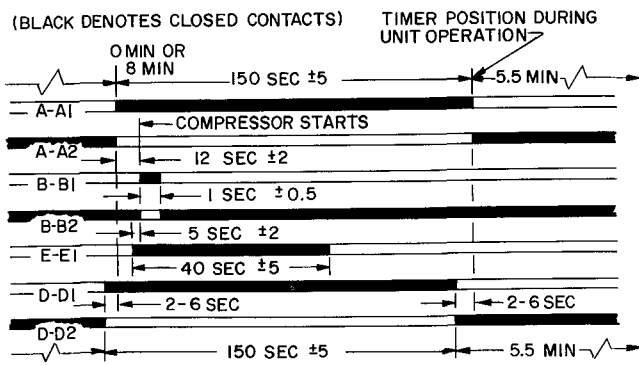


Fig. 14 — Timer Cycle

Sequence of Operation — At start-up, the thermostat calling for cooling and all safety devices satisfied, the control circuit relay (CRI) closes. The indoor fan motor starts immediately. With minimal demand for cooling, only TC1 of the thermostat is made. The timer motor starts and condenser fan no. 1 starts. Fan no. 2 starts if high side pressure is higher than 260 psig (1793 kPa). Fan no. 3 (38AK044 only) starts if outdoor ambient rises above 80 F. After a delay by Time Guard® circuit of 12 seconds to approximately 8 minutes depending on the timer position, the compressor starts and the primary liquid line solenoid valve opens.

With only TC1 calling for cooling, the capacity control liquid line solenoid is not energized, therefore the suction pressure is such that the compressor unloads on suction pressure shortly after compressor start-up. The compressor operates at either 1 or 2 steps of unloading depending on the suction pressure which is, in turn, dependent on the evaporator load conditions. As cooling demand increases, TC2 of the 2-stage thermostat energizes the capacity control liquid line solenoid causing full surface of the evaporator to be active, tending to raise the suction pressure so that the compressor loads.

A pump-out relay (POR) in the control circuit is energized when thermostat contacts make. A set of normally open POR contacts close, completing a compressor control circuit which bypasses the CRI contacts. As cooling demand is satisfied, the thermostat contacts break, de-energizing CRI. The LLS valve closes, stopping the flow of liquid refrigerant to the evaporator and subsequent suction gas to the compressor. The compressor continues to operate because of the CRI bypass with relay TR1. With no refrigerant returning to the compressor, low side pumpout takes place and the compressor shuts down on low-pressure control. The compressor does not restart until the thermostat again calls for cooling.

Complete Unit Stoppage

CAUSES — Interruption of supplied power, open discharge gas thermostat (DGT), compressor overtemperature protection, or open high-pressure safety switch causes compressor stoppage.

RESTART — The unit recycles and restarts automatically under the Time Guard® device when power is restored. Stoppage by DGT, HPS, or compressor circuit breaker requires manual resetting of the control circuit. To restart the Time Guard timer when DGT or HPS are tripped, merely open and then close the thermostat contacts. It is necessary to manually reset the compressor circuit breaker at the unit.

If LPS is not closed within 2.5 minutes after compressor starts, the compressor locks out and the outdoor fans continue to run. It stays locked out for 5.5 minutes until the timer motor comes back to 0 time (see Fig. 14). At 0 time, the LPS is jumpered (winter start control). It remains jumpered for 2.5 minutes. Because the LPS is jumpered, the compressor restarts and runs for the 2.5-minute time period. At the end of this 2.5 minutes, if the LPS has still not closed, the compressor is again locked out. The timer motor is de-energized and cannot restart until the LPS closes. The outdoor fans continue to run as long as there is a call for cooling. Automatic reset of the LPS causes the timer to recycle so that the compressor can start.

If sufficient compressor oil pressure has not been built within 2.5 minutes after the compressor starts, the unit is completely de-energized until the OPS is manually reset at the unit.

⚠ CAUTION

If unit or circuit stoppage occurs more than once due to any safety device, the trouble should be corrected before any attempt to restart.

SERVICE

⚠ CAUTION

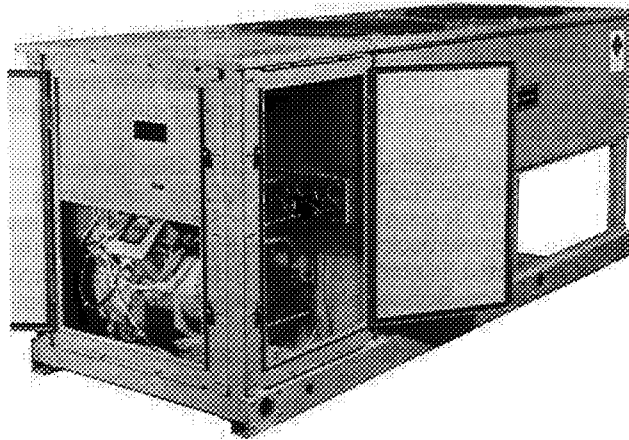
Turn off all power to unit before proceeding.

Access for Servicing (See Fig. 15)

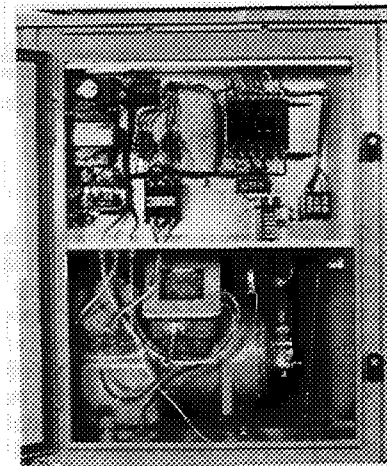
COMPRESSOR SECTION — The compressor compartment has 2 side doors and one front door for servicing, providing access to compressor, all components of the refrigeration system, electrical controls and control box. After opening front door an inner cover must be removed for access to control box.

OIL PRESSURE SAFETY SWITCH is reset by opening the side access door on the left side of the unit (as viewed from the compressor end). The liquid line service valve can be found behind the side access door on the right-hand side of the unit (as viewed from the compressor end).

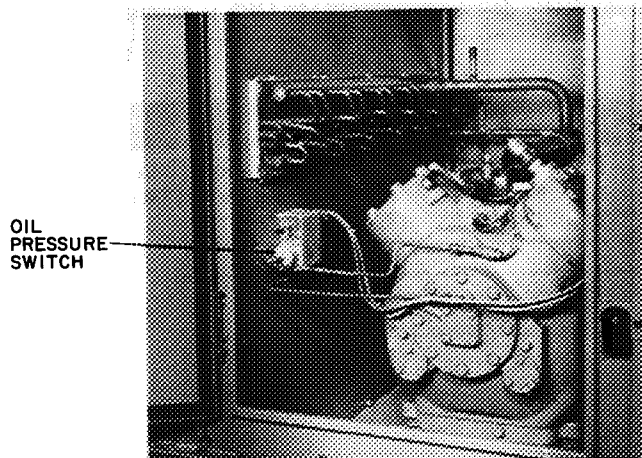
CONDENSER SECTION — Condenser fan motors and fans can be serviced by removal of outlet grilles or side panels. If a fan motor is serviced, be sure the wire fan guard is in place over each fan before starting unit. See Fig. 16 for proper fan adjustment. Tighten fan hub securely on motor shaft with setscrew which bears against the key. Be sure to replace Permagum and rubber cap over end of motor shaft to protect against moisture causing fan to rust on shaft.



COMPRESSOR END AND RIGHT-SIDE VIEW

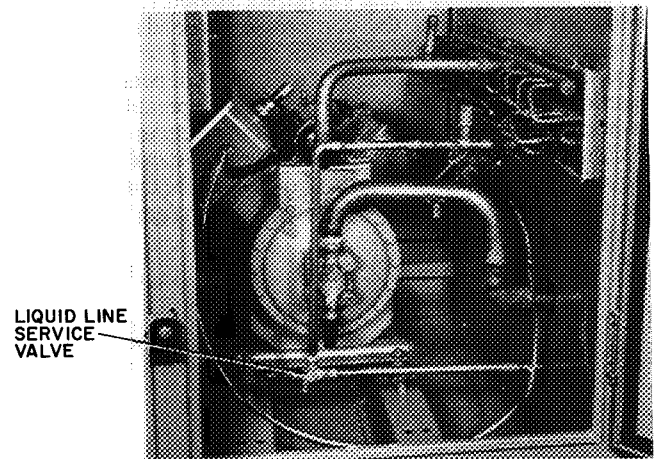


COMPRESSOR END, CONTROLS PANEL REMOVED



OIL
PRESSURE
SWITCH

COMPRESSOR END, LEFT-SIDE ACCESS DOOR

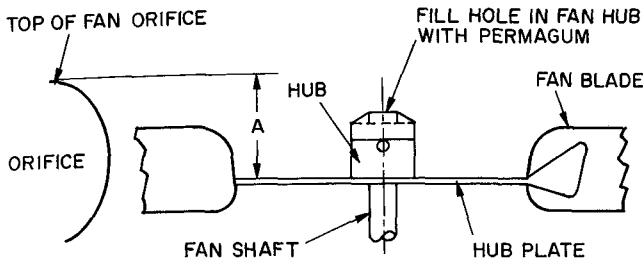


LIQUID LINE
SERVICE
VALVE

COMPRESSOR END, RIGHT-SIDE ACCESS DOOR

Fig. 15 — 38AK Unit with Access Panels Removed
(38AK024 Shown)

Fan Adjustment (See Fig. 16)



PROP LOCATION	"A" in. (mm)	
	Min.	Max.
60 Hz 38AK024	3.12 (79.2)	3.38 (85.9)
38AK028-034 38AK044	3.62 (91.9)	3.88 (98.6)
50 Hz 38AK024	3.62 (91.9)	3.88 (98.6)
38AK028,034,044	3.12 (79.2)	3.38 (85.9)

Fig. 16 — Location of Prop on Motor Shaft from Outside of Orifice Ring

Oil Charge — Compressors are factory charged with oil as follows:

COMPRESSOR	AMOUNT pints (liters)
06E4250	14 (6.6)
06E9265	19 (9.0)
06E9275	19 (9.0)
06E9299	19 (9.0)

When additional oil or a complete charge is required, use only Carrier-approved compressor oil:

Witco Chemical Corp. Suniso 3GS
 Texaco, Inc. Capella WF-32
 Shrieve Chemical Co. Zerol 150 (Synthetic)

IMPORTANT: Do not use drained oil or use oil that has been exposed to atmosphere. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, for procedures to add or remove oil.

Liquid Shutoff/Charging Valve is located inside the compressor compartment and is provided with 1/4-in. flare connection for field charging.

Capacity Control is by either one or 2 suction pressure actuated unloaders. Each controls 2 cylinders. Unloaders are factory set (see Table 1) but may be field adjusted. Number 1 unloader is on cylinder bank on same side of compressor as terminal box.

CONTROL SET POINT — The control set point (cylinder load point) is adjustable from 0 to 85 psig. To adjust, turn control set point adjustment nut (Fig. 17) clockwise to its bottom stop. In this position, set point is 85 psig. Then, turn adjustment counterclockwise to desired control set point. Every full turn counterclockwise decreases set point by 7.5 psig.

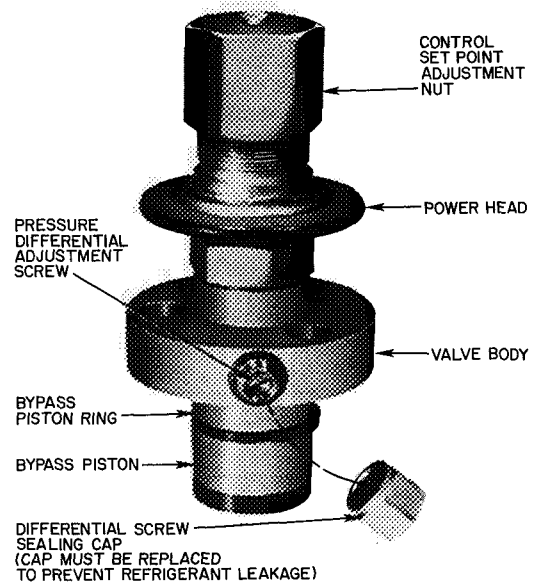


Fig. 17 — Capacity Control Valve

PRESSURE DIFFERENTIAL — The pressure differential (difference between cylinder load and unload points) is adjustable from 6 to 22 psig. To adjust, turn pressure differential adjustment screw (Fig. 17) counterclockwise to its backstop position. In this position, differential is 6 psig. Then, turn adjustment clockwise to desired pressure differential. Every full turn clockwise increases differential by 1.5 psig.

Oil Pressure Safety Switch (OPS) in the control circuit stops 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 may void the Warranty.*

Compressor Protection

CIRCUIT BREAKER — Calibrated trip manual reset, ambient compensated, magnetic breaker protects against motor overload and locked rotor conditions.

DISCHARGE THERMOSTAT — A sensor in the discharge gas of 06E compressor reacts to excessively high discharge gas temperature and shuts off the compressor.

TIME GUARD® control protects compressor against short cycling. See Sequence of Operation (page 16).

CRANKCASE HEATER minimizes absorption of liquid refrigerant by oil in crankcase during brief or extended shutdown periods. Control circuit is maintained if compressor fan motor circuit breakers are turned off. Main disconnect must be on to energize crankcase heater.

IMPORTANT: Never open any switch or disconnect that de-energizes the crankcase heater unless unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown on a service job, energize the crankcase heater for 24 hours before starting the compressor.

High-Pressure Switch has fixed, nonadjustable settings. Switch is mounted on the compressor.

TO CHECK — Open the condenser fan circuit breaker. Head pressure builds up until compressor shuts down. This should be at the cutout pressure in Table 4. Close condenser fan circuit breaker. After pressure drops to cut-in setting, reset control circuit by opening, then closing the control circuit switch. After control circuit is reset, the Time Guard timer cycles and in approximately 5.5 minutes the compressor restarts.

Low-Pressure Switch has fixed, nonadjustable settings. Switch is mounted on the compressor.

TO CHECK — Slowly close liquid shutoff valve and allow compressor to pump down. Do not allow compressor to pump down below 2 psig (13.8 kPa). Compressor should shut down when suction pressure drops to cutout pressure in Table 4, and should restart when pressure builds up to cut-in pressure shown.

Table 4 — Pressure Switch Settings, psig (kPa)

HIGH PRESSURE		LOW PRESSURE	
Cutout	Cut-in	Cutout	Cut-in
426 ± 7 (2937 ± 48)	320 ± 20 (2206 ± 138)	27 ± 3 (186 ± 21)	44 ± 5 (303 ± 34)

Winter Start Control — Switch D in the 4-function timer bypasses low-pressure switch for 2½ minutes on unit start-up.

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

FAN CYCLING — These 38AK units have standard provision for fully automatic intermediate-season head pressure control through condenser fan cycling. Fan no. 2 is cycled by a fan cycling pressure switch (FCPS) which responds to variation in discharge pressure. The pressure sensor is located in the liquid line of the refrigerant circuit. Fan no. 3 cycling is controlled by outdoor air temperature through an air temperature switch (ATS) (38AK044 units only).

The ATS is located in the lower divider panel between the compressor compartment and condenser section. Through a hole in the panel, the sensing element is exposed to air entering the no. 1 fan compartment. Fan no. 1 is non-cycling. Table 5 shows the operating settings of the fan cycling pressure switch and the air temperature switch.

Table 5 — Fan Cycling Controls

CONTROL BY	SWITCH OPENS	SWITCH CLOSSES
Temp, F (C)	70 ± 3 (21 ± 1.7)	80 ± 3 (27 ± 1.7)
Pressure, psig (kPa)	160 ± 10 (1103 ± 69)	260 ± 15 (1793 ± 103)

NOTE: See Fig. 6, 7, 8 for fan arrangement

TROUBLESHOOTING

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
<p>COMPRESSOR DOES NOT RUN</p> <ol style="list-style-type: none"> 1. Power line open 2. Oil pressure switch tripped 3. Safety device tripped 4. Contactor stuck open 5. Loose terminal connection 6. Improperly wired controls 7. Seized compressor 8. Low line voltage 9. Compressor motor defective 	<ol style="list-style-type: none"> 1. Reset circuit breaker 2. Reset oil pressure switch at unit 3. Reset control circuit with thermostat 4. Replace contactor 5. Check connections 6. Check and rewire 7. Check motor winding for open or short. Replace compressor, if necessary 8. Check line voltage — determine location of voltage drop and remedy deficiency 9. Check motor winding for open or short. Replace compressor, if necessary
<p>COMPRESSOR STOPS ON LOW-PRESSURE CONTROL</p> <ol style="list-style-type: none"> 1. Compressor suction shutoff valve partially closed 2. Low refrigerant charge 3. Liquid line solenoid valve(s) fails to open 	<ol style="list-style-type: none"> 1. Open valve 2. Add refrigerant 3. Check liquid line solenoid valve for proper operation. Replace if necessary
<p>COMPRESSOR STOPS ON HIGH-PRESSURE CONTROL</p> <ol style="list-style-type: none"> 1. Compressor discharge valve partially closed 2. Air in system 3. Condenser fan(s) not operating 	<ol style="list-style-type: none"> 1. Open valve or replace if defective 2. Purge and evacuate system 3. Check motor wiring and repair or replace if defective
<p>UNIT OPERATES TOO LONG OR CONTINUOUSLY</p> <ol style="list-style-type: none"> 1. Low refrigerant charge 2. Control contacts fused 3. Air in system 4. Partially plugged expansion valve or filter drier 	<ol style="list-style-type: none"> 1. Add refrigerant 2. Replace control 3. Purge and evacuate system 4. Clean or replace
<p>SYSTEM IS NOISY</p> <ol style="list-style-type: none"> 1. Piping vibration 2. Compressor noisy 	<ol style="list-style-type: none"> 1. Support piping as required 2. Check valve plates for valve noise. Replace compressor if bearings are worn
<p>COMPRESSOR LOSES OIL</p> <ol style="list-style-type: none"> 1. Leak in system 2. Crankcase heaters not energized during shutdown 3. Inadequate piping 	<ol style="list-style-type: none"> 1. Repair leak 2. Check wiring and relays. Check heater and replace if defective 3. Check piping for oil return. Replace if necessary
<p>FROSTED SUCTION LINE</p> <ol style="list-style-type: none"> 1. Expansion valve admitting excess refrigerant 	<ol style="list-style-type: none"> 1. Adjust expansion valve
<p>HOT LIQUID LINE</p> <ol style="list-style-type: none"> 1. Shortage of refrigerant due to leak 2. Expansion valve opens too wide 	<ol style="list-style-type: none"> 1. Repair leak and recharge 2. Adjust expansion valve
<p>FROSTED LIQUID LINE</p> <ol style="list-style-type: none"> 1. Restricted filter drier 	<ol style="list-style-type: none"> 1. Remove restriction or replace
<p>COMPRESSOR WILL NOT UNLOAD</p> <ol style="list-style-type: none"> 1. Defective unloader 2. Defective capacity control solenoid valve 3. Miswired liquid line solenoid 4. Weak, broken or wrong valve body spring 	<ol style="list-style-type: none"> 1. Replace 2. Replace valve 3. Rewire correctly 4. Replace spring
<p>COMPRESSOR WILL NOT LOAD</p> <ol style="list-style-type: none"> 1. Miswired capacity control liquid solenoid 2. Defective capacity control solenoid valve 3. Plugged strainer (high side) 4. Stuck or damaged unloader piston or piston ring(s) 	<ol style="list-style-type: none"> 1. Rewire correctly 2. Replace valve 3. Clean or replace strainer 4. Clean or replace the necessary parts

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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