GEMINI™
38AKS028-044
38AH024-034
Air-Cooled Condensing Units
50/60 Hz

Installation, Start-Up and Service Instructions

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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.

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.

⚠ WARNING

Before installing or servicing system, always turn off main power to system and install lockout tag on disconnect. There may be more than one disconnect switch. Electrical shock can cause personal injury.

BEFORE INSTALLATION

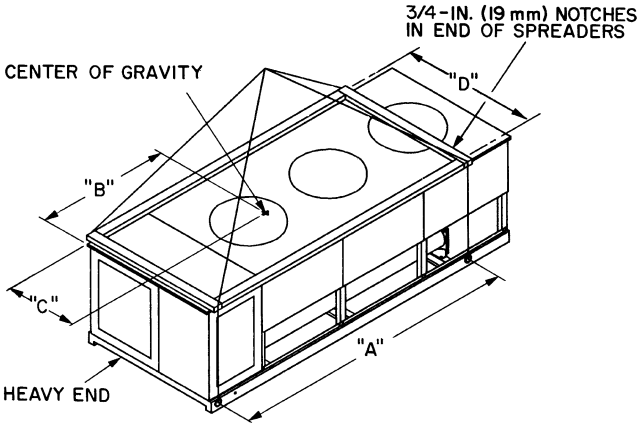
Rigging — Preferred method of rigging is overhead rigging with spreader bars above the unit. Use 2-in. (50-mm) OD pipe or hooks in lifting holes. Rig with 4 cables and spreader bars. See Fig. 1. All panels must be in place when rigging. See rigging label on unit for details concerning shipping weights, distance between lifting holes, center of gravity, and spreader bar dimensions.

If overhead rigging is not possible, place condensing unit 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.

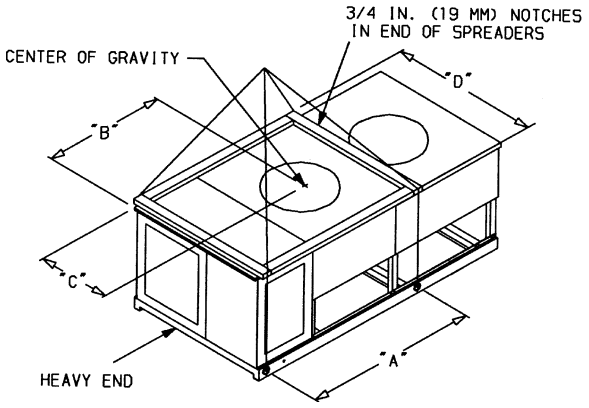
⚠ CAUTION

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

Placing Unit — There must be 4 ft (1200 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 (2440 mm) separation between units for airflow and service. See Tables 1A-4B for physical data and Fig. 2-4 for unit dimensions.



38AKS UNIT



38AH UNIT

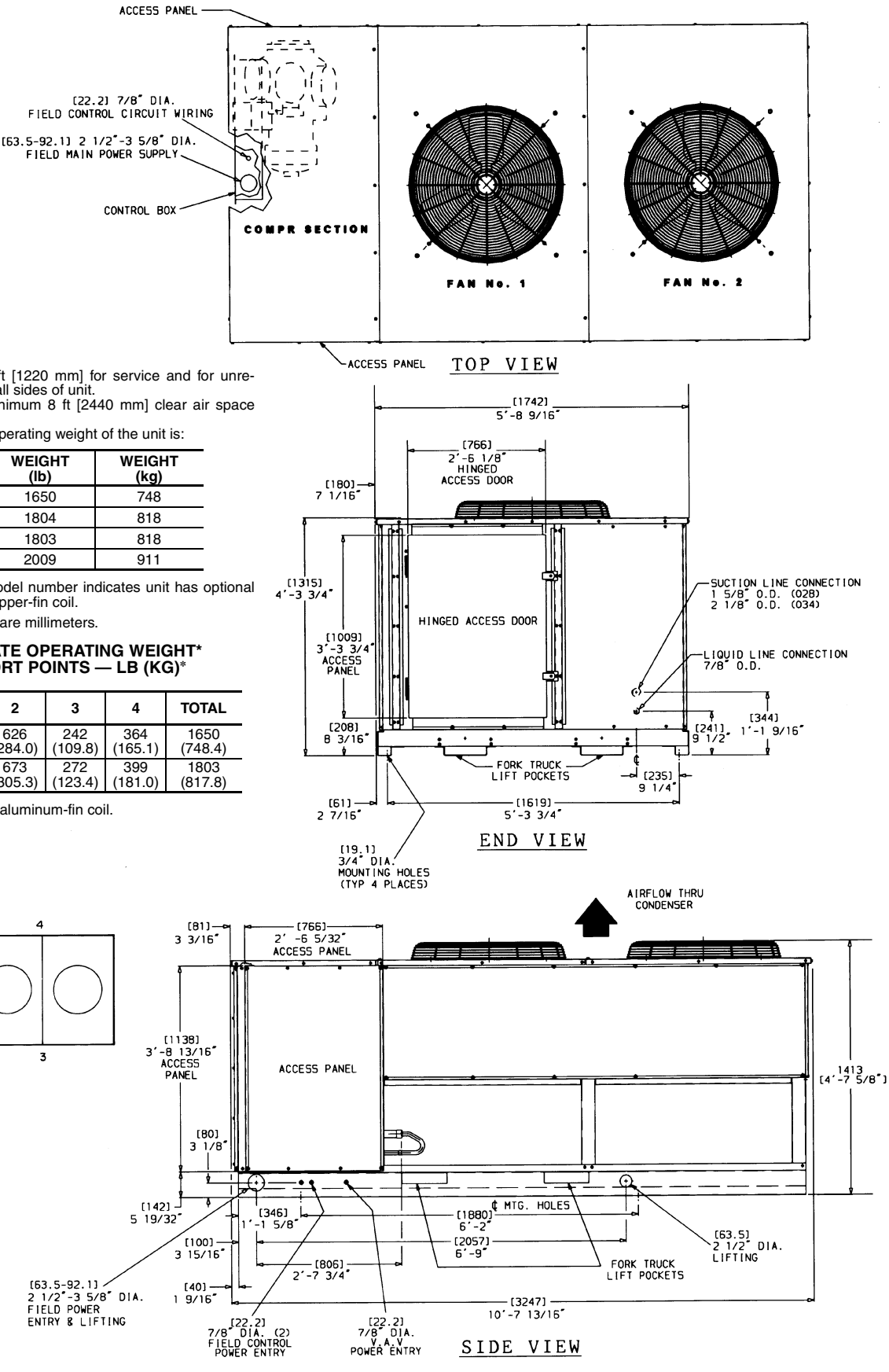
UNIT		MAX SHIPPING WEIGHT		LIFTING HOLES		CENTER OF GRAVITY				DISTANCE BETWEEN RIGGING CABLES	
				A		B		C		D	
		lb	kg	in.	mm	in.	mm	in.	mm	in.	mm
38AKS	**028**	1924	872	81	2057	43.0	1091	28.0	711	73.5	1867
	034	2115	960	81	2057	43.0	1092	28.0	711	73.5	1867
	044	2797	1207	127	3225	49.0	1245	30.5	775	73.5	1867
38AH	**024**	2240	1018	81	2057	40.0	1016	32.8	832	73.5	1867
	024C	2403	1092			43.0	1092				
	028	2300	1045			39.3	997				
	028C	2463	1120			42.3	1073				
	034	2360	1073			41.0	1041				
	034C	2577	1171			44.0	1118				

NOTES:
1. Use 2-in. (50-mm) OD pipe or hooks in lifting holes.
2. Rig with 4 cables and spread with two 'D' long and two 'A' long 2 x 4 in. (50 x 100 mm) bars or equal.
3. Run the rigging cables to a central suspension point so that the angle from the horizontal is not less than 45 degrees.
4. Shipping weights include skid.

⚠ CAUTION

All panels must be in place when rigging.

Fig. 1 — Rigging with Spreader Bars (Field Supplied)



NOTES:
1. There must be 4 ft [1220 mm] for service and for unrestricted airflow on all sides of unit.
2. There must be minimum 8 ft [2440 mm] clear air space above unit.
3. The approximate operating weight of the unit is:

UNIT 38AKS	WEIGHT (lb)	WEIGHT (kg)
028	1650	748
028C	1804	818
034	1803	818
034C	2009	911

NOTE: A "C" in model number indicates unit has optional factory-installed copper-fin coil.

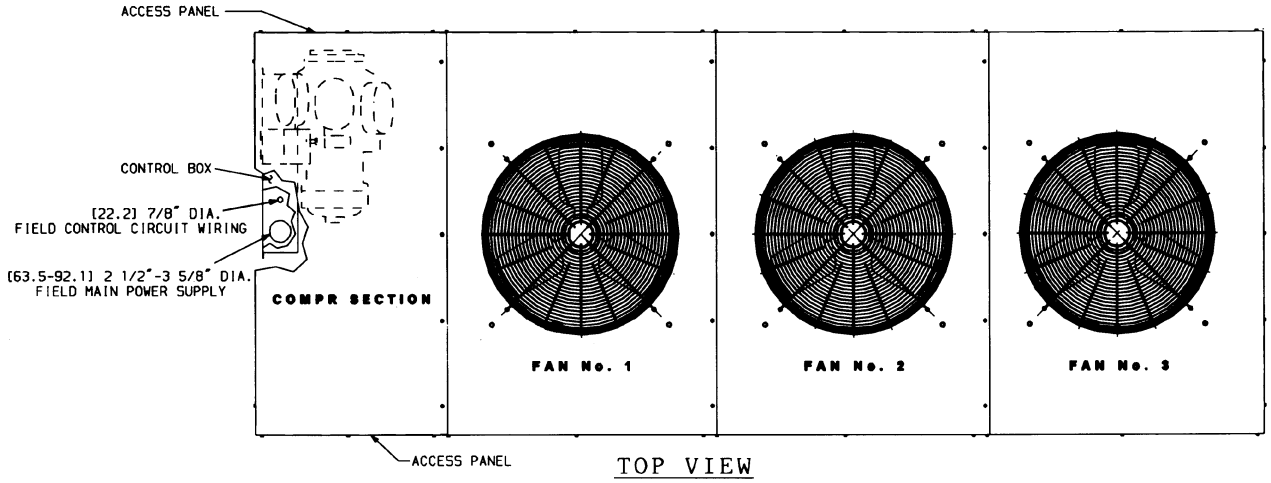
4. Dimensions in [ ] are millimeters.

APPROXIMATE OPERATING WEIGHT* AT SUPPORT POINTS — LB (KG)*

UNIT 38AKS	1	2	3	4	TOTAL
028	418 (189.6)	626 (284.0)	242 (109.8)	364 (165.1)	1650 (748.4)
034	459 (208.2)	673 (305.3)	272 (123.4)	399 (181.0)	1803 (817.8)

*Standard copper tube aluminum-fin coil.

Fig. 2 — 38AKS028-034 Unit Dimensions



NOTES:
1. There must be 4 ft [1220 mm] for service and for unrestricted airflow on all sides of unit.
2. There must be minimum 8 ft [2440 mm] clear air space above unit.
3. The approximate operating weight of the unit is:

UNIT 38AKS	WEIGHT (lb)	WEIGHT (kg)
044	2437	1106
044C	2745	1246

NOTE: A "C" in model number indicates unit has optional factory-installed copper-fin coil.

APPROX. OPER. WT*
AT LIFTING HOLES — LB (KG)*

UNIT 38AKS	1	2	3	4	TOTAL
044	720 (327)	900 (409)	455 (207)	362 (165)	2437 (1106)

*Standard copper tube aluminum-fin coil.

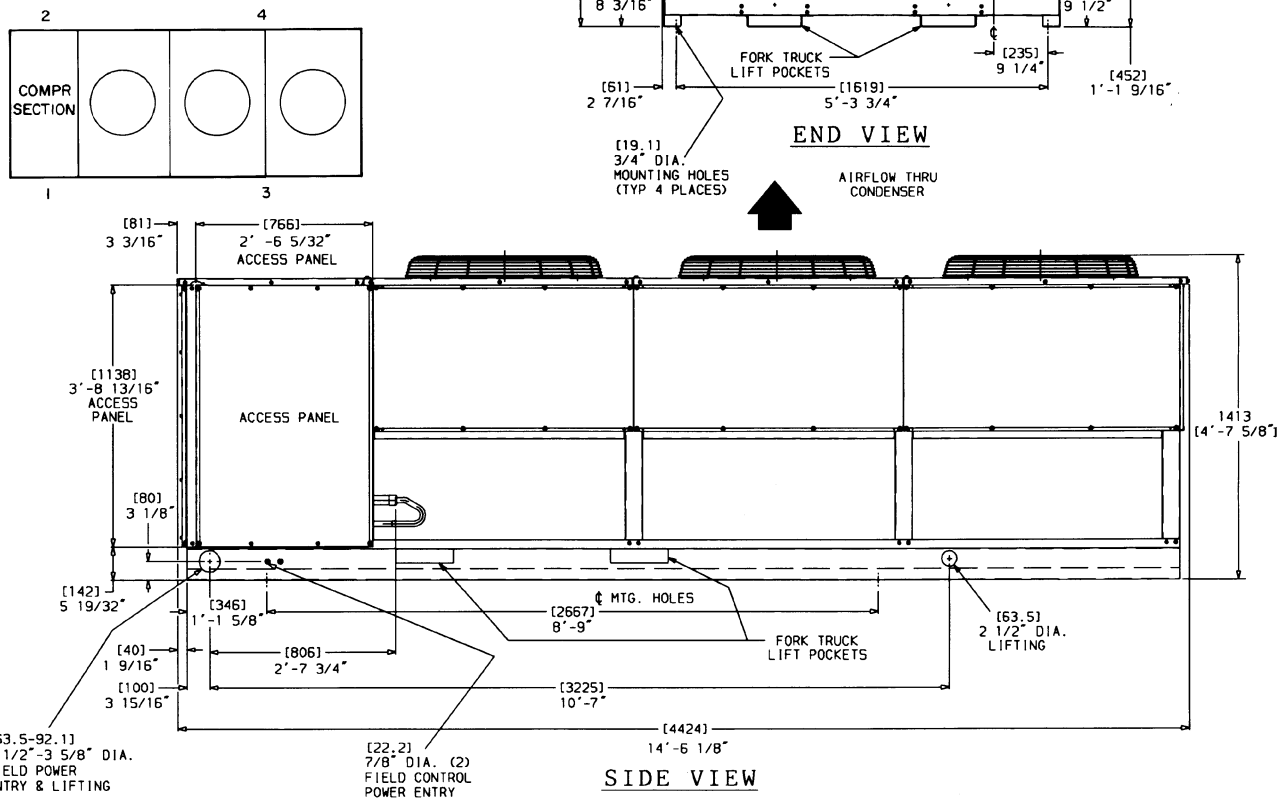
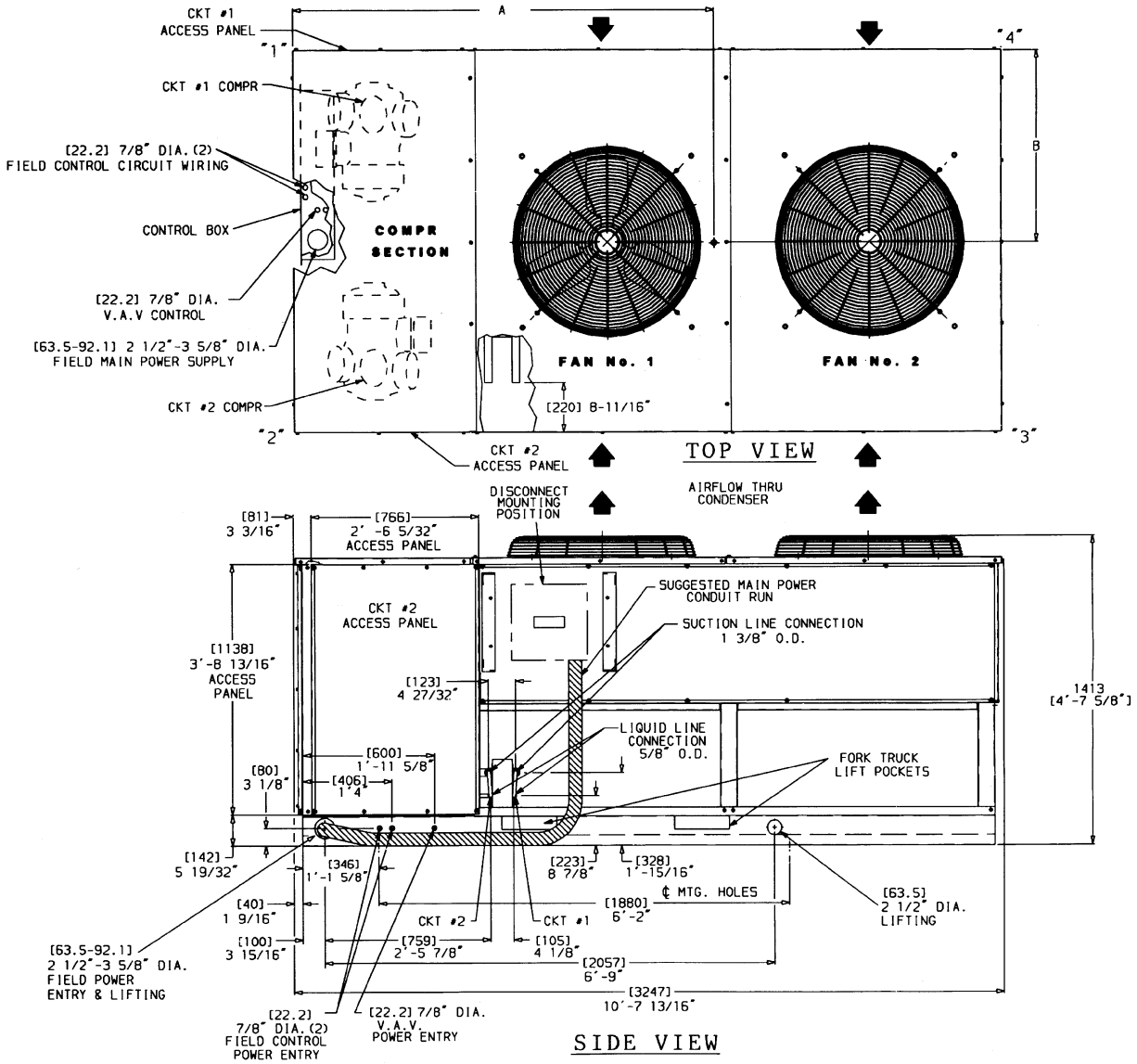


Fig. 3 — 38AKS044 Unit Dimensions



NOTES:
1. There must be 4 ft [1220 mm] for service and for unrestricted airflow on all sides of unit.
2. There must be minimum 8 ft [2440 mm] clear air space above unit.
3. "C" in the package number indicates copper coils.
4. Dimensions in [ ] are in millimeters.
5. The approximate operating weight of the unit is shown below.
6. Certified dimensional drawing is available on request.

UNIT 38AH	CORNER WEIGHT — lb [kg]				CENTER OF GRAVITY		TOTAL UNIT WT lb [kg]
	"1"	"2"	"3"	"4"	A Dim. in. [mm]	B Dim. in. [mm]	
024	631.6 [286.5]	577.6 [262.0]	263.1 [119.3]	287.7 [130.5]	40.00 [1016]	32.75 [832]	1760 [798.3]
024C	666.5 [302.3]	609.5 [276.5]	309.0 [140.2]	337.9 [153.3]	43.00 [1092]		1923 [872.3]
028	658.7 [298.8]	602.4 [273.3]	267.0 [121.1]	291.9 [132.4]	39.25 [997]		1820 [825.6]
028C	693.0 [314.3]	633.8 [287.5]	313.0 [142.0]	342.2 [155.2]	42.25 [1073]		1982 [899.0]
034	667.0 [302.5]	610.0 [276.7]	288.0 [130.7]	315.0 [142.9]	41.00 [1041]		1880 [853.0]
034C	718.3 [325.8]	656.8 [297.9]	344.8 [156.4]	377.0 [171.0]	44.00 [1117]		2097 [951.2]

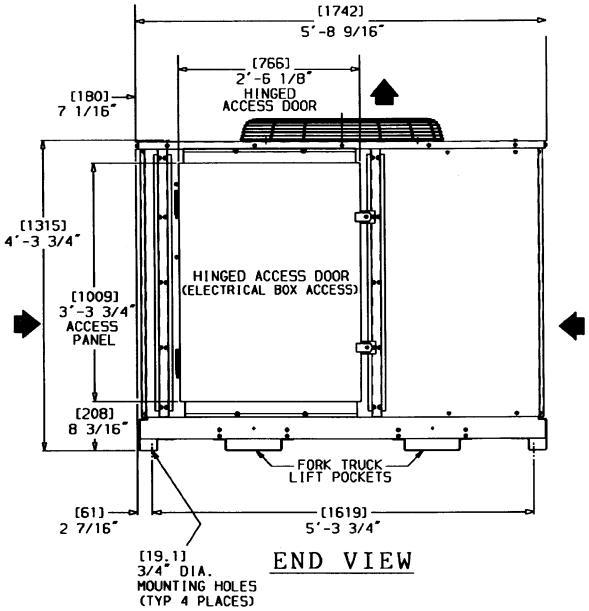


Fig. 4 — 38AH024-034 Unit Dimensions

Table 1A — Physical Data — 38AKS028-044 Units — 60 Hz, English

UNIT 38AKS	028	034	044
NOMINAL CAPACITY (tons)	25	30	40
OPERATING WEIGHTS (lb)			
Aluminum-Fin Coils (standard)	1650	1803	2437
Copper-Fin Coils (optional)	1804	2009	2745
REFRIGERANT*		R-22	
Operating Charge, Typical (lb)†	30.5	43.5	65.0
Shipping Charge (lb)	3	4	5
COMPRESSOR		Reciprocating, Semi-Hermetic	
Qty...Model	1...06E9265	1...06E9275	1...06E9299
Oil Charge (pt)	20	20	19
No. Cylinders	6	6	6
Speed (rpm)		1750	
Capacity Steps (%)		100, 66, 33	
Unloader Setting (psig)			
Unloader No. 1 Load		76	
Unload		58	
Unloader No. 2 Load		78	
Unload		60	
Crankcase Heater Watts		180	
CONDENSER FANS		Propeller Type — Direct Drive	
Qty...Rpm		2...1140	3...1140
Diameter (in.)		30	
Nominal Hp		1.0	
Nominal Airflow (cfm total)		15,700	
Watts (total)	1490	1750	1520
CONDENSER COIL		Enhanced Copper Tubes, Lanced Aluminum Fins	
Rows...Fins/in.	2...19	3...17	3...17
Face Area (sq ft total)	39.2	39.2	58.4
Storage Capacity (lb)**	37.7	56.6	84.4
CONTROLS			
Pressurestat Settings (psig)			
High Open		426 ± 7	
Close		320 ± 20	
Low Open		27 ± 3	
Close		44 ± 5	
Oil Pressure Switch			
Open		6.2	
Close		9.0	
FAN CYCLING CONTROLS			
Operating Pressure (psig)			
No. 2 Fan, Close		255 ± 10	
Open		160 ± 10	
PRESSURE RELIEF			
Location		Liquid and Suction Line	
Temperature (F)		210	
PIPING CONNECTIONS (in. ODM)			
Suction	$1\frac{5}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$
Liquid		$\frac{7}{8}$	
Hot Gas		$\frac{5}{8}$	

*Unit is factory-supplied with holding charge only.
†Typical operating charge with 25 ft. of interconnected piping. Operating charge is approximate for maximum system capacity.
**Storage capacity is 80% full at liquid saturated temperature of 125 F.

Table 1B — Physical Data — 38AKS028-044 Units — 60 Hz, SI

UNIT 38AKS	028	034	044
NOMINAL CAPACITY (kW)	88	105	141
OPERATING WEIGHT (kg)			
Aluminum-Fin Coils (standard)	748	818	1106
Copper-Fin Coils (optional)	818	911	1246
REFRIGERANT*		R-22	
Operating Charge Typical (kg)†	14	20	29
Shipping Charge (kg)	1.5	1.8	2.3
COMPRESSOR		Reciprocating, Semi Hermetic	
Qty...Model	1...06E9265	1...06E9275	1...06E9299
Oil Charge (l)	9.4	9.4	9
No. Cylinders		6	
Speed (r/s)		29	
Capacity Steps (%)		100,66,33	
Unloader Settings (kPag)			
Unloader No. 1 Load		524	
Unload		400	
Unloader No. 2 Load		538	
Unload		414	
Crankcase Heater Watts		180	
CONDENSER FANS		Propeller Type-Direct Drive	
Qty...r/s		2...29	
Diameter (mm)		2…762	3…762
Nominal Hp		1	1
Nominal Airflow (L/s)		7400	11,180
Watts (total)	1490	1750	1520
CONDENSER COIL		Enhanced Copper Tubes, Lanced Aluminum Fins	
Rows….Fins/m.	2…748	3…670	
Face Area (sq. m total)	3.6	3.6	5.4
Storage Capacity (kg)**	17.1	25.7	38.3
CONTROLS			
Pressurestat Settings (kPag)			
High Open		2937 ± 48	
Close		2206 ± 138	
Low Open		186 ± 21	
Close		303 ± 34	
Oil Pressure Switch			
Open		43	
Close		62	
FAN CYCLING CONTROLS			
Operating Pressure (kPag)			
No. 2 Fan, Close		1793 ± 103	
Open		1103 ± 69	
PRESSURE RELIEF			
Location		Liquid and Suction Line	
Temperature (C)		98.9	
PIPING CONNECTIONS (in. ODM)			
Suction	$1\frac{5}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$
Liquid		$\frac{7}{8}$	
Hot Gas		$\frac{5}{8}$	

*Unit is factory supplied with holding charge only.
†Typical operating charge with 7.5 m of interconnected piping. Operating charge is approximate for maximum system capacity.
**Storage capacity is 80% full at liquid saturated temperature of 51.7 C.

Table 2A — Physical Data — 38AH024-034 Units — 60 Hz, English

UNIT 38AH	024		028		034	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
NOMINAL CAPACITY (tons)	20		25		30	
OPERATING WEIGHT (lb)						
Aluminum-Fin Coil (standard)	1760		1820		1880	
Copper-Fin Coil (optional)	1923		1982		2097	
REFRIGERANT*	R-22					
Operating Charge, Typical (lb)	20	20	20	20	25	25
Shipping Charge (lb)	3	3	3	3	3	3
COMPRESSOR	Reciprocating Semi-Hermetic					
Qty...Model	1...06DH824	1...06DA824	1...06DH328	1...06DA328	1...06DH328	1...06DA537
No. Cylinders	6	6	6	6	6	6
Speed (rpm)	1750	1750	1750	1750	1750	1750
Oil Charge Per Circuit (pt)	10					
Capacity Steps (%)						
	100	100	100	100	100	100
	67†	—	67†	—	67†	—
	33**	—	33**	—	33**	—
Unloader Setting (psig)	Factory Installed					
Load	76	—	76	—	76	—
Unload	58	—	58	—	58	—
CONDENSER FANS	Propeller Type — Direct Driven					
Qty...Rpm	2...1140					
Diameter (in.)	30					
Nominal Hp	1.0		1.0		1.0	
Nominal Airflow (cfm)	16,700		16,700		15,700	
Watts (total)	1550					
CONDENSER COIL	Enhanced Copper Tubes, Lanced Aluminum Fins					
Rows...Fins/in.	2...19		2...19		3...17	
Face Area (sq ft total)	39.20		39.20		39.20	
Storage Cap. (lb)††	37.7		37.7		56.6	
CONTROLS						
Pressurestat Settings (psig)						
High Open	426 ± 7					
Close	320 ± 20					
Low Open	27 ± 3					
Close	44 ± 5					
Oil Pressure Switch	Manual Reset					
Open	6.0					
Close	8.8					
FAN CYCLING CONTROLS						
Temperature (F)						
No. 2 Fan, Close	70 ± 3					
Open	60 ± 3					
PRESSURE RELIEF						
Location	Liquid Line, Suction Line, Compressor					
Temperature (F)	210					
PIPING CONNECTIONS						
Suction	$1\frac{3}{8}$					
Liquid	$\frac{5}{8}$					
Hot Gas	$\frac{5}{8}$					

LEGEND

FIOP — Factory-Installed Option
VAV — Variable Air Volume

*Typical operating charge with 25 ft of interconnecting piping. Operating charge is approximate for maximum system capacity.
†Standard unit — single suction pressure-actuated unloader on compressor no. 1.
**VAV FIOP — two electrically actuated unloaders on compressor no. 1.
††Storage capacity is 80% full at liquid saturated temperature of 120 F.

NOTE: Refer to Loading Sequence tables on page 31 for additional capacity step data.

Table 2B — Physical Data — 38AH024-034 Units — 60 Hz, SI

UNIT 38AH	024		028		034	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
NOMINAL CAPACITY (kW)	70		88		105	
OPERATING WEIGHT (kg)						
Aluminum-Fin Coils (standard)	798.3		825.6		853	
Copper-Fin Coils (optional)	872.3		899		951.2	
REFRIGERANT	R-22					
Operating Charge Typical (kg)*	9.1	9.1	9.1	9.1	11.4	11.4
Shipping Charge (kg)	1.5	1.5	1.5	1.5	1.5	1.5
COMPRESSOR	Reciprocating, Semi Hermetic					
Qty...Model	1...06DH824	1...06DA824	1...06DH328	1...06DA328	1...06DH328	1...06DA537
No. Cylinders	6		6		6	
Speed (r/s)	29		29		29	
Oil Charge Per Circuit (l)	4.7	4.7	4.7	4.7	4.7	4.7
Capacity Steps (%)						
	100	100	100	100	100	100
	67†	—	67†	—	67†	—
	33**	—	33**	—	33**	—
Unloader Settings (kPag)	Factory Installed					
Load	524	—	524	—	524	—
Unload	400	—	400	—	400	—
CONDENSER FANS	Propeller Type - Direct Driven					
Qty...r/s	2...19					
Diameter (mm)	762					
Nominal Hp	1.0					
Nominal Airflow (L/s)	7882		7882		7410	
Watts (total)	1550					
CONDENSER COIL	Enhanced Copper Tubes, Lanced Aluminum Fins					
Rows….Fins/m	2…748		2…748		3…670	
Face Area (Sq. m total)	3.6		3.6		3.6	
Storage Capacity (kg)††	17.4		17.4		26.0	
CONTROLS						
Pressurestat Settings (kPag)						
High Open	2937 ± 48					
Close	2206 ± 138					
Low Open	186 ± 21					
Close	303 ± 34					
Oil Pressure Switch	Manual Reset					
Open	43					
Close	62					
FAN CYCLING CONTROLS						
Temperature (C)						
No. 2 Fan, Close	21 ± 1.5					
Open	15.5 ± 1.5					
PRESSURE RELIEF						
Location	Liquid Line, Suction Line, Compressor					
Temperature (C)	100					
PIPING CONNECTIONS (in. ODM)						
Suction	$1\frac{3}{8}$					
Liquid	$\frac{5}{8}$					
Hot Gas	$\frac{5}{8}$					

*Typical operating charge with 7.5m of interconnected piping. Operating charge is approximate for maximum system capacity.
†Standard unit with single pressure operated unloader on compressor No. 1.
**VAV FIOP with two electrically operated unloaders on compressor No. 1.
††Storage capacity is 80% full at liquid saturated temperature of 48.8 C.

Table 3A — Physical Data — 38AKS028-044 Units — 50 Hz, English

UNIT 38AKS	028	034	044
NOMINAL CAPACITY (tons)	23.4	26.7	35.8
OPERATING WEIGHTS (lb)			
Aluminum-Fin Coils (standard)	1650	1803	2437
Copper-Fin Coils (optional)	1804	2009	2745
REFRIGERANT*		R-22	
Operating Charge, Typical (lb)†	30.5	43.5	65.0
Shipping Charge (lb)	3	4	5
COMPRESSOR		Reciprocating, Semi-Hermetic	
Qty...Model	1...06E9265	1...06E9275	1...06E9299
Oil Charge (pt)	20	20	19
No. Cylinders	6	6	6
Speed (rpm)		1450	
Capacity Steps (%)		100, 66, 33	
Unloader Setting (psig)			
Unloader No. 1 Load		76	
Unload		58	
Unloader No. 2 Load		78	
Unload		60	
Crankcase Heater Watts		180	
CONDENSER FANS		Propeller Type — Direct Drive	
Qty...(Rpm)		2...950	3...950
Diameter (in.)		30	
Nominal Hp		1.0	
Nominal Airflow (cfm total)		15,700	23,700
Watts (Total)	1490	1750	1520
CONDENSER COIL		Enhanced Copper Tubes, Lanced Aluminum Fins	
Rows...Fins/in.	2...19	3...17	3...17
Face Area (sq ft total)	39.2	39.2	58.4
Storage Capacity (lb)**	37.7	56.6	84.4
CONTROLS			
Pressurestat Settings (psig)			
High Open		426 ± 7	
Close		320 ± 20	
Low Open		27 ± 3	
Close		44 ± 5	
Oil Pressure Switch			
Open		6.2	
Close		9.0	
FAN CYCLING CONTROLS			
Operating Pressure (psig)			
No. 2 Fan, Close		255 ± 10	
Open		160 ± 10	
PRESSURE RELIEF			
Location		Liquid and Suction Line	
Temperature (F)		210	
PIPING CONNECTIONS (in. ODM)			
Suction	$1\frac{5}{8}$	$2\frac{1}{8}$	$2\frac{1}{8}$
Liquid		$\frac{7}{8}$	
Hot Gas		$\frac{5}{8}$	

*Unit is factory supplied with holding charge only.
†Typical operating charge with 25 ft of interconnecting piping. Operating charge is approximate for maximum system capacity.
**Storage capacity is 80% full at liquid saturated temperature of 125 F.

Table 3B — Physical Data — 38AKS028-044 Units — 50 Hz, SI

UNIT 38AKS	028	034	044
NOMINAL CAPACITY (kW)	82.8	94.5	127.0
OPERATING WEIGHTS (kg)			
Aluminum-Fin Coils (standard)	748	818	1106
Copper-Fin Coils (optional)	818	911	1246
REFRIGERANT*		R-22	
Operating Charge, Typical (kg)†	13.8	19.7	29.5
COMPRESSOR		Reciprocating, Semi-Hermetic	
Qty...Model	1...06E9265	1...06E9275	1...06E9299
Oil Charge (L)	8.99	8.99	9.46
No. Cylinders	6	6	6
Speed (r/s)		24.2	
Capacity Steps (%)		100, 66, 33	
Unloader Settings (kPag)			
Unloader No. 1 Load		524	
Unload		400	
Unloader No. 2 Load		538	
Unload		414	
Crankcase Heater Watts		180	
CONDENSER FANS		Propeller Type — Direct Drive	
Qty...r/s	2...15.8		3...15.8
Diameter (mm)		762	
Nominal Hp		1.0	
Nominal Airflow (L/s total)	7400		11,180
Watts (Total)	1490	1750	1520
CONDENSER COIL		Enhanced Copper Tubes, Lanced Aluminum Fins	
Rows...Fins/m	2...748	3...670	3...670
Face Area (sq m total)	3.64	3.64	5.43
Storage Capacity (kg)**	17.1	25.7	38.3
CONTROLS			
Pressurestat Settings (kPag)			
High Open		2937 ± 48	
Close		2206 ± 138	
Low Open		186 ± 21	
Close		303 ± 34	
Oil Pressure Switch			
Open		43	
Close		62	
FAN CYCLING CONTROLS			
Operating Pressure (kPag)			
No. 2 Fan, Close		1758 ± 69	
Open		1103 ± 69	
PRESSURE RELIEF			
Location		Liquid and Suction Line	
Temperature (C)		98.9	
PIPING CONNECTIONS (in. ODM)			
Suction	1 5/8	2 1/8	2 1/8
Liquid		7/8	
Hot Gas		5/8	

*Unit is factory supplied with holding charge only.
†Typical operating charge with 7.6 m of interconnecting piping. Operating charge is approximate for maximum system capacity.
**Storage capacity is 80% full at liquid saturated temperature of 51.7 C.

Table 4A — Physical Data — 38AH024-034 Units — 50 Hz, English

UNIT 38AH	024		028		034	
	Circuit 1	Circuit 2	Circuit 1	Circuit 2	Circuit 1	Circuit 2
NOMINAL CAPACITY (Tons)	18		21		25	
OPERATING WEIGHT (lb)						
Aluminum-Fin Coil (standard)	1760		1820		1880	
Copper-Fin Coil (optional)	1923		1982		2097	
REFRIGERANT*	R-22					
Operating Charge, Typical (lb)	20	20	20	20	25	25
Shipping Charge (lb)	3	3	3	3	3	3
COMPRESSOR	Reciprocating Semi-Hermetic					
Qty...Model	1...06DH824	1...06DA824	1...06DH328	1...06DA328	1...06DH328	1...06DA537
No. Cylinders	6	6	6	6	6	6
Speed (rpm)	1450	1450	1450	1450	1450	1450
Oil Charge Per Circuit (Pt)	10					
Capacity Steps %						
	100	100	100	100	100	100
	67†	—	67†	—	67†	—
	33**	—	33**	—	33**	—
Unloader Setting (psig)	Factory Installed					
Load	76	—	76	—	76	—
Unload	58	—	58	—	58	—
CONDENSER FANS	Propeller Type — Direct Driven					
Qty...Rpm	2...950					
Diameter (in.)	30		30		30	
Nominal Hp	1.0		1.0		1.0	
Nominal Airflow (cfm)	16,700		16,700		15,700	
Watts (total)	3100					
CONDENSER COIL	Enhanced Copper Tubes, Aluminum Lanced Fin					
Rows...Fins/in.	2...19		2...19		3...17	
Face Area (sq ft total)	39.20		39.20		39.20	
Storage Capacity (lb)††	37.7		37.7		56.6	
CONTROLS						
Pressurestat Settings (psig)						
High Open	426 ± 7					
Close	320 ± 20					
Low Open	27 ± 3					
Close	44 ± 5					
Oil Pressure Switch	Manual Reset					
Cutout	6.0					
Cut-in	8.8					
FAN CYCLING CONTROLS						
Temperature (F)						
No. 2 Fan, Close	70 ± 3					
Open	60 ± 3					
PRESSURE RELIEF						
Location	Liquid Line, Suction Line, Compressor					
Temperature (F)	210					
PIPING CONNECTIONS (in. ODM)						
Suction	$1\frac{3}{8}$					
Liquid	$\frac{5}{8}$					
Hot Gas	$\frac{5}{8}$					

LEGEND

FIOP — Factory-Installed Option
VAV — Variable Air Volume

*Typical operating charge with 25 ft of interconnecting piping. Operating charge is approximate for maximum system capacity.
†Standard unit — single pressure-actuated suction unloader on compressor no. 1.
**VAV FIOP — double electrically actuated unloaders on compressor no. 1.
††Storage capacity is 80% full at liquid saturated temperature of 120 F.

NOTE: Refer to Loading Sequence tables on page 31 for additional capacity step data.

Table 4B — Physical Data — 38AH024-034 Units — 50 Hz, SI

UNIT 38AH	024		028		034	
	Circuit 1	Circuit 2	Circuit 1	Circuit 2	Circuit 1	Circuit 2
NOMINAL CAPACITY (kW)	63		73		87	
OPERATING WEIGHT (kg)						
Aluminum-Fin Coil (standard)	798.3		825.6		853.0	
Copper-Fin Coil (optional)	872.3		899.0		951.2	
REFRIGERANT*	R-22					
Operating Charge, Typical (kg)	9.10	9.10	9.10	9.10	11.40	11.40
Shipping Charge (kg)	1.36	1.36	1.36	1.36	1.36	1.36
COMPRESSOR	Reciprocating Semi-Hermetic					
Qty...Model	1...06DH824	1...06DA824	1...06DH328	1...06DA328	1...06DH328	1...06DA537
No. Cylinders	6	6	6	6	6	6
Speed (r/s)	24.3	24.3	24.3	24.3	24.3	24.3
Oil Charge Per Circuit (L)	4.73					
Capacity Steps (%)						
	100	100	100	100	100	100
	67*	—	67†	—	67†	—
	33†	—	33**	—	33**	—
Unloader Setting (kPa)	Factory Installed					
Load	524	—	524	—	524	—
Unload	400	—	400	—	400	—
CONDENSER FANS	Propeller Type — Direct Driven					
Qty... r/s	2...16					
Diameter (mm)	762		762		762	
Nominal Hp	1.0		1.0		1.0	
Nominal Airflow (L/s)	7870		7870		7400	
Watts (total)	3100					
CONDENSER COIL	Enhanced Copper Tubes, Aluminum Lanced Fin					
Rows...Fins/m	2...748		2...748		3...670	
Face Area (sq m total)	3.64		3.64		3.64	
Storage Capacity (kg)††	17.4		17.4		26.0	
CONTROLS						
Pressurestat Settings (kPa)						
High Open	2937 ± 48					
Close	2206 ± 138					
Low Open	186 ± 21					
Close	303 ± 34					
Oil Pressure Switch	Manual Reset					
Cutout	41.4					
Cut-in	60.7					
FAN CYCLING CONTROLS						
Temperature (C)						
No. 2 Fan, Close	21.1 ± 1.6					
Open	15.6 ± 1.6					
PRESSURE RELIEF						
Location	Liquid Line, Suction Line, Compressor					
Temperature (C)	99					
PIPING CONNECTIONS (in. ODM)						
Suction	1 3/8					
Liquid	5/8					
Hot Gas	5/8					

LEGEND

FIOP — Factory-Installed Option
VAV — Variable Air Volume

*Typical operating charge with 7.6 m of interconnecting piping. Operating charge is approximate for maximum system capacity.
†Standard unit — single pressure-actuated suction unloader on compressor no. 1.
**VAV FIOP — double electrically actuated unloaders on compressor no. 1.
††Storage capacity is 80% full at liquid saturated temperature of 120 F.

NOTE: Refer to Loading Sequence tables on page 31 for additional capacity step data.

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. See Fig. 5. 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. 6.

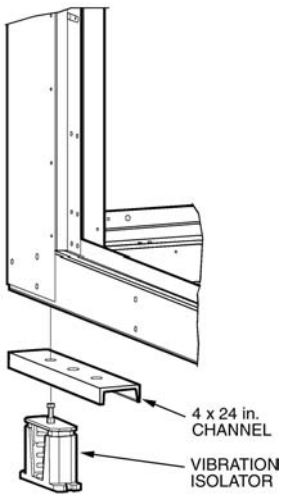


Fig. 5 — Mounting on Vibration Isolator

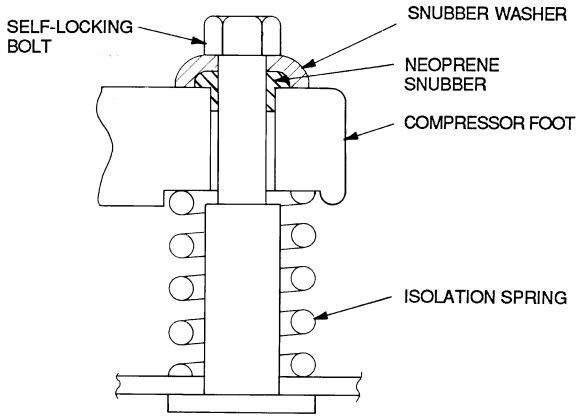


Fig. 6 — Compressor Mounting (Typical 38AH Unit Shown)

INSTALLATION

Refrigerant Piping Connections — Line sizes depend on length of piping required between condensing unit and evaporator. See Tables 5A-10B. 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. 7-9 for recommended piping details. Do NOT bury refrigerant piping.

Liquid Solenoid Drop Refrigerant Control — All units are factory wired to operate on solenoid drop refrigerant control. A field-supplied liquid line solenoid valve (LLSV) must be installed in the liquid line ahead of the indoor coil on 38AH units. See Fig. 8. Wires from solenoid valve need to be in conduit as coil voltage is 115 v.

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

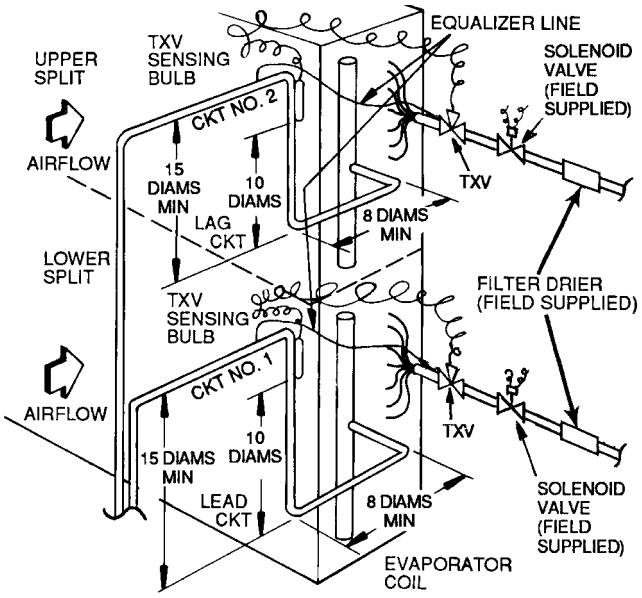
The LLSV is shipped with the 38AKS units and field-supplied for 38AH units.

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. Figures 7 and 8 show recommended locations of filter drier(s) and sight glass(es). Complete the refrigerant piping from the evaporator to the condenser before opening the liquid and suction lines at the condensing unit.

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 (TXV) in liquid line ahead of each evaporator section.

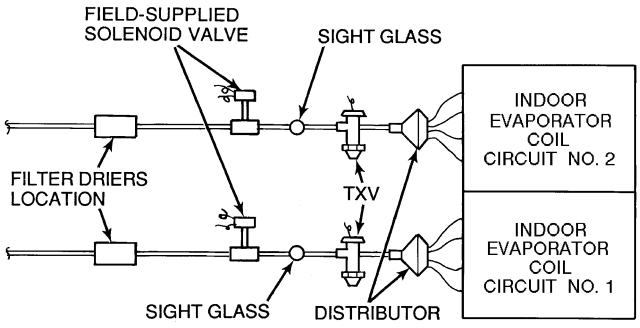


LEGEND

TXV — Thermostatic Expansion Valve

NOTES:
1. Lower section is first on and last off.
2. For more complete piping information, refer to Carrier System Design Manual, Part 3, or E20-II® refrigerant piping computer program.

Fig. 7 — Suction Line Piping to Unit with 2-Section Coil Split (Typical 38AH Unit Shown)



LEGEND

TXV — Thermostatic Expansion Valve

Fig. 8 — Liquid Line Solenoid Valve, Filter Drier(s), and Sight Glass Locations (Typical 38AH Unit Shown)

Table 5A — Refrigerant Pipe Sizes, Single Suction Risers — 38AKS028-044, 60 Hz Units

UNIT 38AKS	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
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	2 1/8	1 1/8	2 5/8*
044	7/8	2 1/8	7/8	2 1/8	1 1/8	2 5/8*	1 1/8	2 5/8*	1 1/8	2 5/8*

LEGEND

L — Liquid Line
S — Suction Line

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

* IMPORTANT: Requires a double suction riser, if evaporator is below condensing unit. See table below.

Table 5B — Refrigerant Pipe Sizes, Double Suction Risers — 38AKS028-044, 60 Hz Units

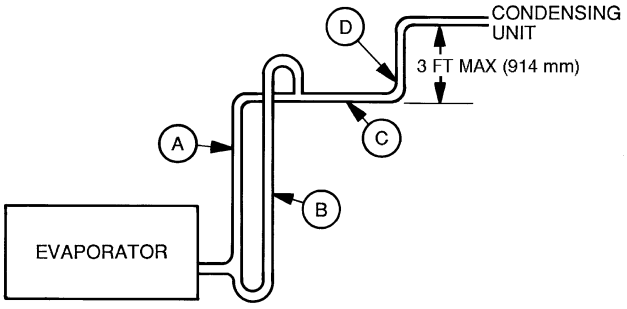
UNIT 38AKS	LENGTH OF INTERCONNECTING PIPING, (Ft)											
	26-50			51-75			76-100			101-200		
	A	B	C	A	B	C	A	B	C	A	B	C
028	1 3/8	1 5/8	2 1/8	1 3/8	1 5/8	2 1/8	1 3/8	1 5/8	2 1/8	1 3/8	1 5/8	2 1/8
034	—	—	—	—	—	—	—	—	—	1 5/8	2 1/8	2 5/8
044	—	—	—	1 5/8	2 1/8	2 5/8	1 5/8	2 1/8	2 5/8	1 5/8	2 1/8	2 5/8

NOTE: For A, B, and C dimensions refer to Fig. 9.

Table 6 — Maximum Liquid Lift — 38AKS028-044

UNIT 38AKS	FT
028	76
034	67
044	76

SUCTION LINE PIPING



LEGEND

(A) Suction Riser *Without* Trap

(B) Suction Riser *With* Trap

(C) Horizontal Suction Line to Condensing Unit

(D) Short Vertical Riser:
38AKS028 — 1 5/8 in. OD
38AKS034, 044 — 2 1/8 in. OD
38AH — Diameter to be the same as Riser A.

Fig. 9 — Suction Line Piping, 38AKS,AH Units

Table 7A — Refrigerant Pipe Sizes, Single Suction Risers — 38AH024-034, 60 Hz Units

UNIT 38AH		LENGTH OF INTERCONNECTING PIPING, FOR EACH CIRCUIT (Ft)									
		0-25		25-50		50-75		75-100		100-200	
		L	S	L	S	L	S	L	S	L	S
024	Ckt 1	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	5/8	1 5/8*	7/8	1 5/8*
	Ckt 2	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	5/8	1 5/8†	7/8	1 5/8†
028	Ckt 1	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8*	7/8	2 1/8**
	Ckt 2	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8†	7/8	2 1/8**
034	Ckt 1	1/2	1 1/8	5/8	1 3/8	5/8	1 5/8*	7/8	1 5/8*	7/8	2 1/8**
	Ckt 2	1/2	1 3/8	5/8	1 5/8	7/8	1 5/8	7/8	1 5/8	7/8	2 1/8†

LEGEND

L — Liquid Line
S — Suction Line

*Double suction riser required if evaporator is below condensing unit and 2 unloaders are used on that circuit.

†Double suction riser required if evaporator is below condensing unit and compressor is equipped with 2 unloaders. Note the only time circuit no. 2 may be equipped with 2 unloaders is if it is serving its own air handler and the unit does not require low ambient operation (Motormaster® III control).

**Double suction riser required if evaporator is below condensing unit and compressor has one or more unloader(s).

NOTES:
1. All line sizes are inches OD.
2. Standard unit comes with one pressure-operated unloader on circuit no. 1. If unit serves one air handler, an additional unloader may be field installed on circuit no. 1 compressor only. If the unit serves 2 separate air handlers and low ambient operation is required (Motormaster III control), each circuit's compressor may only be equipped with *one* unloader.

Table 7B — Refrigerant Pipe Sizes, Double Suction Risers — 38AH024-034, 60 Hz Units

UNIT 38AH		LENGTH OF INTERCONNECTING PIPING (Ft)								
		50-75			75-100			100-200		
		A	B	C	A	B	C	A	B	C
024	Ckt 1	—	—	—	1 1/8	1 3/8	1 5/8	1 1/8	1 3/8	1 5/8
	Ckt 2	—	—	—	1 1/8	1 3/8	1 5/8	1 3/8	1 3/8	1 5/8
028	Ckt 1	—	—	—	1 1/8	1 3/8	1 5/8	1 3/8	1 5/8	2 1/8
	Ckt 2	—	—	—	1 1/8	1 3/8	1 5/8	1 3/8	1 5/8	2 1/8
034	Ckt 1	1 1/8	1 3/8	1 5/8	1 1/8	1 3/8	1 5/8	1 3/8	1 5/8	2 1/8
	Ckt 2	—	—	—	—	—	—	1 3/8	1 5/8	2 1/8

NOTE: For A, B, and C dimensions refer to Fig. 9.

Table 8 — Maximum Liquid Lift — 38AH024-034

UNIT 38AH	MAXIMUM LIQUID LIFT PER CIRCUIT — Ft (m)
024	76 (23.2)
028	73 (22.3)
034	100 (30.5)

Table 9A — Refrigerant Pipe Sizes, Single Suction Risers — 38AKS028-044, 50 Hz Units

UNIT 38AKS	LENGTH OF INTERCONNECTING PIPING — FT (m)									
	16-25 (4.9-7.6)		25-50 (7.9-15.2)		50-75 (15.5-22.8)		75-100 (23.2-30.5)		100-200 (30.8-60.9)	
	L	S	L	S	L	S	L	S	L	S
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	2 1/8	1 1/8	2 5/8*
044	7/8	2 1/8	7/8	2 1/8	1 1/8	2 5/8*	1 1/8	2 5/8*	1 1/8	2 5/8*

LEGEND

L — Liquid Line
S — Suction Line

* IMPORTANT: If condensing unit is above air handler, a double suction riser is required. See table below for sizing.

Table 9B — Refrigerant Pipe Sizes, Double Suction Risers — 38AKS028-044, 50 Hz Units

UNIT 38AKS	LENGTH OF INTERCONNECTING PIPING — FT (m)											
	26-50 (7.9-15.2)			50-75 (15.5-22.8)			75-100 (23.2-30.5)			100-200 (30.8-60.9)		
	A	B	C	A	B	C	A	B	C	A	B	C
028	1 5/8	1 5/8	2 1/8	1 5/8	1 5/8	2 1/8	1 5/8	1 5/8	2 1/8	1 5/8	1 5/8	2 1/8
034	—	—	—	—	—	—	—	—	—	1 5/8	2 1/8	2 5/8
044	—	—	—	1 5/8	2 1/8	2 5/8	1 5/8	2 1/8	2 5/8	1 5/8	2 1/8	2 5/8

NOTE: For A, B, and C dimensions, refer to Fig. 9.

Table 10A — Refrigerant Pipe Sizes, Single Suction Risers — 38AH024-034, 50 Hz Units

UNIT 38AH	LENGTH OF INTERCONNECTING PIPING, FOR EACH CIRCUIT — FT (m)									
	0-25 (0-7.6)		25-50 (7.6-15.2)		50-75 (15.2-22.9)		75-100 (22.9-30.5)		100-200 (30.5-61.0)	
	L	S	L	S	L	S	L	S	L	S
024 Ckt 1	1/2	1 1/8	5/8	1 1/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8*†
Ckt 2	1/2	1 1/8	5/8	1 1/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8*†
028 Ckt 1	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8*†
Ckt 2	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8*†
034 Ckt 1	1/2	1 1/8	5/8	1 3/8	5/8	1 3/8	5/8	1 3/8	7/8	1 5/8*†
Ckt 2	5/8	1 3/8	5/8	1 5/8	5/8	1 5/8	7/8	1 5/8	7/8	2 1/8*†

LEGEND

L — Liquid Line
S — Suction Line

*Double suction riser required if evaporator is below condensing unit and 2 unloaders are used on that circuit.

†Double suction riser required if evaporator is below condensing unit and compressor is equipped with 2 unloaders. Note the only time circuit no. 2 may be equipped with 2 unloaders is if it is serving its own air handler and the unit does not require low ambient operation (Motormaster® III control).

NOTES:

1. All line sizes are inches OD.
2. Standard unit comes with one pressure-operated unloader on circuit no. 1. If unit serves one air handler, an additional unloader may be field installed on circuit no. 1 compressor only. If the unit serves 2 separate air handlers and low ambient operation is required (Motormaster III control), each circuit's compressor may only be equipped with *one* unloader.

Table 10B — Refrigerant Pipe Sizes, Double Suction Risers — 38AH024-034, 50 Hz Units

UNIT 38AH	LENGTH OF INTERCONNECTING PIPING — FT (m)		
	100-200 (30.5-61.0)		
	A	B	C
024 Ckt 1	1 1/8	1 3/8	1 5/8
Ckt 2	1 3/8	1 3/8	1 5/8
028 Ckt 1	1 1/8	1 3/8	1 5/8
Ckt 2	1 1/8	1 3/8	1 5/8
034 Ckt 1	1 1/8	1 3/8	1 5/8
Ckt 2	1 3/8	1 5/8	2 1/8

SUCTION PIPING AT EVAPORATOR AND TXV BULB LOCATION (See Fig. 7) — 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 degree 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. Suction piping for the high velocity section should be selected for about 0.5° F (0.3° C) friction loss. If a 2° F (1.1° C) loss is allowed for the entire suction line, 1.5° F (0.8° C) 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 condensing unit is below the evaporator, the riser at the evaporator does not have to extend as high as the top level of a given evaporator circuit. 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. Other fusible plugs are located on the compressor(s) and on the suction line(s).

VAV (Variable Air Volume) APPLICATIONS — Field-supplied suction line accumulator(s) (one per circuit) (Replacement Components Division, Carrier part no. KH73LZ001 [38AH] or 38AKS00410 [38AKS]) is required for VAV applications in outdoor units. Accumulators prevent liquid from entering the compressor on start-up.

IMPORTANT: Failure to install accumulator in outdoor unit VAV applications may VOID warranty.

NOTE: Accumulators cannot be installed inside cabinets of 38AH units due to lack of interior space. Accumulators must be installed outside of cabinet on field-supplied mountings.

Install accumulator inside compressor compartment in suction line as follows (see Fig. 10):

1. Close suction service valve on compressor.
2. Cut and remove suction pipe at location where accumulator will be installed.
3. Install accumulator, keeping top of accumulator below top of factory-installed vertical riser, using field-supplied street elbows, 90-degree elbows, couplings, and straight tubing.
4. Check for leaks. Evacuate and recharge system per Carrier GTAC II, Module 5, Charging, Recovery, Recycling, and Reclamation, and chart on unit.

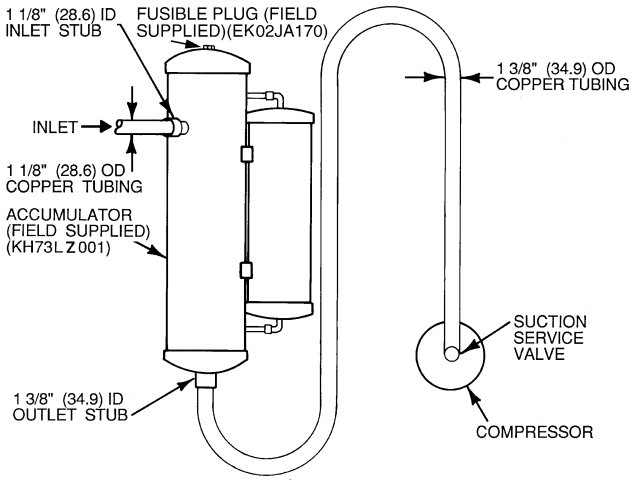
Power Supply — Electrical characteristics of available power supply must agree with unit nameplate rating. Supply voltage must be within limits shown in Tables 11A-11D.

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 section.

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 [U.S.A. Standard]) 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 be closed except when unit is being serviced.*



NOTE: Dimensions in ( ) are in millimeters.

Fig. 10 — Installation of Accumulator (KH73LZ001 Shown)

Table 11A — Electrical Data — 38AKS028-044, 60 Hz Units

UNIT 38AKS	NOMINAL VOLTAGE	VOLTAGE RANGE*		FLA	COMPRESSOR		FAN MOTORS		POWER SUPPLY		
	(3 Ph, 60-Hz)	Min	Max		RLA	LRA	Qty	FLA (ea)	MCA	MOCP†	ICF
028	208/230	187	254	102.2	89.8	446	2	6.2	124.6	200	452.2
	380**	342	418	53.3	45.5	247		3.9	64.7	110	250.9
	460	414	508	49.8	43.6	223		3.1	60.7	100	226.1
	575	518	632	43.3	36.5	164		3.4	52.5	80	167.4
034	208/230	187	254	118.4	106.5	506	2	6.2	145.5	250	512.2
	380**	342	418	60.4	52.6	280		3.9	72.5	125	283.9
	460	414	508	56.2	50.0	253		3.1	68.7	110	256.1
	575	518	632	45.3	38.5	176		3.4	54.9	90	179.4
044	208/230	187	254	165.6	147.5	690	3	6.2	203.0	350	702.4
	380**	342	418	91.2	79.5	382		3.9	111.1	175	389.8
	460	414	508	74.7	65.4	345		3.1	91.0	150	351.2
	575	518	632	67.3	57.1	276		3.4	81.5	125	282.8

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning, and Refrigeration
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 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
UL — Underwriters' Laboratories

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed minimum and maximum limits.
†Fuse or HACR circuit breaker.
**The 380-v units are export models not listed with UL or UL, Canada.

NOTES:
1. MCA and MOCP values are calculated in accordance with NEC (National Electric Code) (U.S.A. Standard), Article 440.
2. Motor FLA and RLA values are established in accordance with UL (Underwriters' Laboratories) Standard 1995 (U.S.A. standard).

Table 11B — Electrical Data — 38AH024-034, 60 Hz Units

UNIT 38AH	NOMINAL VOLTAGE	VOLTAGE RANGE*		COMPRESSOR				FAN MOTORS†		POWER SUPPLY		
				RLA		LRA		Qty	FLA (ea)	MCA	MOCP**	ICF
	3 Ph, 60 Hz	Min	Max	Ckt 1	Ckt 2	Ckt 1	Ckt 2					
024	208/230	187	254	39.3	39.3	198	198	2	(1) 5.5 (2) 6.6	100.5	125	249.7
	380††	342	418	24.0	24.0	93	93		3.9	61.8	80	124.8
	460	414	508	19.6	19.6	99	99		(1) 2.8 (2) 3.3	50.2	60	124.8
	575	518	632	15.7	15.7	79	79		3.4	42.1	50	101.5
028	208/230	187	254	43.6	43.6	228	228	2	(1) 5.5 (2) 6.6	110.2	150	284.0
	380††	342	418	26.4	26.4	104	104		3.9	67.2	90	138.2
	460	414	508	22.1	22.1	114	114		(1) 2.8 (2) 3.3	55.8	70	142.3
	575	518	632	19.7	19.7	91	91		3.4	47.1	60	117.5
034	208/230	187	254	43.6	63.6	228	266	2	(1) 5.5 (2) 6.6	135.2	175	322.0
	380††	342	418	26.4	34.3	104	145		3.9	77.0	110	179.2
	460	414	508	22.1	30.0	114	120		(1) 2.9 (2) 3.3	65.7	90	148.3
	575	518	632	17.9	22.9	91	96		3.4	53.3	70	120.7

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning, and Refrigeration
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
UL — Underwriters' Laboratories

*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.
**Fuse or HACR circuit breaker.
††The 380-v units are export models not listed with UL or UL, Canada.

NOTES:
1. MCA and MOCP values are calculated in accordance with NEC National Electric Code) (U.S.A. Standard), Article 440.
2. Motor FLA and RLA values are established in accordance with UL (Underwriters' Laboratories) Standard 1995 (U.S.A. standard).
3. The 208/230-v, 460-v, and 575-v base units are UL and UL, Canada listed.

Table 11C — Electrical Data — 38AKS028-044, 50 Hz Units

UNIT 38AKS	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE*		COMPR		FAN MOTOR		POWER SUPPLY	
		Min	Max	RLA	LRA	Qty	FLA (ea)	MCA	MOCP†
028	230-3-50	198	254	76.9	205	2	6.4	109.0	175
	346-3-50	311	380	44.9	155	2	4.4	64.9	100
	400-3-50	342	440	43.6	223	2	3.0	60.5	100
034	230-3-50	198	254	85.9	220	2	6.4	120.2	200
	346-3-50	311	380	53.9	176	2	4.4	76.1	125
	400-3-50	342	440	50.0	253	2	3.0	68.5	110
044	230-3-50	198	254	105.1	327	3	6.4	150.6	250
	346-3-50	311	380	79.5	240	3	4.4	112.6	175
	400-3-50	342	440	65.4	345	3	3.0	90.8	150

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps per NEC Section 430-24
MOCP — Maximum Overcurrent Protection
NEC — National Electrical Code (U.S.A. Standard)
RLA — Rated Load Amps (Compressor)

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

NOTES:
1. The MCA and MOCP values are calculated in accordance with NEC (National Electrical Code) (U.S.A. Standard), Article 440.
2. Motor FLA and RLA values are established in accordance with UL (Underwriters' Laboratories) Standard 1995 (U.S.A. standard).
3. 230-v and 346-v units are part-wind-start units; the value under compressor LRA is for the first winding energized. The 400-v units are across-the-line-start units; value shown is for all windings energized.

Table 11D — Electrical Data — 38AH024-034, 50 Hz Units

UNIT 38AH	NAMEPLATE VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE*		COMPRESSOR				FAN MOTORS† (Qty 2)			POWER SUPPLY		
		Min	Max	RLA		LRA		FLA (ea)	Nominal Hp	Nominal kW	MCA	MOCP**	ICF
				Ckt 1	Ckt 2	Ckt 1	Ckt 2						
024	230-3-50	198	254	39.3	39.3	128	128	6.3	1	0.75	101.0	125	268.8
	400-3-50	342	400	18.0	18.0	99	99	3.0			46.5	60	204.0
	346-3-50	311	380	24.0	24.0	93	93	4.4			62.8	80	194.8
028	230-3-50	198	254	43.6	43.6	143	143	6.3	1	0.75	110.7	150	298.8
	400-3-50	342	400	22.1	22.1	114	114	3.0			55.7	70	234.0
	346-3-50	311	380	26.4	26.4	104	104	4.4			68.2	90	216.8
034	230-3-50	198	254	43.6	63.6	143	200	6.3	1	0.75	135.7	175	355.8
	400-3-50	342	400	22.1	30.0	114	120	3.0			65.6	90	240.0
	346-3-50	311	380	26.4	34.3	104	145	4.4			78.1	110	257.8

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
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) (U.S.A. Standard)
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.
†All fans are protected by a single circuit breaker.
**Fuse or HACR circuit breaker.

NOTES:
1. MCA and MOCP values are calculated in accordance with NEC (National Electric Code) (U.S.A. Standard), Article 440.
2. Motor FLA and RLA values are established in accordance with UL (Underwriters' Laboratories) Standard 1995 (U.S.A. standard).

CONDENSER FANS — The fans must rotate counterclockwise 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 (See Fig. 11-15)

1. Main Power — Bring wires from the fused disconnect switch through hole in bottom rail of unit to control box and connect to terminals 11 , 12, 13 on line side of terminal block TB1. To comply with NEC Article 440-14, the disconnect must be located within sight and readily accessible from the unit.
2. 24-v Control Power — Units have single-point power connections. Control circuit is directly connected internally to unit. Maximum current for 24-v control circuit is 3.2 amps.

   NOTE: For wire runs, use the following sizes of insulated wire. Tables 12A and 12B show maximum wire sizes.

Ft (M)		
0-50 (0-15.2)	**50-75 (15.2-22.9)**	**Over 75 (Over 22.9)**
No. 18 AWG (0.82 sq mm) 35 C Min	No. 16 AWG (1.30 sq mm) 35 C Min	No. 14 AWG (2.08 sq mm) 35 C Min

LEGEND

AWG — American Wire Gage

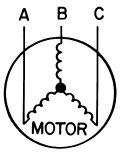
3. ModuPanel™ Control Connections (38AH units) — Refer to Fig. 14 and 15 for field connections.
4. Control Circuit Interlock (38AKS units) — An airflow switch may be installed in the indoor air handler to prevent unit from running when indoor air is not flowing. This switch (no. HR81JE001) is available from Service Parts Center, or equivalent can be field supplied. This should be electrically interlocked in the control circuit, between thermostat TC1 (stage 1, cooling) and terminal 2 Y1 on TB3. See Fig. 13 for typical field wiring. This is in the 24-v circuit. wires must be run in conduit with ground wire.
5. Transformer Connections — For wiring, see unit label diagram, notes 1 and 2, located on inside of 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 percent voltage imbalance:

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

EXAMPLE: Supply voltage is 240-3-60.



AB = 243 v
BC = 236 v
AC = 238 v

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

$$= 239 \text{ v}$$

Determine maximum deviation from average voltage:

(AB) 243 – 239 = 4 v

(BC) 239 – 236 = 3 v

(AC) 239 – 238 = 1 v

Maximum deviation is 4 v.

Determine percent 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%.

Table 12A — 38AKS028-044, 50/60 Hz — Maximum Wire Sizes

UNIT 38AKS	V-PH-Hz	WIRE SIZE
028	208/230-3-60	350 kcmil
034	208/230-3-60 230-3-50	
044	208/230-3-60 230-3-50	

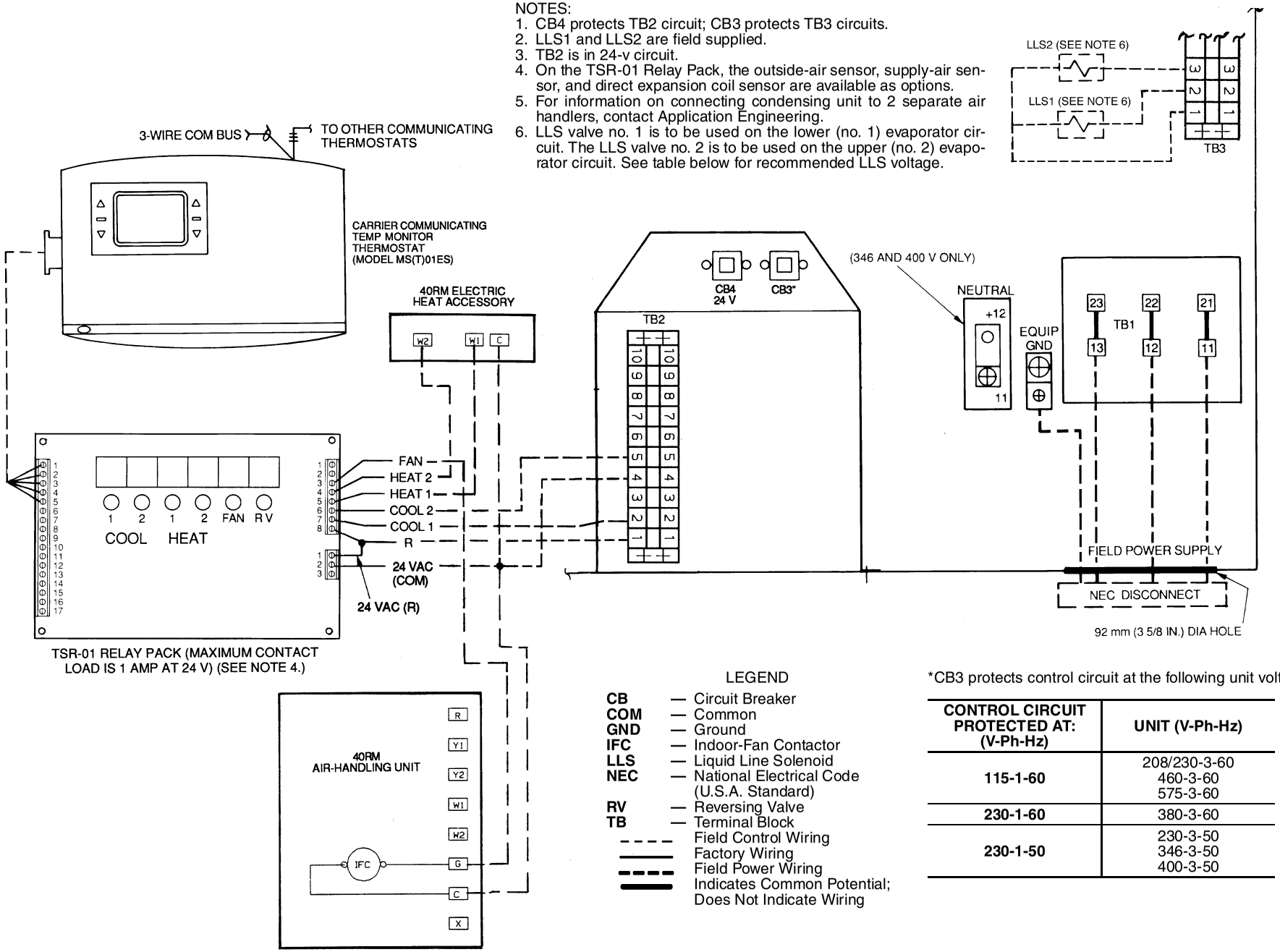
Table 12B — 38AH024-034, 50/60 Hz — Maximum Wire Sizes

UNIT 38AH	V-PH-Hz	WIRE SIZE
024-034	**208/230-3-60**	350 kcmil (178 sq mm)
	380-3-60	2/0 AWG (67 sq mm)
	460-3-60	
	575-3-60	
	230-3-50	350 kcmil (178 sq mm)
	346-3-50	2/0 AWG (67 sq mm)
	400-3-50	

LEGEND

AWG — American Wire Gage
kcmil — Thousand Circular Mils

NOTES:
1. CB4 protects TB2 circuit; CB3 protects TB3 circuits.
2. LLS1 and LLS2 are field supplied.
3. TB2 is in 24-v circuit.
4. On the TSR-01 Relay Pack, the outside-air sensor, supply-air sensor, and direct expansion coil sensor are available as options.
5. For information on connecting condensing unit to 2 separate air handlers, contact Application Engineering.
6. LLS valve no. 1 is to be used on the lower (no. 1) evaporator circuit. The LLS valve no. 2 is to be used on the upper (no. 2) evaporator circuit. See table below for recommended LLS voltage.



LEGEND

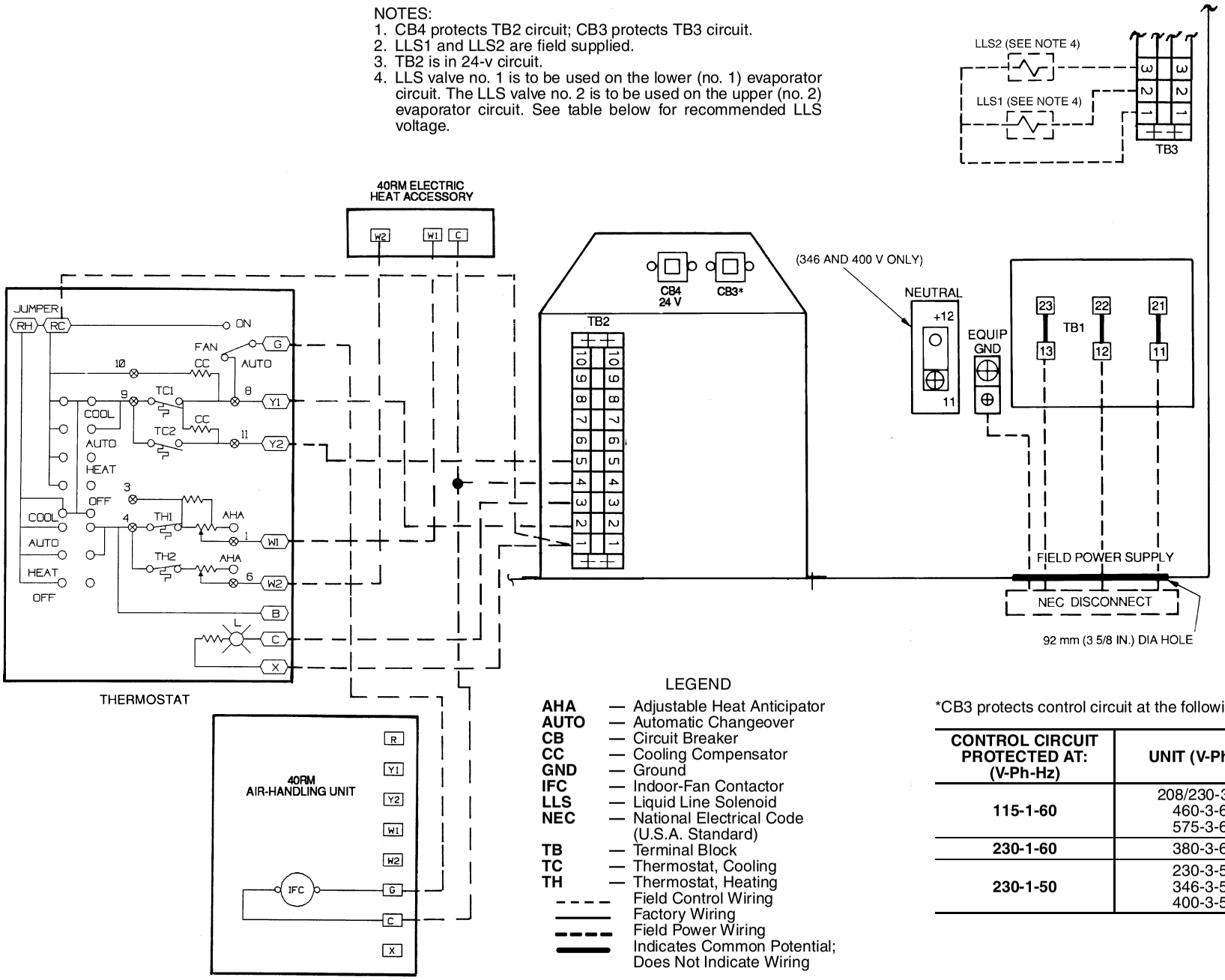
CB	—	Circuit Breaker
COM	—	Common
GND	—	Ground
IFC	—	Indoor-Fan Contactor
LLS	—	Liquid Line Solenoid
NEC	—	National Electrical Code (U.S.A. Standard)
RV	—	Reversing Valve
TB	—	Terminal Block
		Field Control Wiring
		Factory Wiring
		Field Power Wiring
		Indicates Common Potential; Does Not Indicate Wiring

*CB3 protects control circuit at the following unit voltages:

CONTROL CIRCUIT PROTECTED AT: (V-Ph-Hz)	UNIT (V-Ph-Hz)
115-1-60	208/230-3-60 460-3-60 575-3-60
230-1-60	380-3-60
230-1-50	230-3-50 346-3-50 400-3-50

Fig. 11 — Typical Control Wiring Schematic, 38AH Unit — Programmable Thermostat

NOTES:
1. CB4 protects TB2 circuit; CB3 protects TB3 circuit.
2. LLS1 and LLS2 are field supplied.
3. TB2 is in 24-v circuit.
4. LLS valve no. 1 is to be used on the lower (no. 1) evaporator circuit. The LLS valve no. 2 is to be used on the upper (no. 2) evaporator circuit. See table below for recommended LLS voltage.



LEGEND

AHA	—	Adjustable Heat Anticipator
AUTO	—	Automatic Changeover
CB	—	Circuit Breaker
CC	—	Cooling Compensator
GND	—	Ground
IFC	—	Indoor-Fan Contactor
LLS	—	Liquid Line Solenoid
NEC	—	National Electrical Code (U.S.A. Standard)
TB	—	Terminal Block
TC	—	Thermostat, Cooling
TH	—	Thermostat, Heating
		Field Control Wiring
		Factory Wiring
		Field Power Wiring
		Indicates Common Potential; Does Not Indicate Wiring

*CB3 protects control circuit at the following unit voltages:

CONTROL CIRCUIT PROTECTED AT: (V-Ph-Hz)	UNIT (V-Ph-Hz)
115-1-60	208/230-3-60 460-3-60 575-3-60
230-1-60	380-3-60
230-1-50	230-3-50 346-3-50 400-3-50

Fig. 12 — Typical Control Wiring Schematic, 38AH Unit — Standard Thermostat

LEGEND

AFS	—	Airflow Switch
CB	—	Circuit Breaker
EQUIP	—	Equipment
FU	—	Fuse
GND	—	Ground
LLS1	—	Liquid Line Solenoid for Solenoid Drop Control
LLS2	—	Liquid Line Solenoid for Capacity Control
LLSV	—	Liquid Line Solenoid Valve
NEC	—	National Electrical Code, U.S.A.
TB	—	Terminal Block
TC	—	Thermostat, Cooling
▬▬▬		Field Power Wiring
- - -		Field Control Wiring
———		Factory-Installed Wiring

NOTES:

1. Factory wiring in accordance with the NEC. Any field modifications or additions must be in compliance with all applicable codes.
2. All field interlock contacts 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.
3. For internal wiring, reference wiring book or unit wiring label diagram. TB2 is 115-1-60, TB3 is 24-1-60.
4. The following components are not located in the 38AKS unit control box: LLS1, LLS2, field control thermostat, AFS, alarm shut-off switch, and alarm or light.

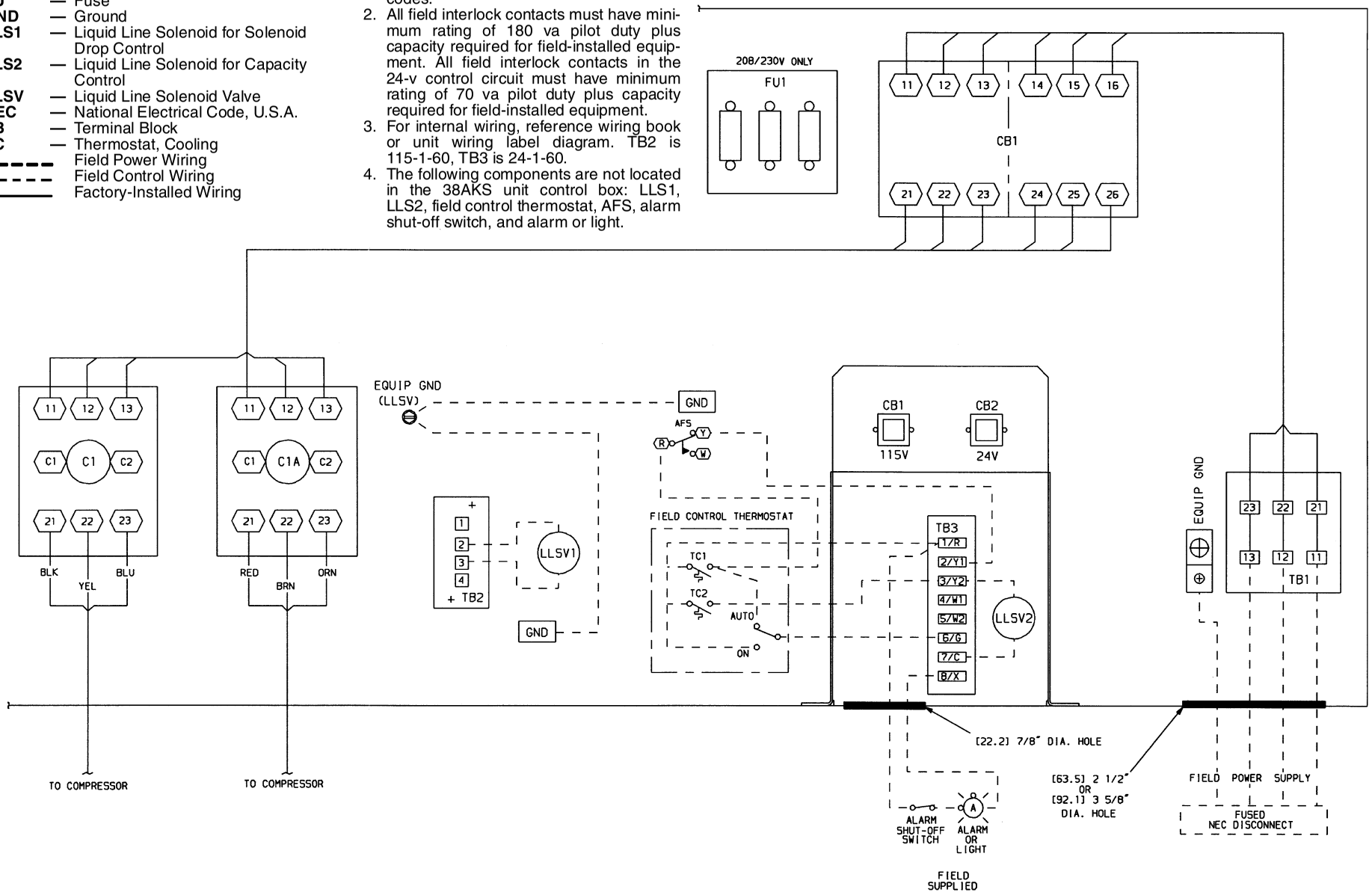


Fig. 13 — Typical Wiring Schematic, 38AKS Units — Control Circuit Interlock

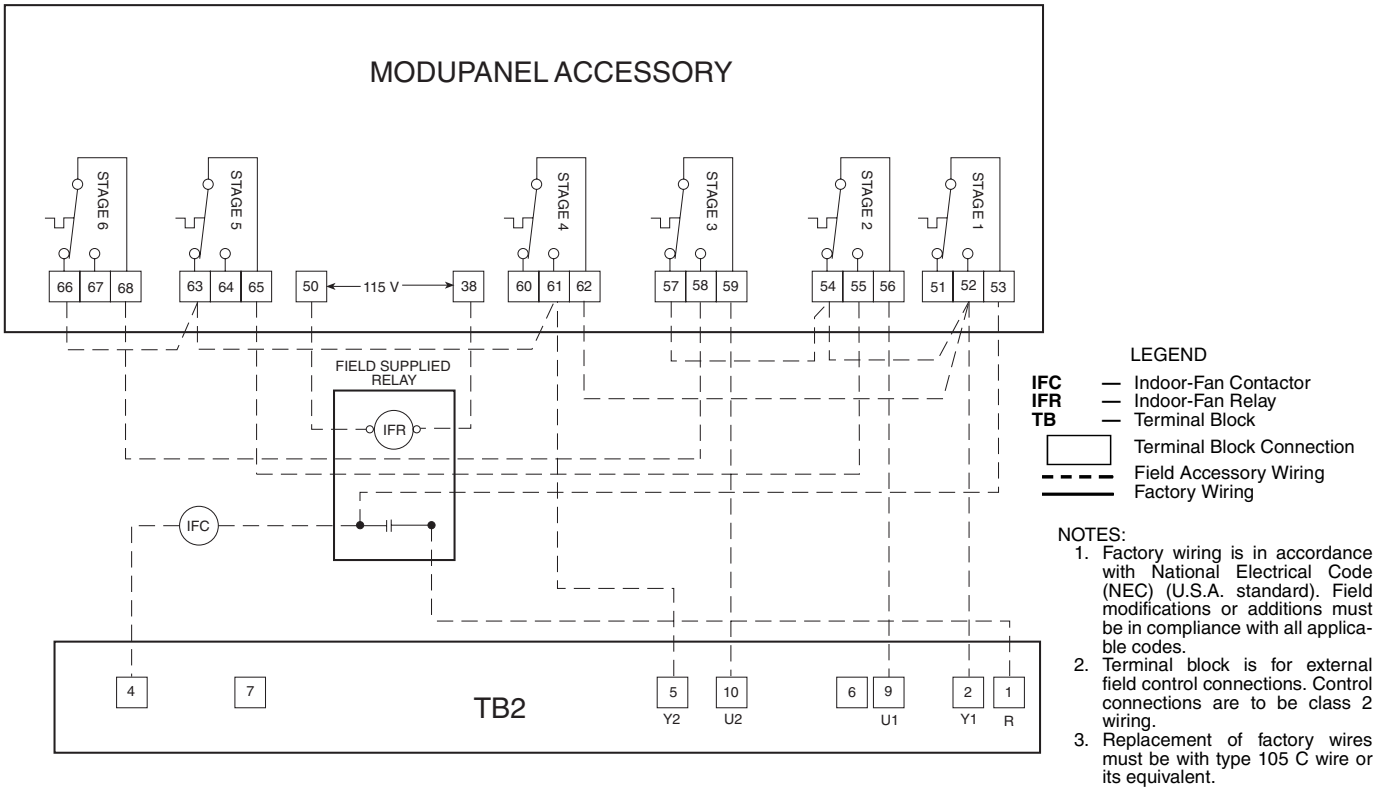


Fig. 14 — Typical 38AH Unit Field Wiring — ModuPanel™ Controller with 38AH024-034 Dual-Circuit Condensing Unit and Air Handler

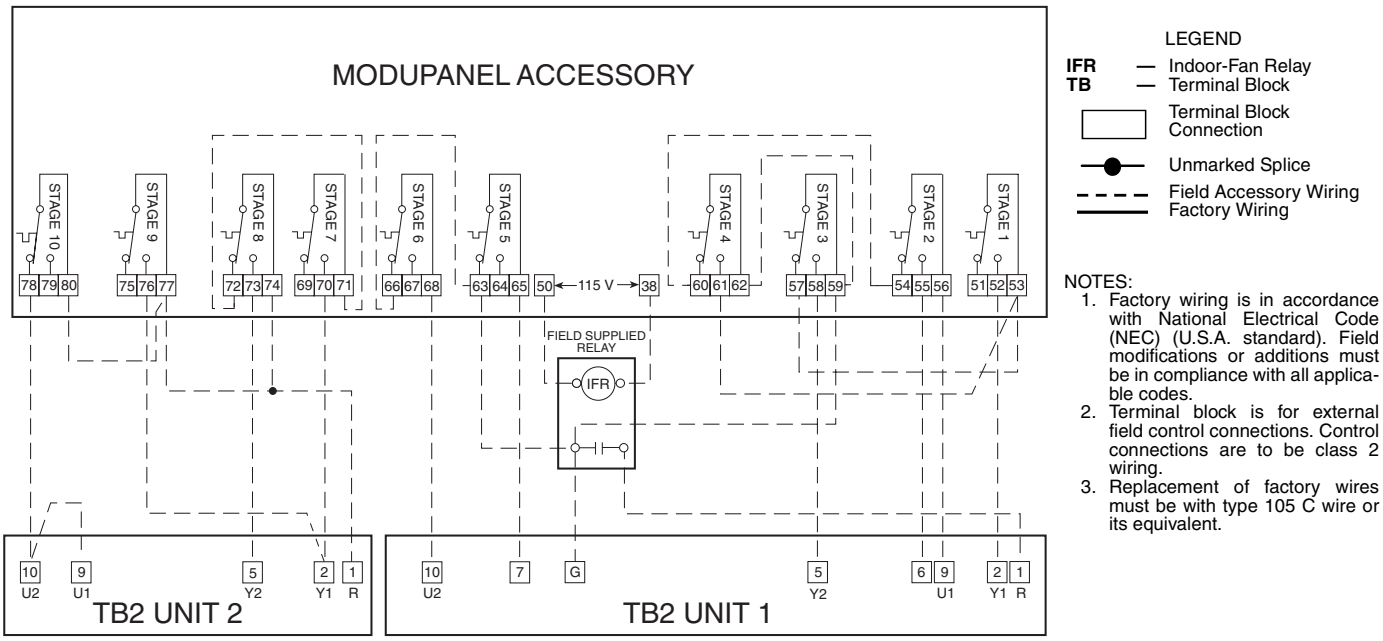


Fig. 15 — Typical 38AH Unit Field Wiring — VAV ModuPanel Control, Two Dual-Circuit Condensing Units with Air Handler

PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, review Start-Up Checklist at the back of this book. The Checklist assures proper start-up of a unit and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

⚠ CAUTION

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

System Check

1. Check all air handler(s) and other equipment auxiliary components. Consult the manufacturer's instructions regarding any other equipment connected to the condensing unit. If unit has field-installed accessories, be sure all are properly installed and correctly wired.
2. Backseat (open) compressor suction and discharge valves. Now close valves one turn to allow refrigerant pressure to reach test gages.
3. Open liquid line service valves.
4. Check tightness of all electrical connections.
5. Compressor oil level should be visible in sight glass. Adjust the oil level as required. No oil should be removed unless the crankcase heater has been energized for at least 24 hours.
6. Be sure unit is properly leak checked, dehydrated, and charged. See Preliminary Charge, below.
7. Electrical power source must agree with nameplate rating.
8. *Crankcase heater must be firmly locked into compressor crankcase. Be sure crankcase is warm (heater must be on for 24 hours before starting compressor).*
9. Fan motors are 3-phase. Check rotation of fans during first start-up check. Fan rotation is counterclockwise as viewed from top of unit. If fan is not turning counterclockwise, reverse 2 of the power wires.
10. Be sure compressor floats freely on the mounting springs and that snubber washers can be moved with finger pressure. See Compressor Mounting section and Fig. 6 for loosening compressor bolts.

Leak Test and Dehydration — Leak test the entire refrigerant system using soap bubbles and/or an electric leak detector. Evacuate and dehydrate entire refrigerant system by use of methods described in Carrier GTAC II, Module 4, System Dehydration.

Preliminary Charge — Refer to Carrier GTAC II, Module 5, Charging, Recovery, Recycling, and Reclamation for charging methods and procedures. Charge each system with R-22 by the liquid charging method (through liquid service valve) on the high side. See approximate refrigerant charge in Tables 1A-4B. Charge according to the values in the Charging Chart, Fig. 16-20.

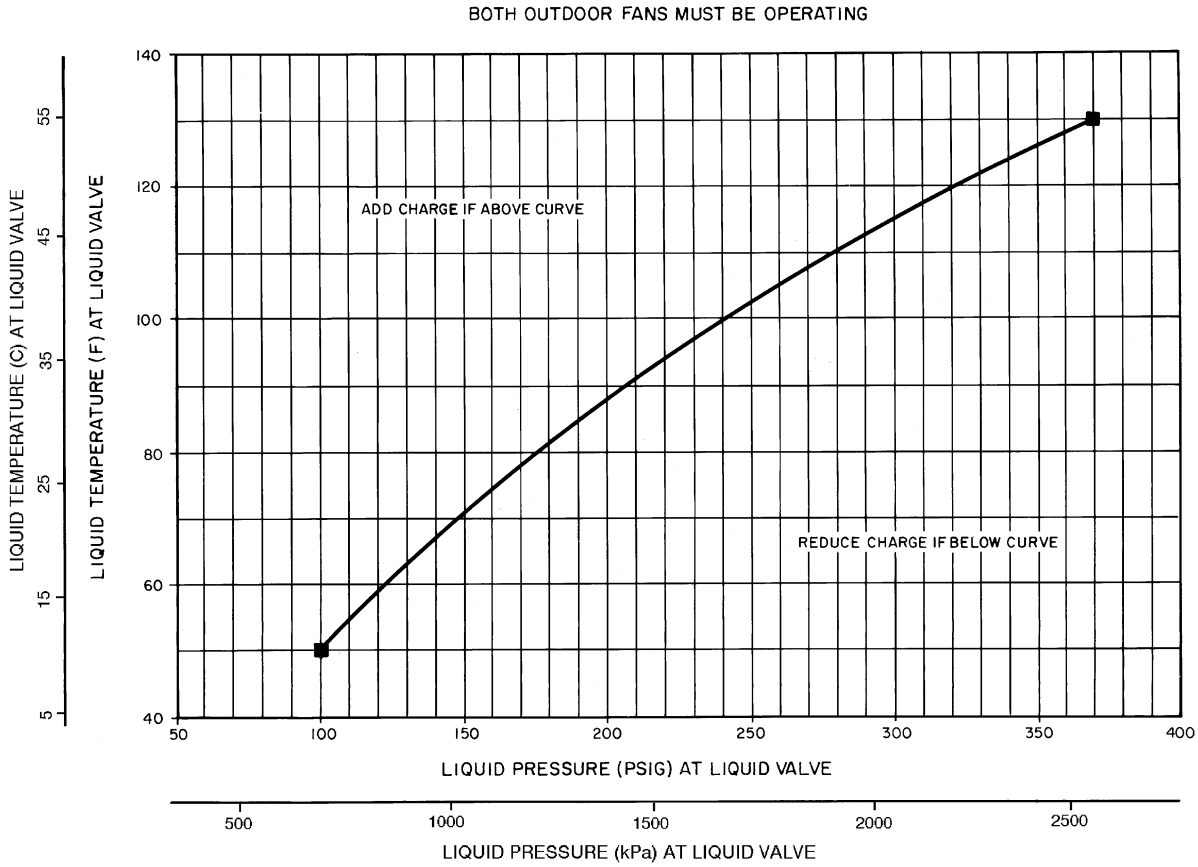


Fig. 16 — Charging Chart, 38AKS028, 50/60 Hz

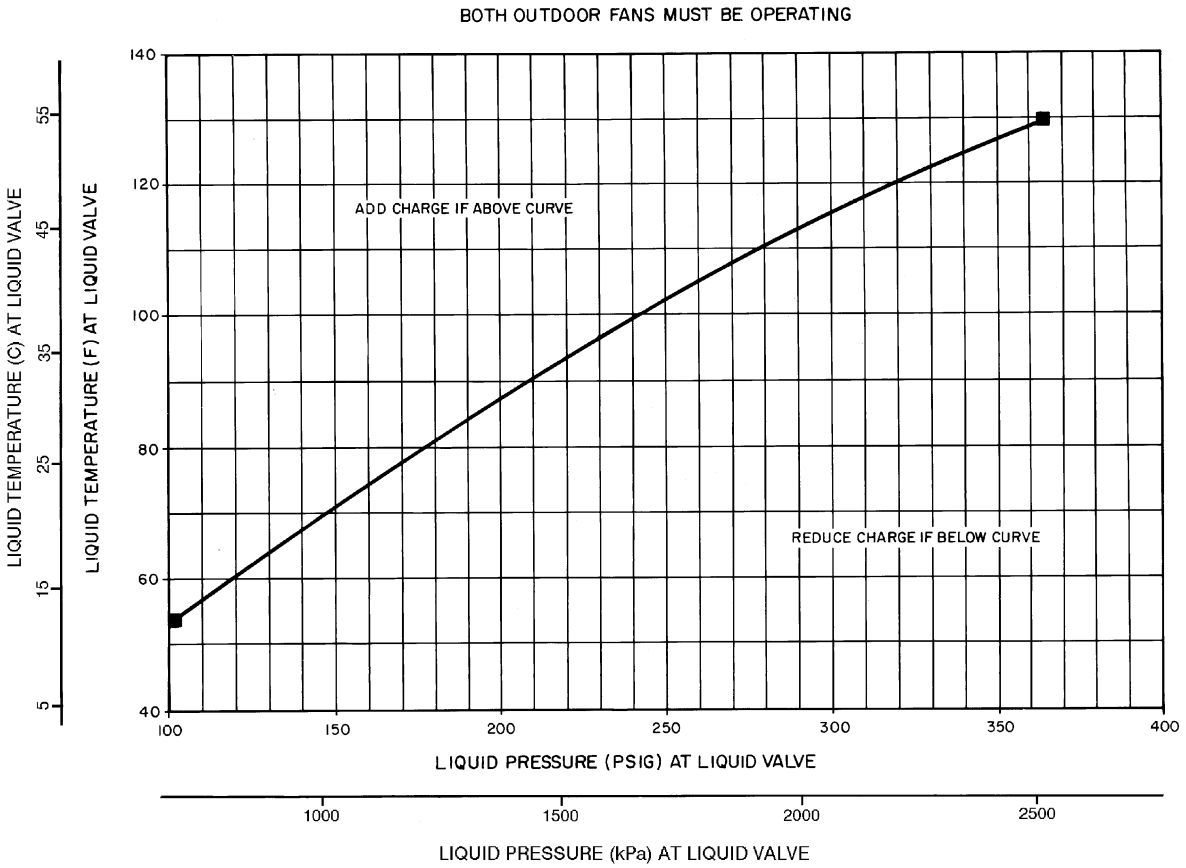


Fig. 17 — Charging Chart, 38AKS034, 50/60 Hz

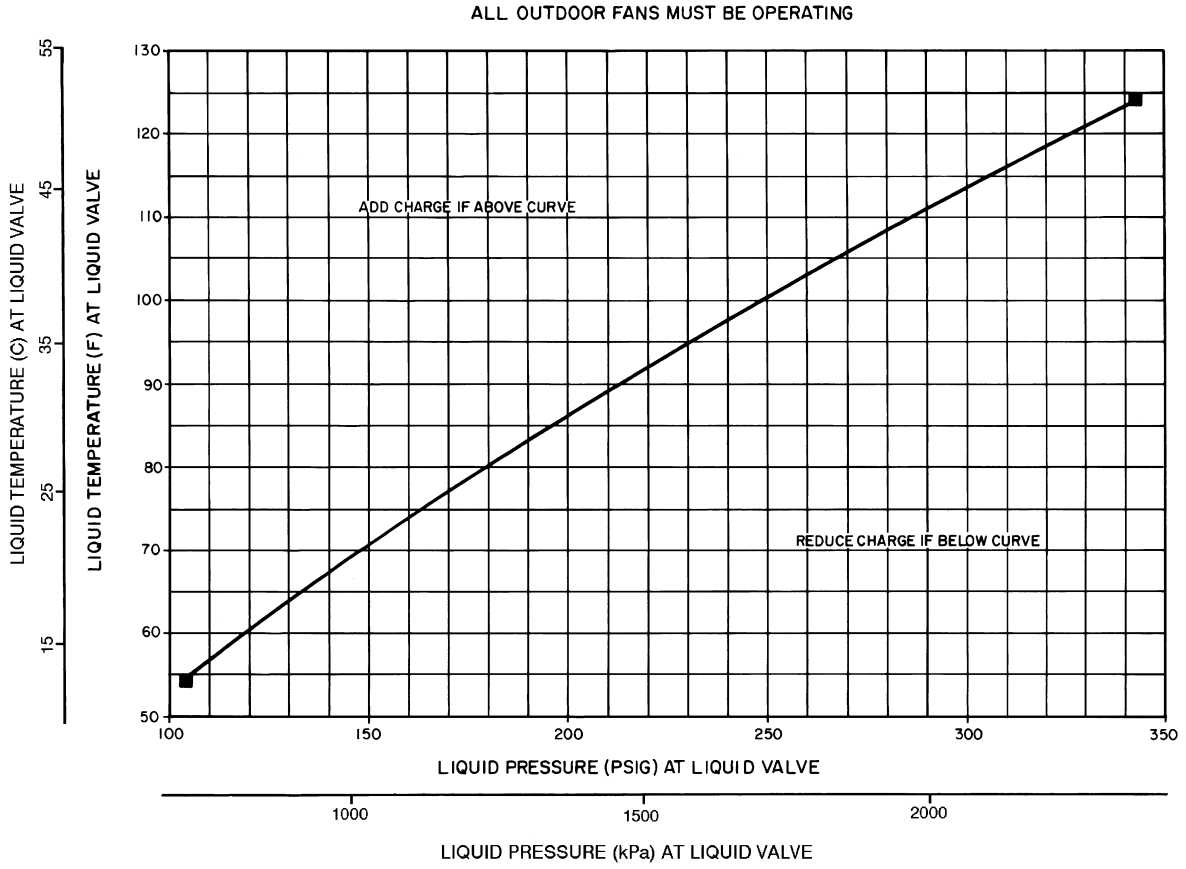


Fig. 18 — Charging Chart, 38AKS044, 50/60 Hz

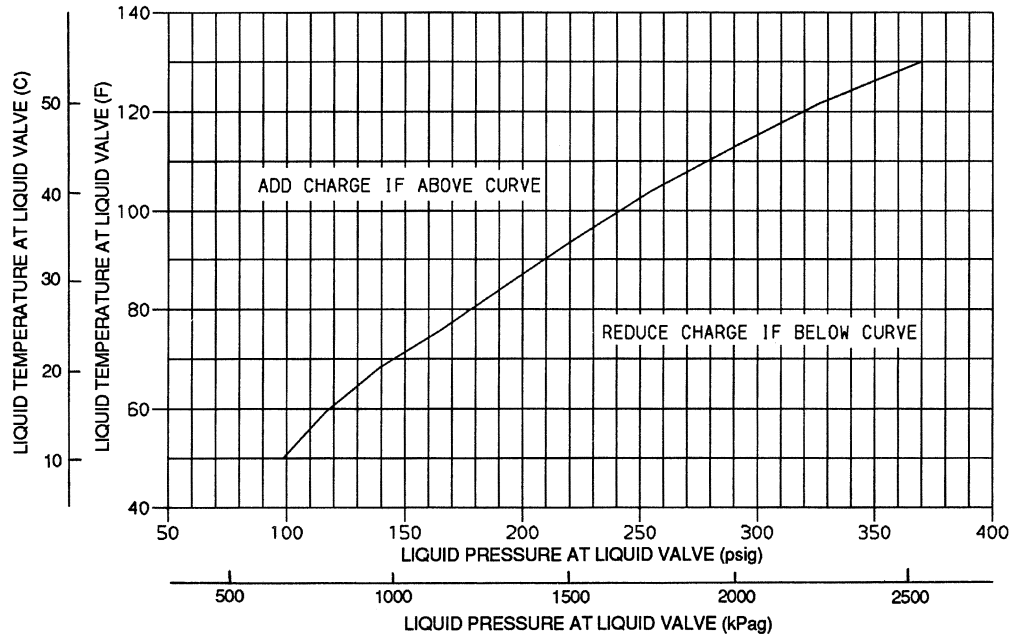
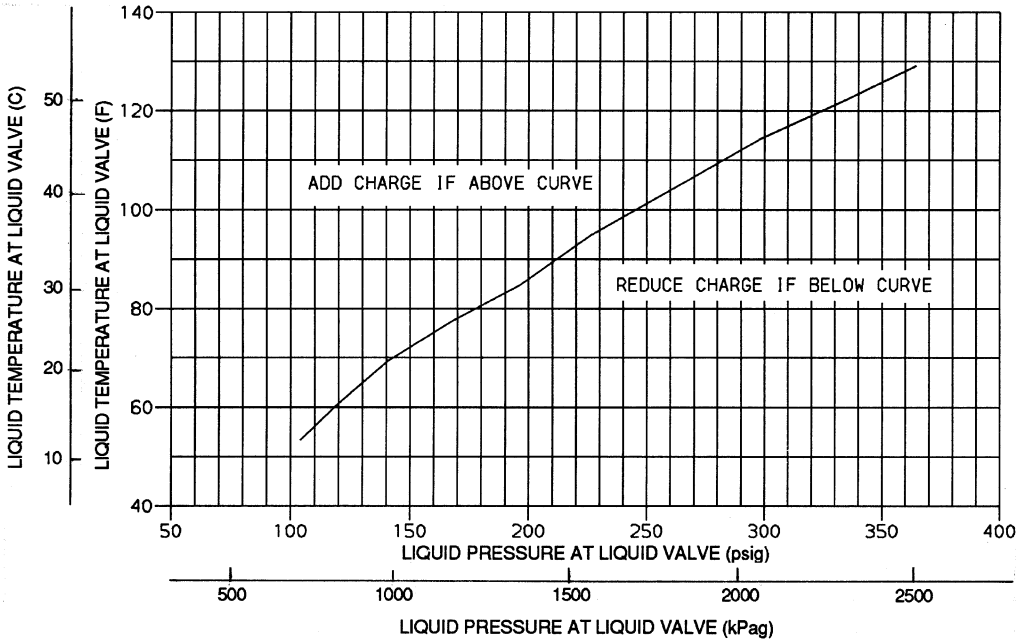


Fig. 19 — Charging Chart, 38AH024 and 028, 50/60 Hz (Circuits No. 1 and 2)



NOTE: All outdoor fans must be operating.

Fig. 20 — Charging Chart, 38AH034, 50/60 Hz (Circuits No. 1 and 2)

START-UP

38AKS Units — Close field disconnect. 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.

The start-up of the compressor can occur between 3 seconds and approximately 5 minutes from the time the control circuit is energized due to the anti-short cycle feature of the control module (CM).

CHARGE SYSTEM — Actual start-up should be done only under supervision of a qualified refrigeration mechanic. Measure pressure at the liquid line service valve, being sure a Schrader depressor is used if required. Also, measure liquid line temperature as close to the liquid service valve as possible. Add or reduce charge until the pressure and temperature conditions of the charging charge curve are met. If liquid pressure and temperature point fall above curve, add charge. 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.

CONTROL MODULE (CM) — The unit control module is located in the control section of the control box. See wiring diagram in Fig. 21. The control module performs several functions. On power up the Power LED (DS1) will flash continuously 1/4 second on, 1/4 second off. The module starts a 3-minute compressor on delay timer. This delay can be bypassed by pressing the reset switch for at least 1/2 second. The Status LED (DS3) must be flashing or the reset switch will not function.

On a call for cooling the module checks (7 seconds) for valid Y signal; checks that the 3-minute delay has elapsed or been overridden by the reset switch; and also checks the status of the HPS/COTP (high-pressure switch/compressor overtemperature protection switch). If no alarms are detected nor delays are active the module will energize the compressor contactor relay. A timer is started to provide a minimum 3 1/2-minute compressor run period.

During the compressor run time the module continuously checks the HPS/COTP status. A change in this status will immediately shut down the unit and display the alarm. Power must be cycled to restore normal control operation.

During the first 60 seconds of operation the OPS (oil pressure switch) state is monitored but ignored. After this time if the OPS is open the unit will be shut down. Alarm LED (DS2) displays the state of the OPS. A double blink (two 1/4-second blinks, 1 second off) indicates the OPS is open. If the OPS opens during operation and remains open for longer that 60 seconds the module will lockout unit operation and display the alarm. Power must be cycled to restore normal control operation.

The LPS (low-pressure switch) is monitored during a call for cooling. During the first 2 1/2 minutes of operation the state of the LPS is ignored. Alarm LED (DS2) displays the state of the LPS. A single blink (1/4 second on, 1 second off) indicates that the LPS is open. If the LPS remains open after 2 1/2 minutes or opens later during the call for cooling the module shuts down the unit. The compressor 3-minute on delay is started and the cycle repeats. If the call for cooling remains and this LPS cycle is repeated 3 times the module will lock out and display the alarm. Power must be cycled to restore normal control operation.

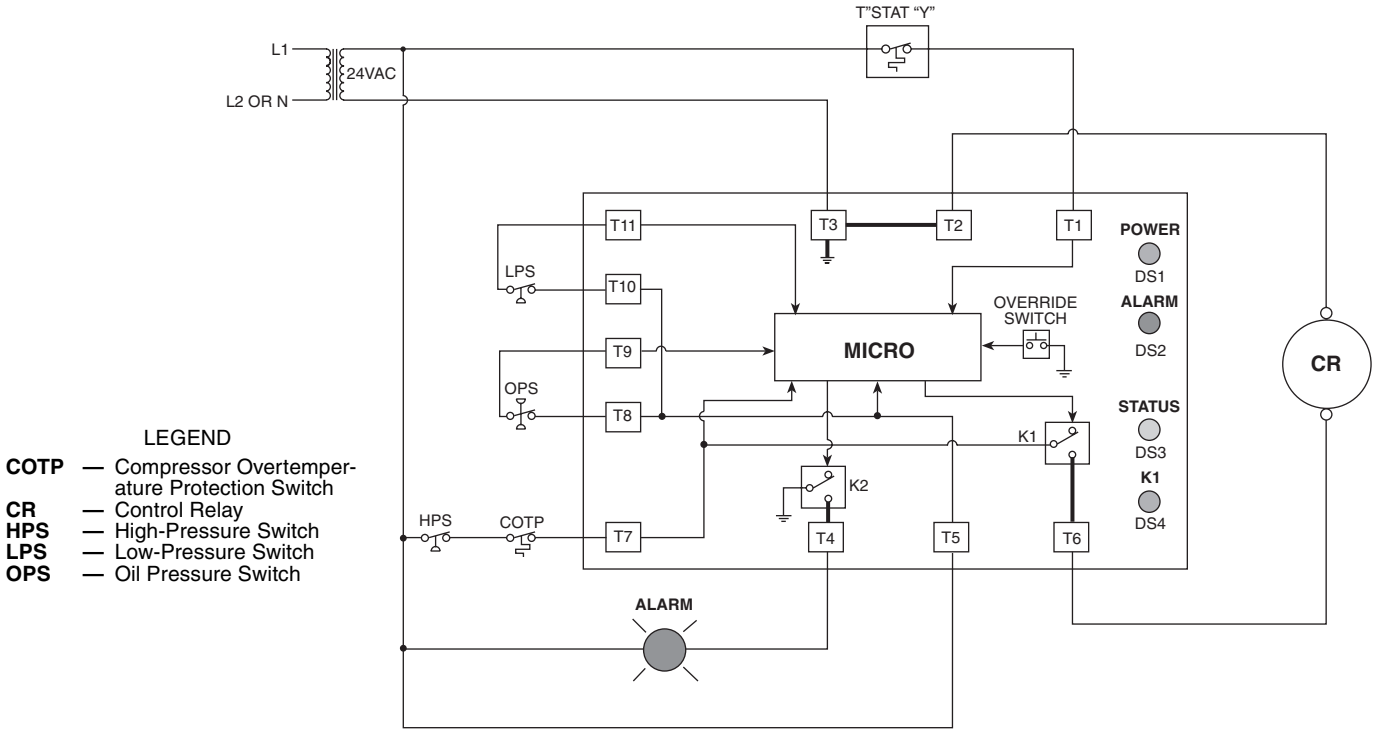


Fig. 21 — Generic Control Module Wiring

When the call for cooling is satisfied and the compressor has run for at least 3 1/2 minutes the module shuts the unit down. The control module restarts the compressor 3-minute on delay timer.

TIME-DELAY RELAY (TDR) (50 Hz Only) — This solid-state delay-on-make relay is factory set for a 1-second delay. The number 1 DIP switch is set to the ON position, and all the other DIP switches are set to the OFF position. Once the control relay (CR) is energized, the compressor contactor C1 is powered, and the first set of compressor windings is energized. After the 1-second time delay, contactor C1A is powered and the second set of compressor windings is energized (part-wind start).

COMPLETE UNIT STOPPAGE

Causes — Interruption of supplied power, compressor overtemperature protection, open HPS, open OPS, or open LPS causes compressor stoppage.

The LPS is governed by the 3-strike rule. Three trip cycles are allowed before the unit is locked out. The alarm LED will flash a code for the cause of the lockout.

Restart — The unit recycles and restarts automatically under the CPM when power is restored or cycled. Complete stoppage of the unit by the CPM, or compressor circuit breaker requires manual resetting of the control circuit. To restart the CPM when the HPS is tripped, it is necessary to interrupt power to the unit, restarting the CPM logic. It is necessary to manually reset the compressor circuit breaker at the unit.

If the LPS is not closed within 2 1/2 minutes after compressor starts, the compressor and the outdoor fans are shut off. The unit remains off for 3 minutes. After 3 minutes the system is restarted. The LPS is again bypassed for 2 1/2 minutes. This cycle will repeat 3 times if the cause of the LPS open is not eliminated. Operation will be locked out after the third cycle until CPM power is cycled.

If sufficient compressor oil pressure has not been built within 1 minute after the compressor starts, the unit is locked out. The LPS may have to be manually reset at the unit. Power must be cycled to the CPM to reset the controller.

⚠ 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.

38AH Units — Compressor crankcase heaters must be on for 24 hours before start-up. To energize the crankcase heaters, set the space thermostat above the ambient so there will be no demand for cooling. Close the field disconnect and turn on the fan circuit breakers. Leave the compressor circuit breakers off/open. The crankcase heaters are now 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.

PRELIMINARY CHECKS

1. Ensure that compressor service valves are backseated.
2. Verify that each compressor floats freely on its mounting springs.
3. Check that electric power supply agrees with unit nameplate data.
4. Verify that compressor crankcase heaters are securely in place.
5. Check that compressor crankcase heaters have been on at least 24 hours.
6. Note that compressor oil level is visible in the sight glass.
7. Recheck for leaks using same procedure as previously outlined in Pre-Start-Up section, Leak Test and Dehydration, on page 25.
8. If any leaks are detected, evacuate and dehydrate as previously outlined in Pre-Start-Up section, Leak Test and Dehydration, on page 25.

PRELIMINARY OIL CHARGE — Each compressor is factory charged with oil. When oil is checked at start-up, it may be necessary to add or remove oil to bring it to the proper level. One recommended oil level adjustment method is as follows:

Add Oil — Close suction service valve and pump down crankcase to 2 psig (14 kPa). (Low-pressure switch must be jumpered.) Wait a few minutes and repeat until pressure remains steady at 2 psig (14 kPa). Remove oil fill plug above the oil level sight glass, add oil through plug hole, and replace plug. Run compressor for 20 minutes and check oil level.

NOTE: Use only Carrier-approved compressor oil. Approved sources are:

Texaco, Inc. . . . . .Capella WF-32

Witco Chemical Corp. . . . . Suniso 3GS-A

Do not use oil that has been drained out, or oil that has been exposed to atmosphere.

Remove Oil — Pump down compressor to 2 psig (14 kPa). Loosen the 1/4-in. (6.4 mm) pipe plug at the compressor base and allow the oil to seep out past the threads of the plug.

NOTE: The crankcase will be slightly pressurized. Do not remove the plug, or the entire oil charge will be lost.

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

START UNIT — The field disconnect is closed, the fan circuit breaker is closed, and the space thermostats are set above ambient so that there is no demand for cooling. Only the crankcase heaters will be energized.

Next, close the compressor circuit breakers and then reset space thermostat TC1 below ambient so that a call for stage one cooling is ensured. If compressor does not start, set thermostat lower.

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

Start-up of circuit no. 1 compressor will be delayed from one second to 5 minutes from the time the call for cooling is initiated. The TC2 (thermostat contacts 2) close 1.5° F (0.7° C) lower than TC1. After these contacts close, start-up of circuit no. 2 compressor will be delayed from one second to 5 minutes from the time the call for cooling is initiated (see Fig. 22).

ADJUST REFRIGERANT CHARGE

⚠ 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.

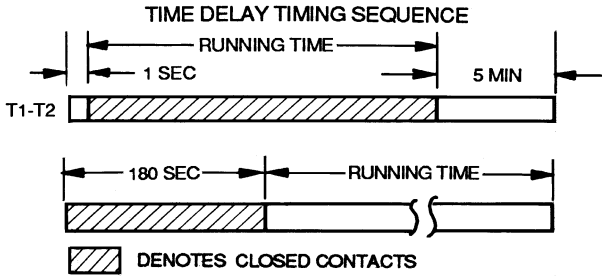


Fig. 22 —Timer Sequence Chart

NOTE: Actual start-up and all refrigerant charge modifications should be done only under supervision of a qualified refrigeration technician.

With all fans operating, adjust the refrigerant charge in accordance with the unit charging charts (Fig. 16-20).

Measure pressure at the liquid line service valve, being sure Schrader depressor 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 above curve, add charge. If liquid pressure and temperature point fall below curve, recover refrigerant to reduce the charge until the conditions match the curve.

If the liquid line sight glass is cloudy or shows bubbles in refrigerant, check refrigerant charge again. *Ensure all fans are operating*. Also ensure maximum allowable liquid lift has not been exceeded. If charged per chart and if the sight glass is still not clear, check for a plugged filter drier or a partially closed solenoid valve. Replace or repair, as needed.

CHECK COMPRESSOR OIL LEVEL — After adjusting the refrigerant charge, allow each circuit to run fully loaded for 20 minutes. Running oil level should be within view of the crankcase sight glass. Stop the compressors at the field power supply disconnect and check the crankcase oil level. Add oil only if necessary to bring the oil into view in the sight glass. If oil is added, run the circuit for an additional 10 minutes, then stop and check oil level. If the level remains low, check the piping system for proper design for oil return; also, check the system for leaks.

If the initial check shows too much oil (too high in the sight glass) remove oil to proper level. See Preliminary Oil Charge, page 25, for proper procedure for adding and removing oil.

When the above checks are complete, repeat the procedure with the unit operating at minimum load conditions. For this minimum load check, operate each circuit's compressor individually and unloaded to minimum step.

Unload the compressor(s) by turning the control set point adjustment nut counterclockwise until the adjustment nut stops. The unloader is now at 0 psig (0 kPag) set point. If electric actuated unloaders are installed, energize the solenoid to unload the compressor.

Return unloader to original setting after checks are complete.

FINAL CHECKS — Ensure all safety controls are operating, control panel covers are on, and the service panels are in place.

Sequence of Operation

38AKS UNITS — When space thermostat calls for cooling, the no. 1 condenser fan and compressor start after CM valid signal time delay of 7 seconds. If an optional airflow switch is used, compressor and no. 1 condenser fan will not start until sufficient indoor airflow has closed the switch. After 7 seconds the compressor starts and the liquid line solenoid valve for solenoid drop control opens. The crankcase heater is deenergized. If the head pressure reaches 260 psig (1792 kPa) the second condenser fan starts. Fan no. 3 (38AKS044 only) starts if outdoor ambient air rises above 80 F (26.7 C).

If cooling demand is low, suction pressure at the compressor drops. As the pressure drops, the compressor unloads 1 or 2 banks of cylinders as required. If cooling demand is high and 2-stage operation is used, the second stage of the thermostat activates the capacity control liquid line solenoid which activates the second stage evaporator coil. The compressor cylinders load or unload in response to compressor suction pressure to meet evaporator load.

When the compressor starts, the LPS is bypassed for the first $2^1/_2$ minutes of operation. If the LPS opens after $2^1/_2$ minutes, the compressor is shut down and cannot restart until the 3 minute anti-short-cycle timer expires.

As the space cooling load is satisfied, the second stage of the thermostat opens, and closes the field-supplied capacity control liquid line solenoid valve to deactivate the second stage coil. The compressor adjusts the number of active cylinders to meet the new load. When the space temperature is satisfied, the first stage of the thermostat opens, deenergizing the control relay. The compressor stops and the crankcase heater is energized, preventing refrigerant migration to the compressor during the off cycle. The liquid line solenoid closes (solenoid drop refrigerant control) and the 3 minute compressor anti-short-cycle timer is energized.

38AH STANDARD CONSTANT VOLUME UNIT WITH 2-STAGE COOLING THERMOSTAT — Seven seconds after a thermostat call for the first stage of cooling, compressor no. 1 and the outdoor fans start. The no. 2 fan only starts if the outdoor ambient temperature is above 70 F (21.1 C). The oil-pressure switch and the low-pressure switch are bypassed for the 1 and $2^1/_2$ minutes, respectively. If either the low-pressure switch or oil pressure switch remain open after the delay, the unit shuts down and goes into alarm mode. The indoor-fan motor starts immediately whenever there is a call for cooling. If a liquid line solenoid valve has been installed (for refrigerant control during the off cycle), then the solenoid valve for compressor no. 1 opens immediately upon a call for cooling.

On standard units, compressor no. 1 operates either fully loaded or at one step of unloading, depending on the suction pressure, which is dependent on the evaporator load conditions.

As the cooling demand increases, the thermostat calls for the second stage of cooling. Within 7 seconds from a call for the second stage of cooling, compressor no. 2 starts. The oil switch and low-pressure switch for circuit no. 2 are bypassed during start-up.

As the cooling load is satisfied, the thermostat stops the call for the second stage of cooling, which in turn deenergizes compressor no. 2, closes the no. 2 liquid line solenoid (if installed) and energizes the compressor no. 2 crankcase heater.

If the space temperature continues to decrease, then the thermostat stops the call for the first stage of cooling, which then deenergizes compressor no. 1 and the outdoor fans, closes the no. 1 liquid line solenoid valve (if installed), and energizes the compressor no. 1 crankcase heater.

The unit controls prevent both compressors from reenergizing within 3 minutes from a previous call for operation.

If the unit safeties trip during operation, refer to the Control Module section on page 28, and to Troubleshooting. To reset the lockout mode, cycle the unit power.

NOTE: If the thermostat fan switch is in the auto position, the indoor fan cycles on and off as the thermostat calls for cooling (or heating). If the switch is in the continuous position, the fan runs when the outdoor unit is powered.

38AH OPTIONAL VARIABLE AIR VOLUME UNIT WITH MODUPANEL™ CONTROL — The ModuPanel control regulates up to 10 stages of cooling to maintain a leaving-air temperature for variable air volume (VAV) applications. When connected to one 38AH condensing unit, only 6 stages are used. See Table 13 for unit loading and compressor operating sequence.

When the timeclock connected to the panel closes, the indoor-fan contactor is energized through a field-supplied relay. (The relay must be a pilot-duty SPST relay with 115-v coil and 30 va maximum coil draw.) After the time delays programmed into the ModuPanel™ control have elapsed, and with the leaving air above the set point, the stages of mechanical cooling are sequenced as follows:

1. Stage 1 starts compressor no. 1 with 2 banks of cylinders unloaded (1/3 loaded). Both unloader solenoids are energized.
2. Stage 2 loads one bank of compressor no. 1 cylinders (2/3 loaded) by deenergizing unloader solenoid no. 1.
3. Stage 3 loads the second bank of compressor no. 1 by deenergizing unloader solenoid no. 2.
4. Stage 4 starts compressor no. 2 and unloads 2 banks of compressor no. 1 cylinders unloaded (1/3 loaded). Both unloader solenoids are energized.
5. Stage 5 loads one bank of compressor no. 1 cylinders (2/3 loaded) by deenergizing unloader solenoid no. 1.
6. Stage 6 loads one bank of compressor no. 1 cylinders (fully loaded) by deenergizing unloader solenoid no. 2.

TWO 38AH OPTIONAL VARIABLE AIR VOLUME UNITS WITH A SINGLE MODUPANEL CONTROL — The ModuPanel control regulates up to 10 stages of cooling to maintain a leaving-air temperature for variable air volume (VAV) applications. When connected to two 38AH condensing units, all 10 stages are used. See Table 14 for unit loading and compressor operating sequence.

When the timeclock connected to the panel closes, the indoor-fan contactor is energized through a field-supplied relay. (The relay must be a pilot-duty SPST relay with 115-v coil and 30 va maximum coil draw.) After the time delays programmed into the ModuPanel control have elapsed, and with the leaving air above the set point, the stages of mechanical cooling are sequenced as follows:

1. Stage 1 starts unit no. 1 compressor no. 1 with 2 banks of cylinders unloaded (1/3 loaded). Both unloader solenoids are energized.
2. Stage 2 loads one bank of unit no. 1 compressor no. 1 cylinders (2/3 loaded) by deenergizing unloader solenoid no. 1.
3. Stage 3 turns off unit no. 1 compressor no. 1 and starts compressor no. 2 fully loaded.
4. Stage 4 starts unit no. 1 compressor no. 1 with 2 banks of cylinders unloaded (1/3 loaded). Both unloader solenoids are energized.
5. Stage 5 loads one bank of unit no. 1 compressor no. 1 cylinders (2/3 loaded) by deenergizing unloader solenoid no. 1.
6. Stage 6 loads one bank of unit no. 1 compressor no. 1 cylinders (fully loaded) by deenergizing unloader solenoid no. 2.
7. Stage 7 starts unit no. 2 compressor no. 1 with 2 banks of cylinders unloaded (1/3 loaded). Both unloader solenoids are energized.
8. Stage 8 turns off unit no. 2 compressor no. 1 and starts compressor no. 2 fully loaded.
9. Stage 9 starts unit no. 2 compressor no. 1 with 2 banks of cylinders unloaded (1/3 loaded). Both unloader solenoids are energized.
10. Stage 10 loads 2 banks of unit no. 2 compressor no. 1 cylinders (fully loaded) by deenergizing both unloader solenoids.

RESTART — Manual reset of the 24-v control circuit is required if unit is shut down by any of the safety devices. Applicable devices include the high pressure switch (HPS), low-pressure switch (LPS), oil-pressure switch (OPS), and compressor overtemperature protection (COTP) switch. To restart the unit after the unit has been shut down, raise the thermostat set point above the space temperature (thereby removing the call for cooling) and then lower the set point back to the desired setting.

If unit circuit breakers trip during unit shutdown, they must be reset manually.

CAUSES OF COMPLETE UNIT SHUTDOWN:

- interruption of supplied power
- open compressor overtemperature protection (COTP)
- compressor electrical overload protection (CB1 or CB2)
- open high-pressure or low-pressure safety switches
- open oil pressure switch

Table 13 — 38AH Unit Loading Sequence with ModuPanel™ Control

STAGE	NO. CYLINDERS	LOADED CYLINDERS		CAPACITY STEP (%)
		Compressor No. 1	Compressor No. 2	
1	2	2	—	17
2	4	4	—	33
3	6	6	—	50
4	8	2	6	67
5	10	4	6	83
6	12	6	6	100

Table 14 — Loading Sequence, Two 38AH Condensing Units with ModuPanel Control

STAGE	NO. CYLINDERS	UNIT 1 LOADED CYLINDERS		UNIT 2 LOADED CYLINDERS		CAPACITY STEP (%)
		Compressor No. 1	Compressor No. 2	Compressor No. 1	Compressor No. 2	
1	2	2	—	—	—	8
2	4	4	—	—	—	17
3	6	—	6	—	—	25
4	8	2	6	—	—	33
5	10	4	6	—	—	41
6	12	6	6	—	—	50
7	14	6	6	2	—	58
8	18	6	6	—	6	75
9	20	6	6	2	6	83
10	24	6	6	6	6	100

SERVICE (Fig. 23-27)

⚠ CAUTION

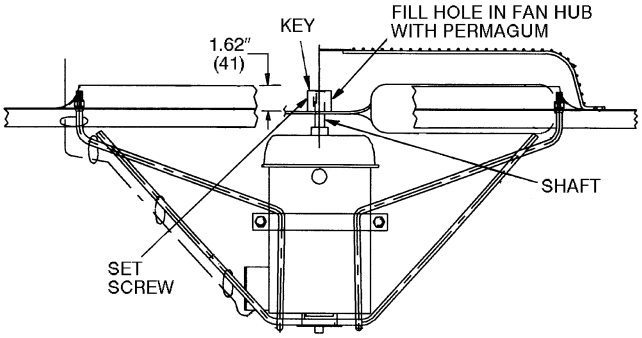
Turn off all power to unit before proceeding.

38AKS Units Access for Servicing (See Fig. 24)

COMPRESSOR SECTION — The compressor compartment has 2 side access panels and one front door for servicing, providing access to compressor, all components of the refrigerant system, electrical controls, and control box. After opening front door there is an inner cover that must be removed for access to control box (except 208/230-v and 460-v units).

OIL PRESSURE SAFETY SWITCH — Switch is accessed by removing the side access panel on the left side of the unit (as viewed from the compressor end). See Fig. 24. The OPS is found attached to the bottom divider panel. The liquid line service valve can be found behind the side access door on the right 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. 23 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.



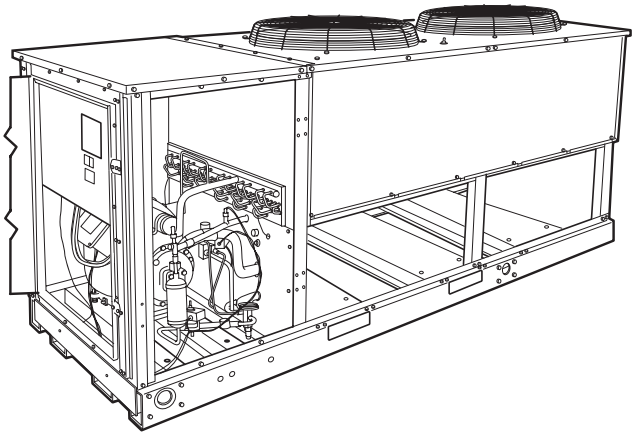
NOTE: Dimension in ( ) is in millimeters.

Fig. 23 — Location of Prop on Motor Shaft from Outside of Orifice Ring — Typical 38AKS Unit

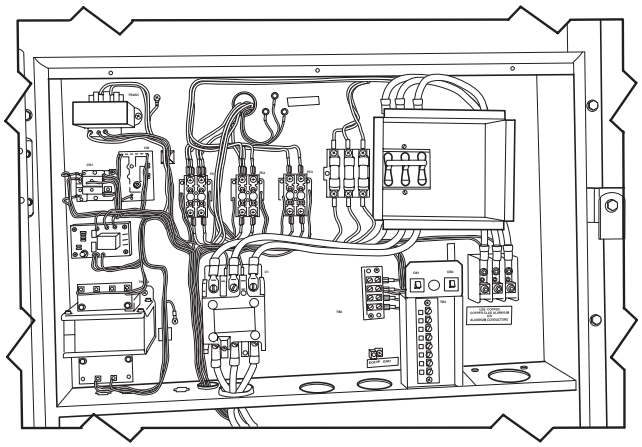
FAN ADJUSTMENT — Adjust fan as shown in Fig. 23.

OIL CHARGE — Compressors are factory charged with oil as follows:

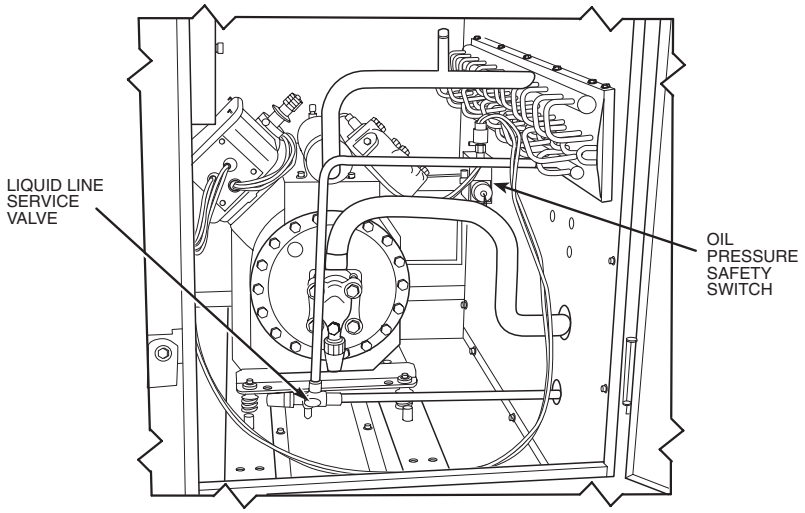
COMPRESSOR	AMOUNT pints (liters)
06E9265	20.0 (9.4)
06E9275	20.0 (9.4)
06E9299	19.0 (9.0)



COMPRESSOR END AND RIGHT-SIDE VIEW



COMPRESSOR END, CONTROL PANEL REMOVED



COMPRESSOR END, RIGHT-SIDE ACCESS DOOR

Fig. 24 — 38AKS Unit with Access Panels Removed

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

Petroleum Specialties Inc. . . . . Cryol 150
Texaco, Inc. . . . . Capella WF-32
Witco Chemical Corp. . . . . Suniso 3 GS

IMPORTANT: Do not use drained oil or use oil that has been exposed to atmosphere. Refer to Carrier Training Booklet, GTAC II, Module 5, for procedures to add oil. To remove oil, isolate the compressor, reclaim internal compressor charge, and use the compressor drain plug.

LIQUID SHUTOFF/CHARGING VALVE — Valve is located inside the compressor compartment and is provided with 1/4-in. flare connection for field charging.

CAPACITY CONTROL — Capacity control is by 2 suction pressure actuated unloaders. Each controls 2 cylinders. Unloaders are factory set, 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 (0 to 586 kPag). To adjust, turn control set point adjustment nut (Fig. 27) clockwise to its bottom stop. In this position, set point is 85 psig (586 kPag). Then, turn adjustment counterclockwise to desired control set point. Every full turn counterclockwise decreases set point by 7.5 psig (52 kPag).

Pressure Differential — The pressure differential (difference between cylinder load and unload points) is adjustable from 6 to 22 psig (41 to 152 kPag). To adjust, turn pressure differential adjustment screw (Fig. 27) counterclockwise to its backstop position. In this position, differential is 6 psig (41 kPag). Then, turn adjustment clockwise to desired pressure differential. Every full turn clockwise increases differential by 1.5 psig (10 kPag).

OIL PRESSURE — The 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.

Control Module Timer — This control protects compressor against short cycling. See Sequence of Operation section.

Crankcase Heater — This minimizes absorption of liquid refrigerant by oil in crankcase during brief or extended shutdown periods.

IMPORTANT: Never open any switch or disconnect that deenergizes 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 — This switch has fixed, nonadjustable settings. Switch is mounted on the compressor. (See Table 15).

Table 15 — 38AKS Pressure Switch Settings, psig (kPa)

HIGH PRESSURE		LOW PRESSURE	
Open	Close	Open	Close
426 ± 7 (2937 ± 48)	320 ± 20 (2206 ± 138)	27 ± 3 (186 ± 21)	44 ± 5 (303 ± 34)

LOW-PRESSURE SWITCH — This switch has fixed, nonadjustable settings. Switch is mounted on the compressor. (See Table 15).

HEAD PRESSURE CONTROL — Control maintains adequate discharge pressure under low ambient temperature conditions. See Table 16.

Fan Cycling — These 38AKS 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) (38AKS044 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 noncycling. Table 17 shows the operating settings of the FCPS and the ATS.

Table 16 — 38AKS Minimum Outdoor-Air Operating Temperature

UNIT 38AKS	COMPR CAP. (%)	COND TEMP, F (C)	MIN OUTDOOR TEMP, F (C)	
			Standard Unit	Low Ambient Control (Motormaster®)
028	100	90 (32)	31 (–1)	–20 (–29)
	67	80 (27)	35 (2)	–20 (–29)
	33	70 (21)	43 (6)	–20 (–29)
034	100	90 (32)	30 (–1)	–20 (–29)
	67	80 (27)	34 (1)	–20 (–29)
	33	70 (21)	42 (6)	–20 (–29)
044	100	90 (32)	25 (–4)	–20 (–29)
	67	80 (27)	30 (–1)	–20 (–29)
	33	70 (21)	35 (2)	–20 (–29)

Table 17 — 38AKS Fan Cycling Controls

CONTROL BY	SWITCH OPENS	SWITCH CLOSES
Temp, F (C)	70 ± 3 (21 ± 1.7)	80 ± 3 (27 ± 1.7)
Pressure, psig (kPa)	160 ± 10 (1103 ± 69)	255 ± 10 (1793 ± 103)

38AH Units Access for Servicing (See Fig. 25)

COMPRESSOR SECTION — The compressor compartment has 2 side panels and one end door for service access to compressors, refrigeration system components, electrical controls, and control box. After opening the end door, an inner cover must be removed for access to control box.

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. 26 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. Recheck rotation of fan(s) after service work on motors.

FAN ADJUSTMENT — See Fig. 26.

OIL CHARGE — Compressors are factory charged with oil as follows:

COMPRESSOR	AMOUNT pints (liters)
06D824 06D328 06D537	10 (4.73)

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

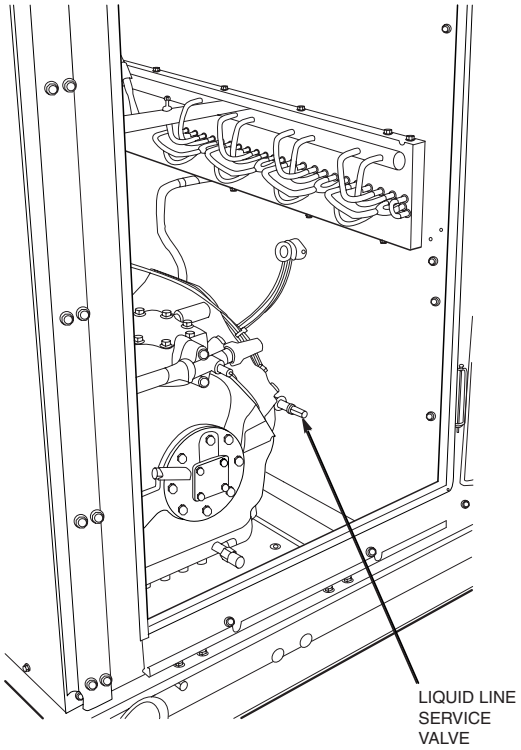
Texaco, Inc.. . . . . Capella WF-32
Witco Chemical Corp. . . . . Suniso 3GS-A

IMPORTANT: Do not use drained oil or use oil that has been exposed to atmosphere. Refer to Carrier GTAC II, Module 5; Charging, Recovery, Recycling, and Reclamation for procedures to add oil.

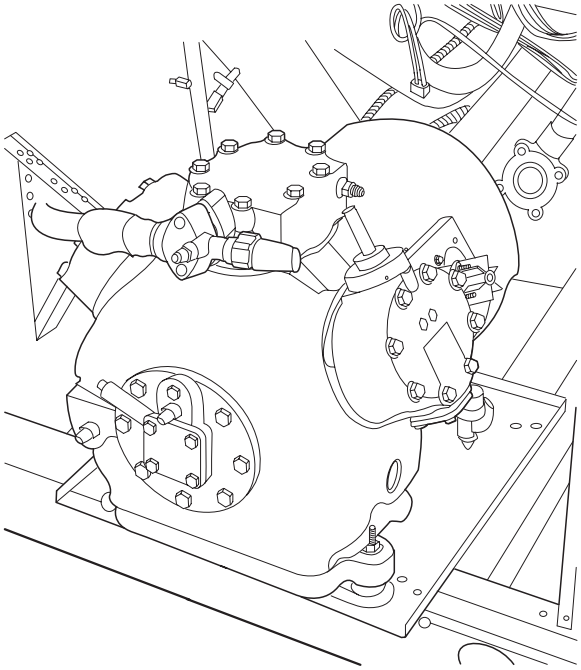
Remove Oil — Pump down compressor to 2 psig (14 kPa). Loosen the 1/4-in. (6.4 mm) pipe plug at the compressor base and allow the oil to seep out past the threads of the plug.

NOTE: The crankcase will be slightly pressurized. Do not remove the plug, or the entire oil charge will be lost.

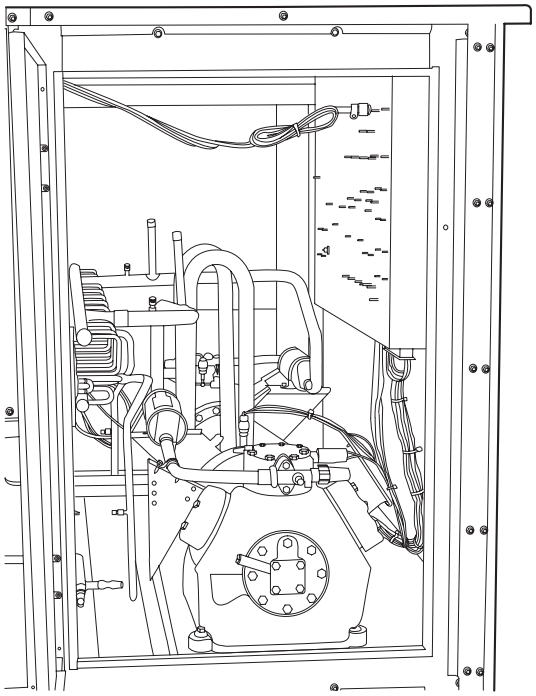
Small amounts of oil can be removed through the oil pump discharge connection while the compressor is running.



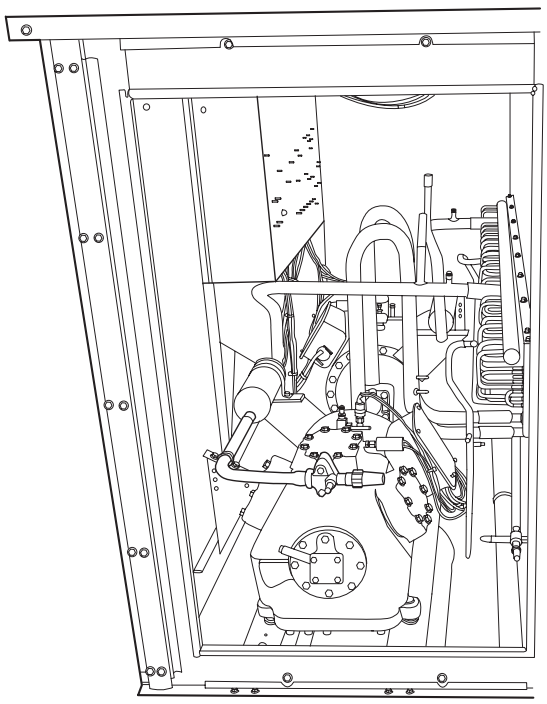
LIQUID LINE SERVICE VALVE LOCATION



06D COMPRESSOR WITH PAN



CIRCUIT NO. 1



CIRCUIT NO. 2

Fig. 25 — 38AH Unit with Access Panels Removed

LIQUID SHUTOFF/CHARGING VALVE — Valve is located inside the compressor compartment and is provided with 1/4-in. flare connection for field charging.

CAPACITY CONTROL, SUCTION PRESSURE-ACTUATED UNLOADERS — Each unloader controls 2 cylinders. Unloaders are factory set but may be field adjusted.

Control Set Point — The control set point (cylinder load point) is adjustable from 0 to 85 psig (0 to 586 kPa). To adjust, turn control set point adjustment nut (Fig. 27) clockwise to its bottom stop. In this position, set point is 85 psig (586 kPa). Then turn adjustment counterclockwise to desired control set point. Every full turn counterclockwise decreases set point by 7.5 psig (51.7 kPa).

Pressure Differential — The pressure differential (difference between cylinder load and unload points) is adjustable from 6 to 22 psig (41 to 15.2 kPa). To adjust, turn pressure differential adjustment screw (Fig. 27) counterclockwise to its backstop position. In this position, differential is 6 psig (41 kPa). Then, turn adjustment clockwise to desired pressure differential. Every full turn clockwise increases differential by 1.5 psig (10.3 kPa).

CAPACITY CONTROL, ELECTRICALLY OPERATED UNLOADERS (VARIABLE AIR VOLUME, FACTORY-INSTALLED OPTION UNITS) — Each unloader controls 2 cylinders. Electric unloaders are not field adjustable. Circuit no. 1 compressor on this factory-installed option has 2 electric unloaders. For service, replace any failed solenoid.

OIL PRESSURE SAFETY SWITCH (OPS) — In the control circuit, the OPS stops the compressor and unit if proper oil pressure differential is not established within 2 minutes of start-up or maintained during operation. If OPS stops the unit, determine the cause and correct before restarting unit. Failure to do so constitutes 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.

Compressor Overtemperature Protection (COTP) — A thermostat installed on compressor motor winding reacts to excessively high winding temperatures and shuts off the compressor.

Time Guard Control — Control prevents compressor from short cycling. See Sequence of Operation section.

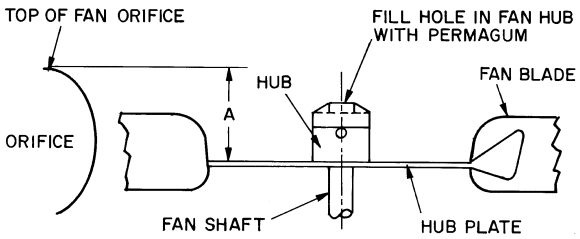
Crankcase Heaters — Heaters minimize absorption of liquid refrigerant by oil in crankcase during brief or extended shutdown periods. The control circuit is maintained if compressor fan motor circuit breakers are turned off. The main disconnect must be on to energize crankcase heater.

IMPORTANT: Never open any switch or disconnect that deenergizes the crankcase heaters 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 heaters for 24 hours before starting the compressor.

HIGH-PRESSURE SWITCHES — Switches have fixed, nonadjustable settings. Switches are mounted on the compressors.

LOW-PRESSURE SWITCHES — Switches have fixed, nonadjustable settings. The switches are mounted on the compressors.

To Check — Slowly close liquid shutoff valve and allow compressor to pump down. Do not allow compressor pump down below 2 psig (13.8 kPa). Compressor should shut down when suction pressure drops to cutout pressure in Table 18. Unit will be in lockout mode requiring manual reset. To reset unit, raise indoor thermostat set point above space temperature and then lower it to desired set point.



UNIT 38AH024-034	PROP LOCATION "A" in. (mm)
60 Hz	3.5 (89)
50 Hz	4.3 (109)

Fig. 26 — Location of Prop on Motor Shaft from Outside of Orifice Ring — Typical 38AH Unit

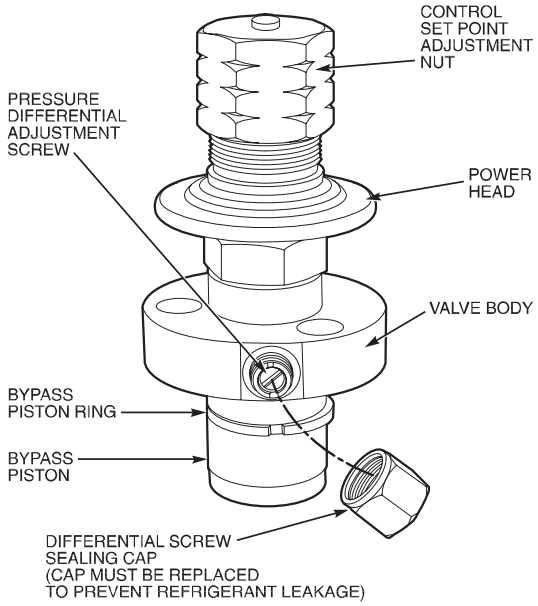


Fig. 27 — Capacity Control Valve

HEAD PRESSURE CONTROL — Control allows system to operate at full capacity under low ambient temperature conditions.

Fan Cycling — The 38AH024-034 units have standard provision for fully automatic intermediate-season head pressure control through condenser fan cycling. Fan no. 2 is cycled by an outdoor-air thermostat which responds to outdoor ambient temperature. The thermostat 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 19 shows the operating settings of the air temperature switch.

Table 18 — 38AH 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)

Table 19 — 38AH Fan Cycling Controls

CONTROL BY	SWITCH OPENS	SWITCH CLOSES
Temp — F (C)	60 ± 3 (15.6 ±1.6)	70 ± 3 (21.1 ± 1.6)

CONDENSER COIL MAINTENANCE AND CLEANING — Routine cleaning of condenser coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residue will greatly increase the life of the coil and extend the life of the unit. The following maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

Remove Surface Loaded Fibers — Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft brush may be used. The cleaning tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges bent over) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse — A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning is recommended.

Routine Cleaning of Coil Surfaces — Monthly cleaning with Totaline Environmentally Sound coil cleaner is essential to extend the life of coils. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper, or E-coated coils are cleaned with the Totaline Environmentally Sound coil cleaner. Coil cleaning should be part of the regularly scheduled maintenance procedures of the unit to ensure long life of the coil. Failure to clean the coils may result in reduced durability of the coil in the environment.

Totaline Environmentally Sound coil cleaner is nonflammable, hypoallergenic, non-bacterial, USDA accepted biodegradable and 100% ecologically safe agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

The following field-supplied equipment is required for coil cleaning:

- $2^1/_2$ gallon garden sprayer
- water rinse with low velocity spray nozzle
- Totaline Environmentally Sound coil cleaner

Perform the following procedure to clean the coil:

NOTE: Wear proper eye protection such as safety glasses during mixing and application.

1. Remove all surface loaded fibers and dirt with a vacuum cleaner.
2. Thoroughly wet finned surfaces with clean water using a low velocity water stream from a garden hose, being careful not to bend fins.
3. Mix Totaline Environmentally Sound coil cleaner in a $2^1/_2$ gallon garden sprayer according to the instructions included with the enzyme cleaner.

⚠ CAUTION

DO NOT USE water with temperature in excess of 130 F. Enzymes in coil cleaner will be destroyed and coil cleaner will not be effective.

4. Thoroughly apply Totaline Environmentally Sound coil cleaner solution to all coil surfaces including finned area, tube sheets, and coil headers. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage. Ensure cleaner thoroughly penetrates deep into finned areas. Interior and exterior finned areas must be thoroughly cleaned.
5. Allow finned surfaces to remain wet with cleaning solution for 10 minutes. Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10-minute saturation is achieved.
6. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

⚠ CAUTION

Do not use bleach, harsh chemicals, or acid cleaners on outdoor or indoor coils of any kind. These types of cleaners are difficult to rinse, and they promote rapid corrosion of the fin collar-copper tube connection. Only use the Totaline Environmentally Sound coil cleaner.

Never use high pressure air or liquids to clean coils. High pressures damage coils and increase the airside pressure drop. To promote unit integrity, follow cleaning and maintenance procedures in this document.

TROUBLESHOOTING — 38AKS UNITS

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
COMPRESSOR DOES NOT RUN	
1. Control circuit breaker tripped.	1. Reset control circuit breaker.
2. Power line open.	2. Reset circuit breaker.
3. Oil pressure switch tripped.	3. Reset oil pressure switch at unit.
4. Safety device tripped.	4. Reset control circuit with thermostat.
5. Contactor stuck open.	5. Replace contactor.
6. Loose terminal connection.	6. Check connections.
7. Improperly wired controls.	7. Check and rewire.
8. Seized compressor.	8. Check motor winding for open or short. Replace compressor, if necessary.
9. Low line voltage.	9. Check line voltage — determine location of voltage drop and remedy deficiency.
10. Compressor motor defective.	10. Check motor winding for open or short. Replace compressor, if necessary.
COMPRESSOR STOPS ON LOW-PRESSURE CONTROL	
1. Compressor suction shutoff valve partially closed.	1. Open valve.
2. Low refrigerant charge.	2. Add refrigerant.
3. Liquid line solenoid valve(s) fails to open.	3. Check liquid line solenoid valve for proper operation. Replace if necessary.
4. Liquid line shutoff valve closed.	4. Open valve.
COMPRESSOR STOPS ON HIGH-PRESSURE CONTROL	
1. Compressor discharge valve partially closed.	1. Open valve or replace if defective.
2. Air in system.	2. Purge and evacuate system.
3. Condenser fan(s) not operating.	3. Check motor wiring and repair or replace if defective.
4. System is overcharged.	4. Reclaim charge as needed.
UNIT OPERATES TOO LONG OR CONTINUOUSLY	
1. Low refrigerant charge.	1. Add refrigerant.
2. Control contacts fused.	2. Replace control.
3. Air in system.	3. Purge and evacuate system.
4. Partially plugged expansion valve or filter drier.	4. Clean or replace.
SYSTEM IS NOISY	
1. Piping vibration.	1. Support piping as required.
2. Compressor noisy.	2. Check valve plates for valve noise. Replace compressor if bearings are worn.
COMPRESSOR LOSES OIL	
1. Leak in system.	1. Repair leak.
2. Crankcase heaters not energized during shutdown.	2. Check wiring and relays. Check heater and replace if defective.
3. Improper interconnecting piping design.	3. Check piping for oil return. Replace if necessary.
FROSTED SUCTION LINE	
Expansion valve admitting excess refrigerant.	Adjust expansion valve.
HOT LIQUID LINE	
1. Shortage of refrigerant due to leak.	1. Repair leak and recharge.
2. Expansion valve opens too wide.	2. Adjust expansion valve.
FROSTED LIQUID LINE	
Restricted filter drier.	Remove restriction or replace.
COMPRESSOR WILL NOT UNLOAD	
1. Defective unloader.	1. Replace.
2. Defective capacity control solenoid valve.	2. Replace valve.
3. Miswired liquid line solenoid.	3. Rewire correctly.
4. Weak, broken, or wrong valve body spring.	4. Replace spring.
COMPRESSOR WILL NOT LOAD	
1. Miswired capacity control liquid solenoid.	1. Rewire correctly.
2. Defective capacity control solenoid valve.	2. Replace valve.
3. Plugged strainer (high side).	3. Clean or replace strainer.
4. Struck or damaged unloader piston or piston ring(s).	4. Clean or replace the necessary parts.

TROUBLESHOOTING — 38AH UNITS

PROBLEM	SOLUTION
COMPRESSOR DOES NOT RUN	
Contactor Open	
1. Power off.	1. Restore power.
2. Fuses blown in field power circuit.	2. After finding cause and correcting, replace with correct size fuse.
3. No control power.	3. Check secondary fuse(s); replace with correct type and size. Replace transformer if primary winding is receiving power.
4. Thermostat circuit open.	4. Check thermostat setting.
5. Time Guard II device not operating.	5. Check Time Guard II devices.
6. Compressor circuit breaker tripped.	6. Check for excessive compressor current draw. Reset breaker; replace if defective.
7. Safety device lockout circuit active.	7. Reset lockout circuit at thermostat or circuit breaker.
8. Oil pressure switch tripped.	8. See following Compressor Stops on Oil Pressure Switch section.
9. Low-pressure switch open.	9. Check for refrigerant undercharge, obstruction of indoor airflow, or whether compressor suction shutoff valve is fully open. Make sure liquid line solenoid valve(s) is open. See following Compressor Stops on Low-Pressure Switch section.
10. High-pressure switch open.	10. Check for refrigerant overcharge, obstruction of outdoor airflow, air in system, or whether compressor discharge valve is fully open. Be sure outdoor fans are operating correctly. See following Compressor Stops on High-Pressure Switch section.
11. Compressor overtemperature switch open.	11. Check for open condition. Allow for reset. Replace if defective.
12. Loose electrical connections.	12. Tighten all connections.
13. Compressor stuck.	13. See 06D compressor service literature.
Contactor Closed	
1. Compressor leads loose.	1. Check connections.
2. Motor windings open.	2. See 06D compressor service literature.
3. Single phasing.	3. Check for blown fuse. Check for loose connection at compressor terminal.
COMPRESSOR STOPS ON HIGH-PRESSURE SWITCH	
Outdoor Fan On	
1. High-pressure switch faulty.	1. Replace switch.
2. Reversed fan rotation.	2. Confirm rotation, correct if necessary.
3. Airflow restricted.	3. Remove obstruction.
4. Air recirculating.	4. Clear airflow area.
5. Noncondensables in system.	5. Recover refrigerant and recharge as required.
6. Refrigerant overcharge.	6. Recover refrigerant as required.
7. Line voltage incorrect.	7. Consult power company.
8. Refrigerant system restrictions.	8. Check or replace filter drier, expansion valve, etc. Check that compressor discharge service valve is fully open.
Outdoor Fan Off	
1. Fan slips on shaft.	1. Tighten fan hub setscrews.
2. Motor not running.	2. Check power and capacitor.
3. Motor bearings stuck.	3. Replace bearings.
4. Motor overload open.	4. Check overload rating. Check for fan blade obstruction.
5. Motor burned out.	5. Replace motor.
COMPRESSOR STOPS ON LOW-PRESSURE SWITCH	
Indoor-Air Fan Running	
1. Compressor suction service valve partially closed.	1. Open valve fully.
2. Liquid line solenoid valve(s) fails to open.	2. Check liquid line solenoid valve(s) for proper operation. Replace if necessary.
3. Filter drier plugged.	3. Replace filter drier.
4. Expansion valve power head defective.	4. Replace power head.
5. Low refrigerant charge.	5. Add charge. Check low-pressure switch setting.

TROUBLESHOOTING — 38AH UNITS (cont)

PROBLEM	SOLUTION
COMPRESSOR STOPS ON LOW-PRESSURE SWITCH (cont)	
Airflow Restricted	
1. Coil iced up.	1. Check refrigerant charge.
2. Coil dirty.	2. Clean coil fins.
3. Air filters dirty.	3. Clean or replace filters.
4. Dampers closed.	4. Check damper operation and position.
Indoor-Air Fan Stopped	
1. Electrical connections loose.	1. Tighten all connections.
2. Fan relay defective.	2. Replace relay.
3. Motor overload open.	3. Check power supply.
4. Motor defective.	4. Replace motor.
5. Fan belt broken or slipping.	5. Replace or tighten belt.
COMPRESSOR STOPS ON OIL PRESSURE SWITCH	
1. Oil level too low or too high.	1. Check oil level requirements; adjust oil level until within view of sight glass when running.
2. Compressor is short cycling.	2. Check for a. Thermostat location and operation. b. Safety device lockout circuit operation. c. Low-pressure switch operation.
3. Crankcase heater off.	3. Check relay operation; replace crankcase heater(s), if defective.
4. Low refrigerant charge.	4. Adjust charge as required.
5. Refrigerant floodback.	5. Adjust TXV superheat.
6. Evaporator coil is blocked or iced.	6. Check and correct as required.
7. Evaporator fan not operating.	7. Check and correct as required.
8. Distributor and/or TXV too large.	8. Check sizing at design conditions; change if incorrect for current application.
9. Suction riser too large.	9. Check line sizing at minimum design condition; change piping if incorrect.
10. Defective oil pressure switch.	10. Check switch for proper operation; check capillary lines for plugged lines.
11. Plugged oil pump inlet screen.	11. Clean oil pump screen.
12. Faulty oil pump drive segment.	12. Replace drive segment.
13. Worn oil pump.	13. Replace bearing head assembly.
14. Worn compressor bearings.	14. Replace compressor; see 06D service instructions.
15. Accumulator external oil return line is plugged.	15. Remove and unplug oil return line.
COMPRESSOR RUNNING BUT COOLING INSUFFICIENT	
Suction Pressure Low	
1. Refrigerant charge low.	1. Add refrigerant.
2. Head pressure low.	2. Check refrigerant charge. Check outdoor-air fan thermostat settings.
3. Air filters dirty.	3. Clean or replace filters.
4. Expansion valve power head defective.	4. Replace power head.
5. Indoor coil partially iced.	5. Check low-pressure setting.
6. Indoor airflow restricted.	6. Remove obstruction.
Suction Pressure High	
1. Unloaders not functioning.	1. Check unloader adjustments. Check unloader setting.
2. Compressor valve defective.	2. See 06D compressor service literature.
3. Heat load excessive.	3. Check for open doors or windows in vicinity of fan coil.

TROUBLESHOOTING — 38AH UNITS (cont)

PROBLEM	SOLUTION
UNIT OPERATES TOO LONG OR CONTINUOUSLY	
1. Low refrigerant charge.	1. Add refrigerant.
2. Control contacts fused.	2. Replace control.
3. Air in system.	3. Purge and evacuate system.
4. Partially plugged expansion valve or filter drier.	4. Clean or replace.
SYSTEM IS NOISY	
1. Piping vibration.	1. Support piping as required.
2. Compressor noisy.	2. Check valve plates for valve noise. Replace compressor if bearings are worn.
COMPRESSOR LOSES OIL	
1. Leak in system.	1. Repair leak.
2. Crankcase heaters not energized during shutdown.	2. Check wiring and relays. Check heater and replace if defective.
3. Improper interconnecting piping design.	3. Check piping for oil return. Replace if necessary.
FROSTED SUCTION LINE	
Expansion valve admitting excess refrigerant.	Adjust expansion valve.
HOT LIQUID LINE	
1. Shortage of refrigerant due to leak.	1. Repair leak and recharge.
2. Expansion valve opens too wide.	2. Adjust expansion valve.
FROSTED LIQUID LINE	
1. Restricted filter drier.	1. Remove restriction or replace.
2. Liquid line solenoid valve partially closed.	2. Replace valve.
COMPRESSOR WILL NOT UNLOAD	
1. Defective unloader.	1. Replace unloader.
2. Defective capacity control solenoid valve (if used).	2. Replace valve.
3. Miswired capacity control liquid line solenoid (if used).	3. Rewire correctly.
4. Weak, broken, or wrong valve body spring.	4. Replace spring.
COMPRESSOR WILL NOT LOAD	
1. Miswired capacity control liquid line solenoid (if used).	1. Rewire correctly.
2. Defective capacity control solenoid valve (if used).	2. Replace valve.
3. Plugged strainer (high side).	3. Clean or replace strainer.
4. Stuck or damaged unloader piston or piston ring(s).	4. Clean or replace the necessary parts.

LEGEND

TXV — Thermostatic Expansion Valve

TROUBLESHOOTING — CONTROL MODULE (CM)

LED	NO. OF BLINKS*	TIME (Seconds)		STATUS
		On	Off	
DS1 Power LED	1	1/4	1/4	Normal operation
	—	Steady	—	Lockout state
DS2 Alarm LED	—	Steady	—	HPS or COTP open
	1	1/4	1	LPS open
	2	1/4	1	OPS open
	3	1/4	1	LPS and OPS open
DS3 Status LED	—	—	Steady	No call for cooling
	—	Steady	—	Cooling
	1	1/4	1/4	3 minute compressor delay
DS4 "K1" LED	—	Steady	—	Relay K1 closed

LEGEND

COTP — Compressor Overtemperature Protection
HPS — High-Pressure Switch
LPS — Low-Pressure Switch
OPS — Oil Pressure Switch

*Multiple blinks are a series of on/off flashes of equal duration followed by 1 second off.

START-UP CHECKLIST

I. PRELIMINARY INFORMATION

OUTDOOR: MODEL NO. _____ SERIAL NO. _____

INDOOR: AIR HANDLER MANUFACTURER _____

MODEL NO. _____ SERIAL NO. _____

ADDITIONAL ACCESSORIES _____

II. PRE-START-UP

OUTDOOR UNIT

IS THERE ANY SHIPPING DAMAGE? _____ (Y/N) _____

IF SO, WHERE: _____

_____

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) _____

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _____

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) _____

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _____

HAVE COMPRESSOR HOLDDOWN BOLTS BEEN LOOSENED (Snubber washers are snug, but not tight)? (Y/N) _____

CONTROLS

ARE THERMOSTAT AND INDOOR FAN CONTROL WIRING CONNECTIONS MADE AND CHECKED? (Y/N) _____

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) _____

HAVE CRANKCASE HEATERS BEEN ENERGIZED FOR 24 HOURS? (Y/N) _____

INDOOR UNIT

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N) _____

ARE PROPER AIR FILTERS IN PLACE? (Y/N) _____

HAVE FAN AND MOTOR PULLEYS BEEN CHECKED FOR PROPER ALIGNMENT? (Y/N) _____

DO THE FAN BELTS HAVE PROPER TENSION? (Y/N) _____

HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N) _____

PIPING

ARE LIQUID LINE SOLENOID VALVES LOCATED AT THE EVAPORATOR COILS AS REQUIRED? (Y/N) ____

HAVE LEAK CHECKS BEEN MADE AT COMPRESSORS, CONDENSERS, EVAPORATORS, TXVs (Thermostatic Expansion Valves), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N) _____

LOCATE, REPAIR, AND REPORT ANY LEAKS. _____

HAVE ALL COMPRESSOR SERVICE VALVES BEEN FULLY OPENED (BACKSEATED)? (Y/N) _____

HAVE LIQUID LINE SERVICE VALVES BEEN OPENED? (Y/N) _____

IS THE OIL LEVEL IN EACH COMPRESSOR CRANKCASE VISIBLE IN THE COMPRESSOR SIGHT GLASSES? (Y/N) _____

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB _____ V AC _____ V BC _____ V

(AB + AC + BC)/3 = AVERAGE VOLTAGE = _____ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____ V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _____ %

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!
CALL LOCAL POWER COMPANY FOR ASSISTANCE.

III. START-UP

CHECK EVAPORATOR FAN SPEED AND RECORD. _____

CHECK CONDENSER FAN SPEED AND RECORD. _____

AFTER AT LEAST 10 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

	COMP A1	COMP B1
OIL PRESSURE		
SUCTION PRESSURE		
SUCTION LINE TEMP		
DISCHARGE PRESSURE		
DISCHARGE LINE TEMP		
ENTERING CONDENSER AIR TEMP		
LEAVING CONDENSER AIR TEMP		
EVAP ENTERING-AIR DB (dry bulb) TEMP		
EVAP ENTERING-AIR WB (wet bulb) TEMP		
EVAP LEAVING-AIR DB TEMP		
EVAP LEAVING-AIR WB TEMP		
COMPRESSOR AMPS (L1/L2/L3)	____/____/____	____/____/____

CHECK THE COMPRESSOR OIL LEVEL SIGHT GLASSES; ARE THE SIGHT GLASSES SHOWING OIL LEVEL IN VIEW? (Y/N) _____

NOTES:

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE