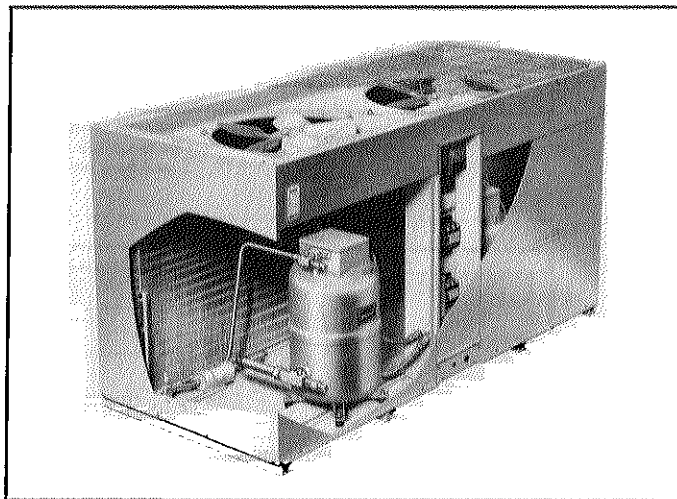


HSM7 SERIES UNITS

I - INTRODUCTION

The HSM7 condensing unit mates specifically to the CMZ1 Direct Multizone Unit. The two units electrically interface. A safety circuit, "stick" function, keeps indoor blower and outdoor fan motors running in the event a compressor contactor welds shut.



HSM7

FIGURE 1

II - UNIT INFORMATION

A - Specifications

Model No.		HSM7-2753V
Condenser	Net face area (sq. ft.)	25.4
	Tube diameter (in.) & No. of rows	3/8 — 6
	Fins per inch	18
Condenser Fan (2)	Diameter (in.) & No. of blades	26 — 5
	Motor hp	(2) — 1 hp
	Air volume (cfm) (factory setting)	13,500
	Fan speed (rpm) (factory setting)	1100
Motor watts (factory setting)		2600
Refrigerant-22 charge furnished		holding charge
Liquid line connection (O.D. in.) sweat		5/8
Suction line connection (O.D. in.) sweat		1-3/8
Net weight (lbs.) (1 Package)		1910
Electrical characteristics (60 hz — 3 ph)		208/230v, 460v, 575v

B - Electrical Data

Model No.		HSM7-2753V		
Line voltage data (60 hertz — 3 phase)		208/230v	460v	575v
Compressor	Rated load amps	†82.2	†41.2	†31.4
	Power factor	†.85	†.85	†.85
	Locked rotor amps	†480.0	†256.0	†184.0
Condenser fan motors (2)	Full load amps (total)	9.6	4.4	3.4
	Locked rotor amps (total)	47.8	21.6	17.2
*Minimum circuit ampacity		102.1	50.8	38.7

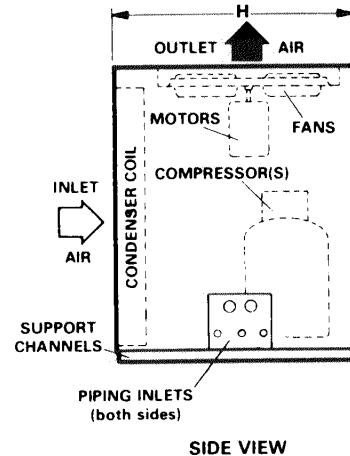
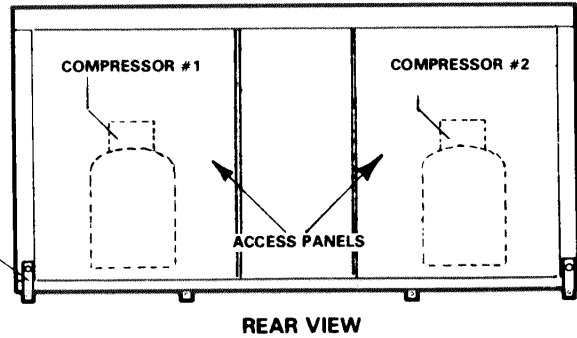
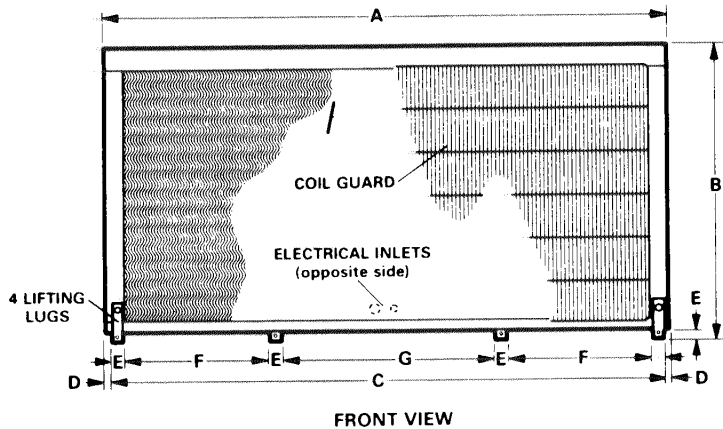
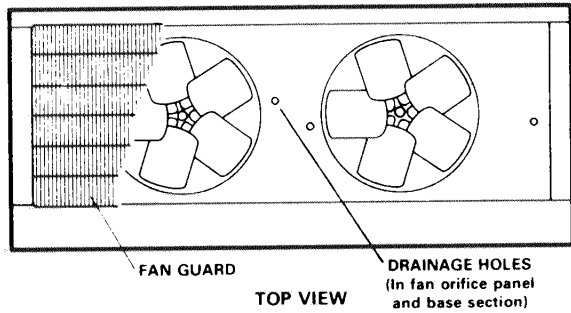
*Refer to National Electrical Code manual to determine wire, fuse and disconnect size requirements.

†Data shown is with both compressors operating.

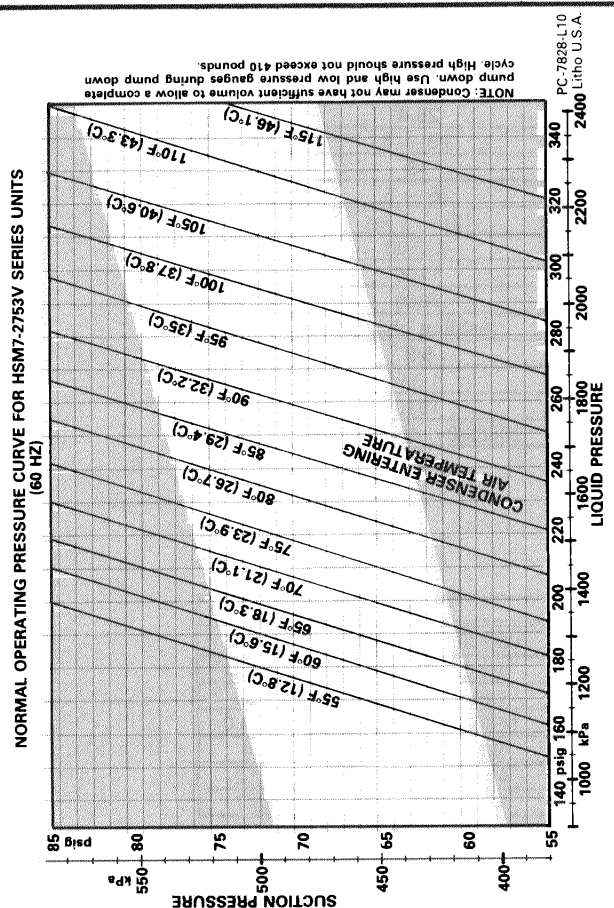
NOTE — Extremes of operating range are plus and minus 10% of line voltage.

C - Dimensions

Dimensions	A	B	C	D	E	F	G	H
inches	93-1/4	48-7/8	92	5/8	2	23-3/4	36-1/2	40
millimeters	2368	1241	2337	16	51	603	927	1016



D - Pressure Curve



III - REFRIGERANT SYSTEM

The service valves and gauge ports are located inside cabinet. See Figure 2. The gauge ports on the service valves can be shut off by backseating valves. Open valve one turn off back seat to record pressure at gauge manifold.

The unit has two independent refrigerant circuits with L2 (11 ton) compressors. The no. 1 circuit also includes hot gas by-pass for reduced capacity. The by-pass valve is a modulating control which begins to open on a decrease in suction pressure below 57 psig and is completely open at 50 psig. A portion of the hot gas is by-passed directly into the refrigerant distributor, maintaining full refrigerant flow and compressor cooling. A separate hot gas line runs between the HSM7 and CMZ1.

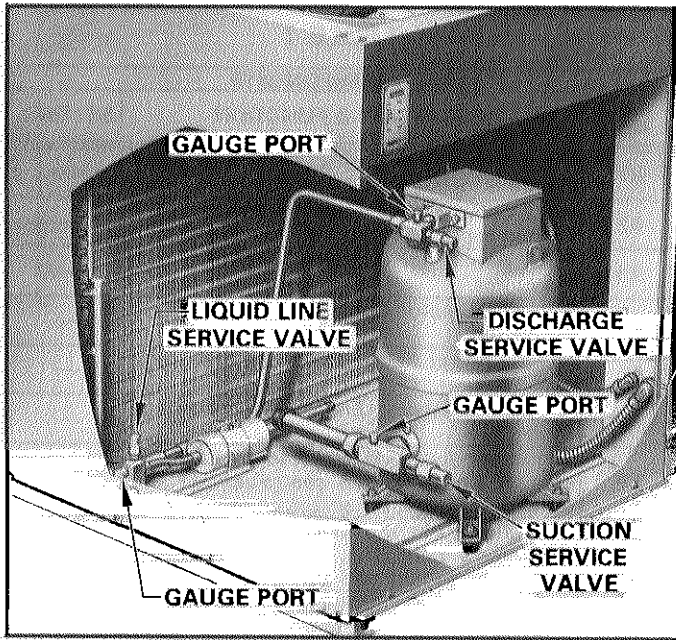


FIGURE 2

Each unit is furnished with a normal operating pressure curve. The curve uses suction pressure, discharge pressure and outdoor temperature comparison. To use the chart, first check suction pressure, then move over to the outdoor temperature and finally down to the discharge pressure. If the discharge pressure is within five pounds of this reading, the unit is properly charged, providing the three conditions meet in the unshaded area of the chart. If they meet in the shaded area, there is something wrong with the system and further checks are needed.

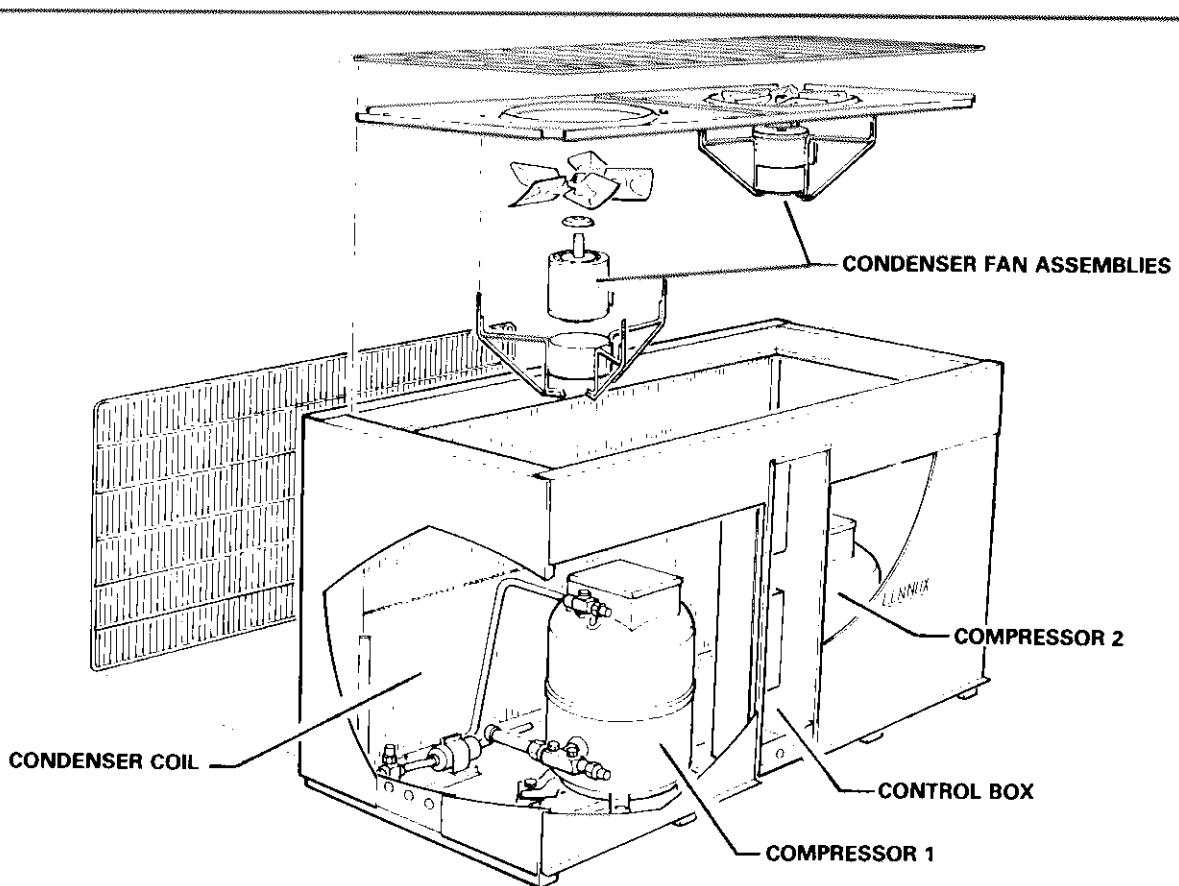
The pressure curve applies to both refrigerant circuits.

IV - COMPONENTS

Figure 3 shows an exploded view of the HSM7. Table 1 lists the electrical components by their key numbers with a brief description and gives control setpoints if applicable. Table 2 lists the controls in the CMZ1 which interface with the HSM7.

A - Control Box

Figure 4 shows the control box component arrangement.



HSM7 EXPLODED VIEW

FIGURE 3

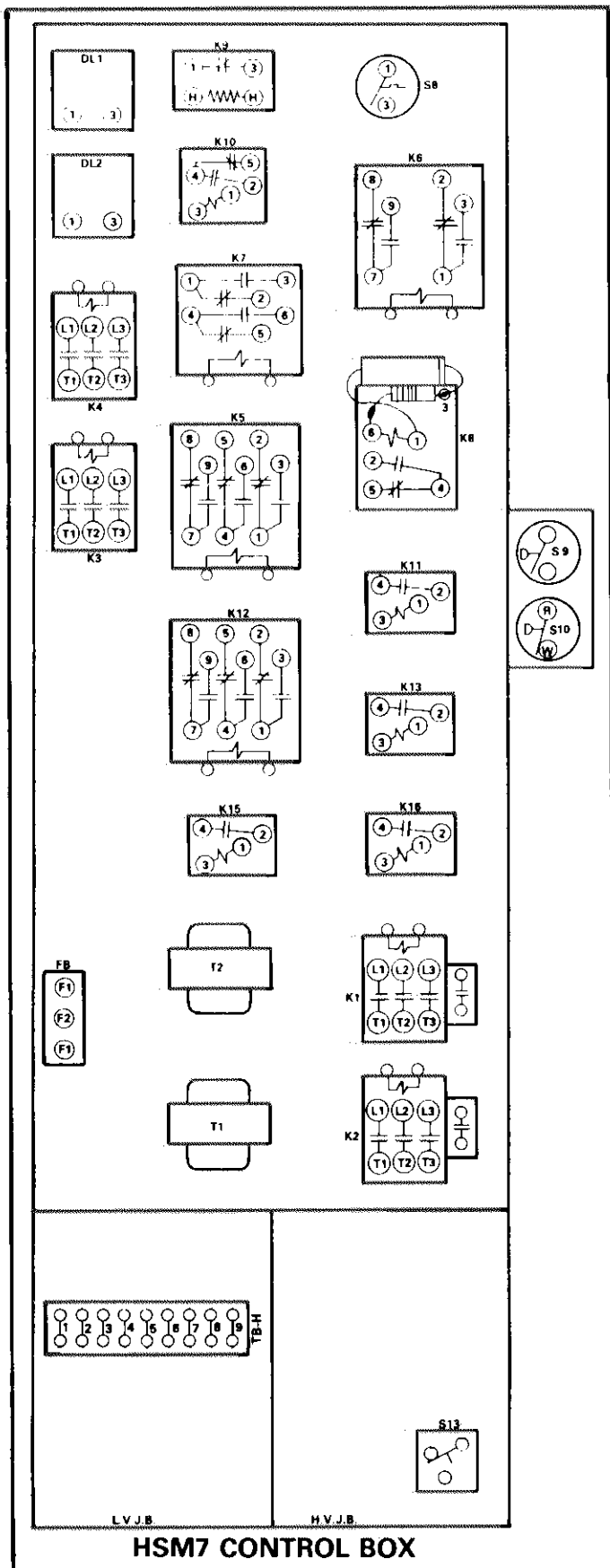


TABLE 1

HSM7 COMPONENTS		
KEY NO.	DESCRIPTION & FUNCTION	SETTING
K1	No. 1 Compressor Contactor - Powers No. 1 Compressor	----
K2	No. 2 Compressor Contactor - Powers No. 2 Compressor.	----
K3	No. 2 Fan Motor Contactor - Powers No. 2 fan motor.	----
K4	No. 1 Fan Motor Contactor - Powers No. 1 fan motor.	----
K5	No. 1 Control Relay - Energizes first stage cooling.	----
K6	No. 2 Control Relay - Energizes second stage cooling.	----
K7	Fan Motor Relay - Is powered by EA3 (C1) contact. Energizes fan control circuit and indoor blower motor circuit.	----
K8	Stick Relay - In the event a compressor contactor should stick, this relay energizes K7 to operate fans and blower	----
K9	Low Pressure Delay Relay - By-passes low pressure switch for a short delay on compressor start-up.	----
K10, K11, K12, K13	K10-K12 Signal Relays & K11-K13 Readout Relays - These relays work in conjunction to indicate an open compressor safety circuit. An open circuit will energize K23 Delay Relay (CMZ1).	----
K15	Compressor 1 Control Relay - Initiates Compressor 1 operation.	----
K16	Compressor 2 Control Relay - Initiates Compressor 2 operation.	----
S2	Compressor Overloads - Protects compressor circuits from overheating	----
S3	Compressor Low Pressure Switch - Shuts off compressor when refrigerant pressure drops below set point.	20 psig off 50 psig on
S5	Ambient Thermostat - Shuts off compressor when temperature drops below set point.	25°F
S6	Compressor High Pressure Switch - Shuts off compressor when refrigerant pressure exceeds set point.	410 psig
S7	Internal Thermostat - Shuts off compressor when internal temperature rises above set point.	----
S8	Crankcase Heater Thermostat - Energizes HR3 to provide additional heat to Compressor 1 at temperatures below setting.	Fixed 35°F close 60°F open
S9	Condenser Heat High Pressure Switch No. 1 - Starts fan #1 when the refrigerant pressure in circuit 1 exceeds set point during condenser heat cycles.	on 310 psig off 175 psig
S10	Compressor Monitor - Locks out compressor 2 whenever the outdoor air temperature falls below set point.	Adj. 40° to 90°F
S11	Condenser Heat High Pressure Switch No. 2 - Starts fan #2 when the refrigerant pressure in circuit 1 exceeds set point during condenser heat cycles.	on 310 psig off 175 psig
S26	Low Pressure - Prevents compressor start-up during low ambient if head pressure drops below set point.	out 140 psig in 285 psig
T1	Power Transformer - Provides 120V control circuit.	----
T2	Control Transformer - Provides 24V control circuit.	----

TABLE 2

CMZ1 COMPONENTS		
KEY NO.	DESCRIPTION & FUNCTION	SETTING
EA3	Load Analyzer Module - Initiates the cooling in stages to satisfy the demand	---
K18	Night Relay - Cuts out power saver and DX cooling during nite setback	---
K22	Pressure Switch Relay - Shuts down unit indoor blower motor is off. Sail switch energizes relay to close contacts	---
K25	Low Temperature Relay - Low Temp Limit (S22) energizes K25. K25-1 locks out compressor 1 below set point	S22 10°F 40°F adj
K26	Compressor Control Relay - Isolates compressor circuits to transformer T5.	---
K49	Warm-up Relay - When return air temperature drops below S32 setting, K49 is de-energized and DX cooling is terminated.	S32 70°F
K50	Shutdown Relay - Controls blower and unit operation per smoke detection option. Shuts down DX cooling when de-energized.	---
K52	Supply Air Motor Contactor - Energizes indoor blower motor.	---
K53	Return Air Motor Contactor - Energizes return air blower motor when used	---
K54	Compressor 2 Cutout Relay - No. 2 Limit Controller (A5) generates an overriding signal which closes K54 and allows compressor 2 to run.	---
K69	Auxiliary Indoor Blower Relay - On a cooling demand this relay makes to positively energize K52 & K53.	---
S17	Supply Air Firestat - Terminates entire unit operation when supply air temperature exceeds setting	136°F
S23	Cold Deck Limit - Terminates cooling when cold deck temperature drops below set point	---
T3	Control Supply Transformer - Drops line voltage to 120V for control circuit voltages	---
T4	Control Transformer - Provides 24V power control circuit.	---
T5	Compressor Control Transformer - Provides 24V power to the isolated compressor control circuit.	---

B - Compressors (L2)

The compressor is protected by a series of controls, located in the compressor make-up box, which monitor the system. They shut down the unit during periods of abnormal operating conditions.

1 - Compressor Overloads (3)

These protectors are current sensitive and are intended to protect the compressor motor from single phasing (loose wiring) and locked rotor conditions.

2 - High Pressure Switch

Opens control circuit at 410 psig head pressure. Automatically resets.

3 - Ambient Thermostat

This thermostat opens control circuit at 22°F ambient and automatically resets at 32°F.

4 - Low Pressure Switch

Opens control circuit at 20 psig suction pressure and automatically resets at 50 psig.

5 - Fuses (2)

The 3 amp fuses protect the inwinding thermostat from damage.

6 - Internal Thermostat

This consists of 2 inwinding devices which protect the motor windings from overheating. It may take up to an hour for reset once tripped.

C - Condenser Coil

The unit utilizes a draw through coil with vertical discharge. Fan motor is prelubricated for an extended period of operation. Some motors employ ball bearing motors which need no further lubrication. Check motor for lubrication requirements. For fan service access, remove the fan guard. The motor has a rain shield for moisture protection. Figure 5 illustrates the condenser fan and motor assembly.

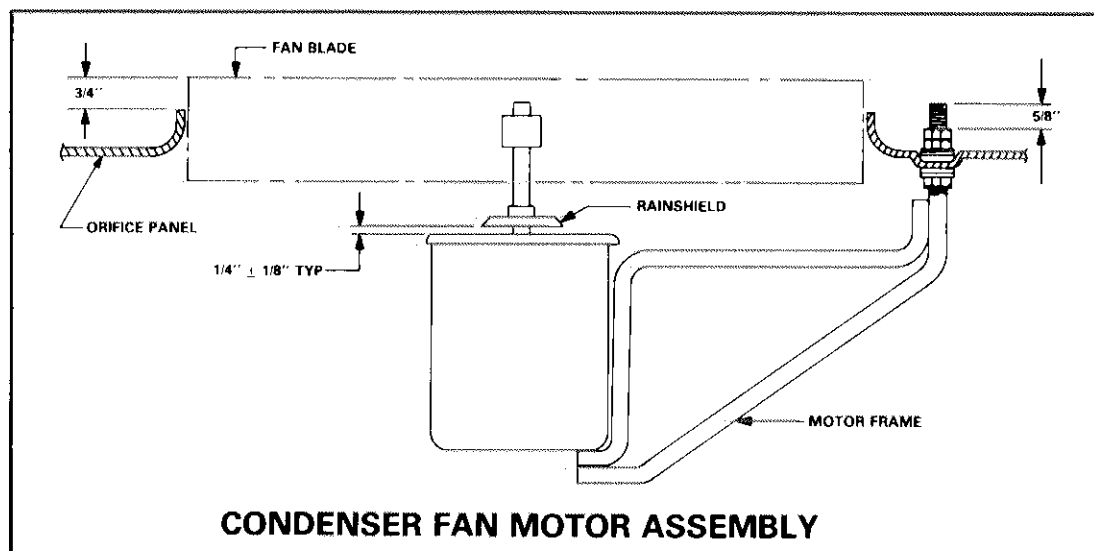


FIGURE 5

V - SCHEMATIC WIRING DIAGRAM OPERATING SEQUENCE

Figure 6 explains the interface between the HSM7 and the CMZ1 and Figure 7 continues with the HSM7 operation.

A - CMZ1 Interface to HSM7 (Figure 6)

- 1 - EA3 'C1' contacts close on a cooling demand. There will be potential at "C1" if the CMZ1 components are in normal operation. Refer to Table 2 for CMZ1 component functions.
- 2 - As 'C1' makes it energizes K7 (Fan Motor Relay) and K5 (Control Relay No.1) through K8-1.
- 3 - K5-1 N. O. contacts close to allow compressor 2 operation only after compressor 1 is in operation.
- 4 - K5-2 N. O. contacts close to energize the No. 1 compressor control circuit. Refer to step 2 in Figure 7. K5-3 N. C. contacts also open.
- 5 - K7-1 N. O. contacts close to energize the condenser fan motor circuit. Refer to steps 11 thru 14 in Figure 7.
- 6 - K7-2 N. O. contacts also close to energize K69 (Auxiliary Indoor Blower Relay).
- 7 - Under normal conditions K50-1 contacts will be closed. See Table 2. As K69-1 contacts close a circuit is verified to K52 & K53 blower contactors. This assures blower operation.
- 8 - On a further cooling demand EA3 "C2" contacts close. This completes a circuit to K6 (Control 2 Relay) through S10 (Compressor 2 Monitor) and K5-1. S10 will open circuit with ambient temperatures below setpoint.
- 9 - K6-1 N. O. contacts close to energize the No. 2 compressor control circuit. Refer to step 7 in Figure 7. K6-2 N. C. contacts also open.
- 10 - As the second stage DX cooling demand is satisfied, "C2" opens to de-energize K6 and the No. 2 Compressor Control Circuit.
- 11 - As the first stage DX cooling demand is satisfied, "C1" opens to de-energize K5 and the No. 1 Compressor Control Circuit.

Welded Contact Compressor Protection

- 12 - Should K1-1 contacts weld, K1-2 interlock remains closed to energize K8 through K5-3 N. C. contacts. Should K2-1 contacts weld, K2-2 interlock remains closed to energize K8 through K6-2 N. C. contacts.
- 13 - K8-1 N. C. contacts open to lockout the compressor control circuits. K8-1 N. O. contacts close to energize K7. This allows condenser fans and blowers to operate.

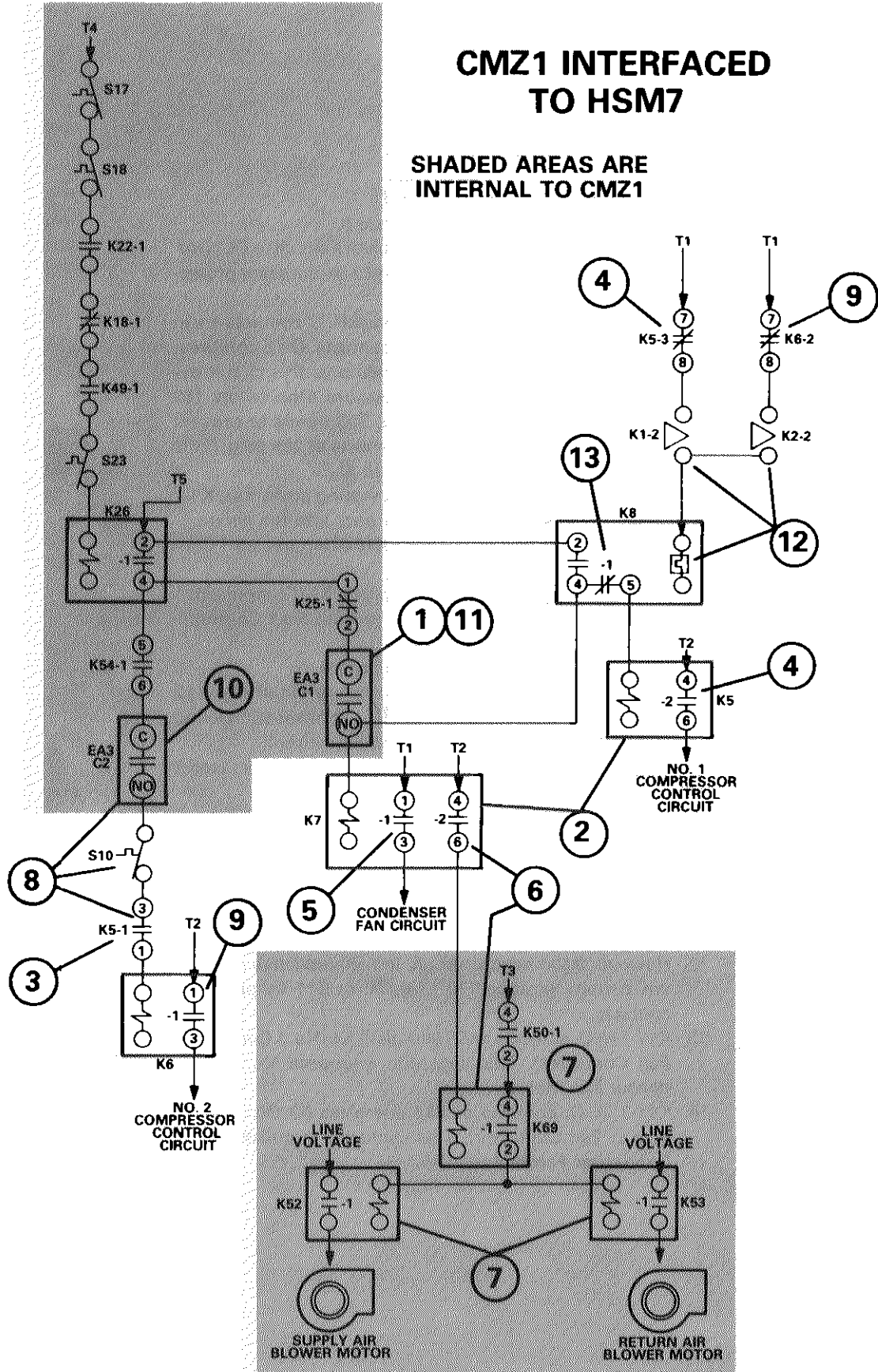


FIGURE 6

B - HSM7 Operation (Figure 7)

- 1 - K5 is energized in step 2 of Figure 6.
- 2 - K5-2 N. O. contacts close to complete a circuit to DL1 (No. 1 Compressor Delay) through the L2 compressor protection circuit.
- 3 - Note that K9-1 (Low Pressure Delay) N. C. contacts are in series with S26 and parallel S3 contacts. On a compressor start-up in low ambient conditions, this circuit bypasses S3. Should the head pressure drop below 140 psig indicating a loss of charge, S26 opens to prevent any start-up. S26 automatically resets at 285 psig. K9 is energized by K15-1 (see next step 4).
After a short delay to stabilize operating pressures, K9-1 N. C. contacts open to bring S3 back into the circuit.
- 4 - 3 minutes after DL1 is powered, K15 (Compressor 1 Control Relay) is energized.
- 5 - K15-1 N. O. contacts close to energize K1 (Compressor 1 Contactor). This contactor then powers No.1 Compressor.
- 6 - K6 was energized in step 8 of Figure 6.
- 7 - K6-1 N. O. contacts close to complete circuits to K12 (Signal Relay) and DL2 (No. 2 Compressor Delay) through the L2 compressor protection circuit.
- 8 - 10 minutes after DL2 is powered, K16 (Compressor 2 Control Relay) is energized.
- 9 - K16-1 N. O. contacts close to energize K2 (Compressor 2 Contactor). This contactor then powers No. 2 Compressor.
- 10 - K7 was energized in step 2 of Figure 6.
- 11 - The K12 contacts remain open until the K6 relay is energized in step 8 of Figure 6.
- 12 - However if the head pressure in the respective refrigerant system exceeds 310 psig, S9 or S11 by-pass K12 contacts.
- 13 - K12-1 N. O. contacts or S9 energizes K4 (No. 1 Condenser Fan Contactor). This contactor energizes No. 1 Condenser Fan Motor.
- 14 - K12-2 N. O. contacts or S11 energizes K3 (No. 2 Condenser Fan Contactor). This contactor energizes No. 2 Condenser Fan Motor.

HSM7

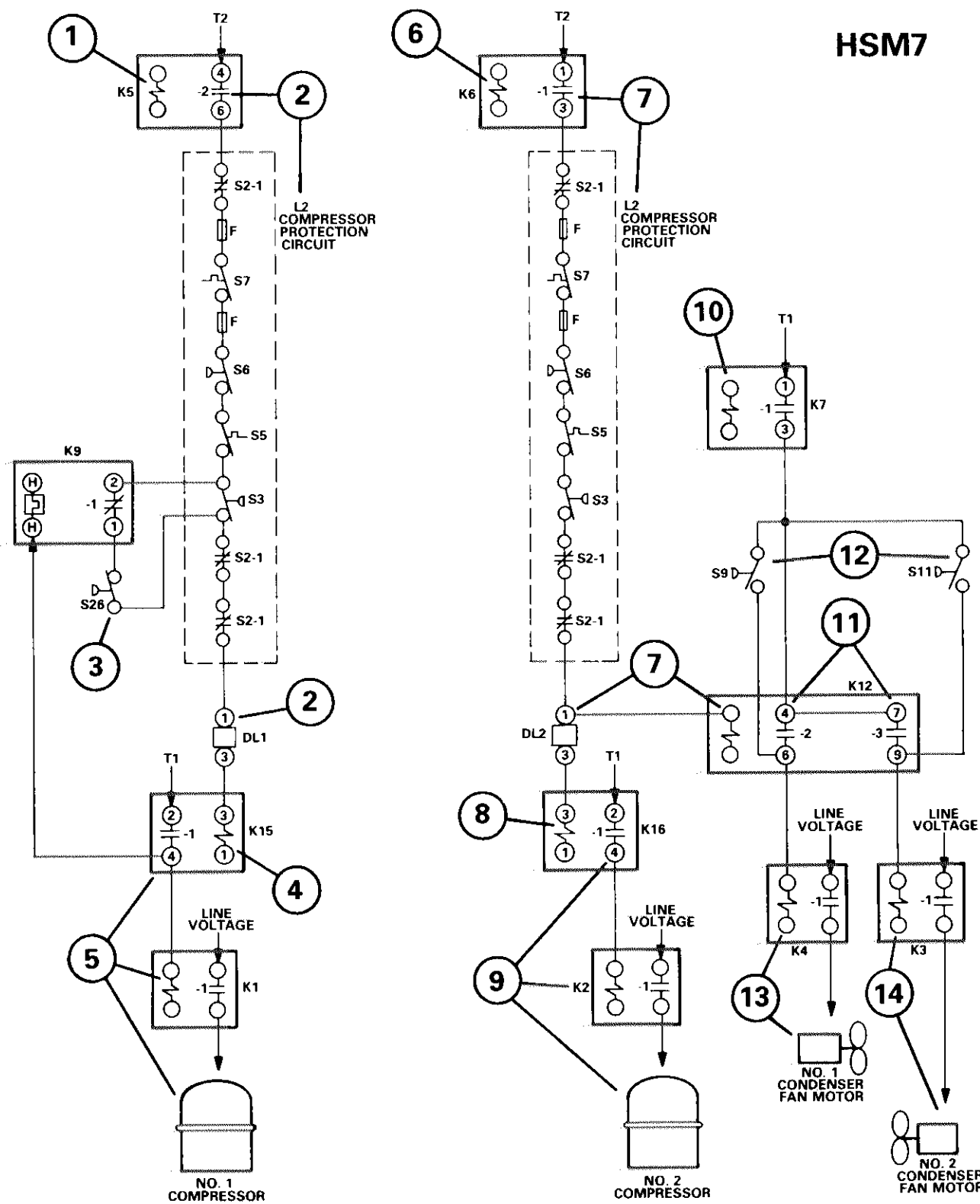


FIGURE 7