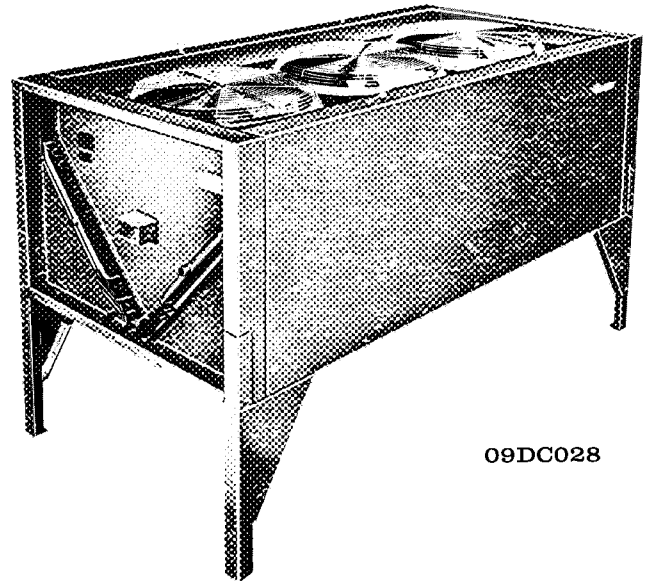


9AB12



09DC028

Air-Cooled Condensers

DESCRIPTION

Capacities to 10 Tons

9AB Air-Cooled Condensers available in nominal capacities of 5, 7½ and 10 tons are designed for vertical installations with horizontal air flow. They may be located in any area having unobstructed air circulation; the low silhouette permits installation in varied ground or roof locations. Each unit consists of a direct drive motor (or motors), fan (or fans), fan guards, motor mounts, condenser coil with integral subcooling circuit, wind deflector, and electrical junction box. Weather Armor* enclosures (which are also provided for 09DC016) have a baked enamel finish which provides maximum weather protection.

Capacities 15 Tons and Over

09DC Air-Cooled Condensers are available in 15-, 20-, 25-, 30- and 40-ton sizes. The 25-, 30- and 40-ton sizes are designed for use in multiples to give capacities of 50, 60 and 80 tons. Each size has three direct drive fans, three motors and motor mounts, three guards, a junction box, and a condenser coil with integral subcooling circuit. The 20-, 25-, 30- and 40-ton units, all using vertical air flow, may have 2 or 3 circuits, each with an integral subcooling circuit. Each circuit may be used as a separate condenser for a single system. Double-weight, hot dipped, galvanized steel enclosures give maximum protection.

FEATURES

- **Multiple Fans and Motors** provide inexpensive, reliable system control in intermediate seasons. Standby protection is provided in case one fan motor fails.
- **Subcooling** permits greater liquid lift in vertical risers without liquid flashing. Special coil circuiting cools liquid refrigerant below the saturated condensing temperature, extending system capacity without increasing motor horsepower.
- **Direct Drive Fans** require no tensioning device or pulleys. Alignment problems, belt maintenance, and friction loss are eliminated.
- **Three Types of Head Pressure Control** (Accessory) are available to maintain a refrigeration load by hold-

ing a minimum head pressure and reducing condenser capacity at low outdoor temperatures.

1. **Motormaster Electronic Control** (9AB6, 8, 12 and 09DC016, single-phase) modulates condenser fan motor speed from zero to full rpm.
2. **Fan Cycling Control** cycles one fan (9AB8, 12) or two fans (09DC) for control during intermediate seasons.
3. **Head Pressure Control Damper** (09DC024, 084), mounted below unit at the uncontrolled fan section, further reduces capacity.
- **Winter Start Control**—Optional package permits start-up of compressor regardless of low temperatures.

PHYSICAL DATA

UNIT	9 A B			09 D C					09DC054	09DC064	09DC084	
	6	8	12	016	024	028	034	044	(Two 028's)	(Two 034's)	(Two 044's)	
RATING (tons)*	6.8	10.5	13.8	15.8	22.1	28.0	35.8	46.7	56.0	71.7	93.4	
NET WEIGHT (lb)†	215	315	410	550	854	904	1225	1600	1808	2450	3200	
FAN (Prop.), No.	1	2	2	3	3	3	3	3	6	6	6	
Prop. Diam (in.)	22	22	22	22	26	30	30	32	30	30	32	
Rpm	1120	1120	1120	1120	1140	1140	1140	1140	1140	1140	1140	
Cfm	4400	6600	8800	13,000	18,200	25,200	28,200	31,000	50,400	56,400	62,000	
MOTORS, No. ... Hp	1.. 1/3	2...1/3	2...1/3	3...1/2	3...3/4	3.1	3...1	3...1	6...1	6...1	6...1	
COILS, Type	3-row			3-row					4-row	3-row		4-row
No.	1			2					2	4		4
Face Area (sq ft)	9.0	13.5	18.0	26.2	35.4	39.0	49.6	60.4	78.0	99.2	120.8	
DIMENSIONS (ft-in.)												
Length (each) A	3-7 ³ / ₈	5-2 ³ / ₈	6-8 ⁷ / ₈	6-9 ⁷ / ₈	9- 7 ³ / ₄	9- 7 ³ / ₄	9- 7 ³ / ₄	9-10 ³ / ₄	9- 7 ³ / ₄	9- 7 ³ / ₄	9-10 ³ / ₄	
Width (module) B	3-1 ¹ / ₈	3-1 ¹ / ₈	3-1 ¹ / ₈	4-6 ¹ / ₄	3-11 ³ / ₄	3-11 ³ / ₄	4-10 ¹ / ₄	6- 0 ¹ / ₄	3-11 ³ / ₄	4-10 ¹ / ₄	6- 0 ¹ / ₄	
Height, w/o Legs C	3-2 ⁵ / ₁₆	3-2 ³ / ₈	3-2 ³ / ₈	1-8 ³ / ₄	2- 4 ¹ / ₈	2- 4 ¹ / ₈	3- 1 ¹ / ₈	3- 1 ¹ / ₈	2- 4 ¹ / ₈	3- 1 ¹ / ₈	3- 1 ¹ / ₈	
Adj Stand (in.) D	4 ³ / ₄	10 ¹ / ₄ or 16 ³ / ₄		12 ¹ / ₂ or 19 ³ / ₈	16 or 24	16 or 24	18 or 26	20 or 28	16 or 24	18 or 26	20 or 28	

UNIT	1 Mod	9AB			09DC	09DC024				09DC028				09DC034				09DC044					
		6	8	12	016																		
CIRCUITS, NO.	1 Mod	1	1	1	1	2				2				2 or 3				2 or 3					
	2 Mod	-	-	-	-	-				09DC054 (Two - 09DC028)				09DC064 (Two - 09DC034)				09DC084 (Two - 09DC044)					
CAP. (%/Circuit) **	1 Mod	100	100	100	100	50 50 63 37				50 50 63 37				50 50 40 20				50 50 38 24					
	2 Mod	-	-	-	-	-				25 25 31.5 18.5				25 25 20 20				10 25 25 19					
REFRIG CHG Min (lb/ckt)		6	11	13	20	10 ¹ / ₄	10 ¹ / ₄	13 ¹ / ₄	7 ¹ / ₄	11 ¹ / ₂	11 ¹ / ₂	14 ¹ / ₂	8 ¹ / ₂	14 ¹ / ₂	11 ¹ / ₂	11 ¹ / ₂	8	25	25	19	19	12	
REFRIG VOL (cu ft/ckt)		.31	.47	.61	.86	.65	.65	.84	.45	.72	.72	.91	.52	.52	.72	.72	.39	1.48	1.48	1.12	1.12	.72	
STOR CAP. (lb/ckt) ††	R-12	20.2	30.0	39.3	55.2	41.5	41.5	54.1	29.0	45.1	46.3	58.5	36.5	36.5	53.9	46.4	46.4	25.1	35.1	25.1	17.2	17.2	12.0
	R-500	17.3	25.8	33.8	47.5	35.7	35.7	46.5	24.9	39.6	39.6	50.4	28.8	28.8	50.8	39.9	39.9	21.3	31.4	21.3	14.6	14.6	9.6
	R-22	18.4	27.4	35.9	50.4	38.0	38.0	49.4	26.5	42.1	42.1	53.5	30.6	30.6	53.9	42.4	42.4	22.9	32.7	22.9	15.8	15.8	10.2

Data common to 1- and 2-module units.

**Use 50/50 split for single circuit. 09DC034 coil 40/40/20 split may be field modified into 40/60 split.

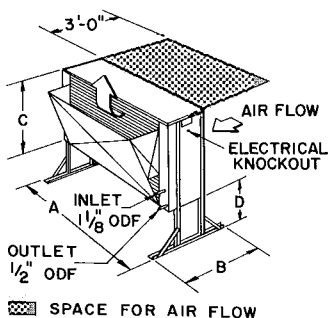
††80% liquid, 20% vapor at 90 F.

NOTES:

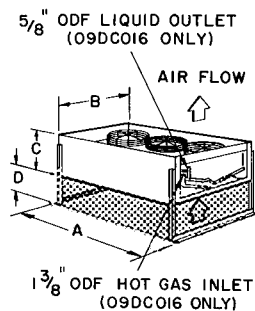
- For 09DC024 thru 084, use maximum adjustable stand height when using a damper section.
- Certified dimension drawings available on request.

DIMENSIONS

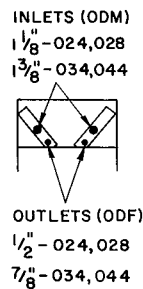
9AB6,8,12



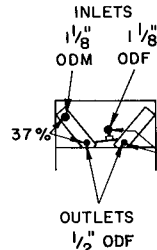
09DC016, 024, 028, 034, 044



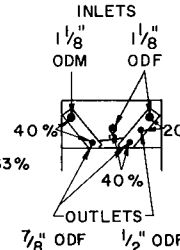
024,028,034,044 50/50 COIL SPLIT



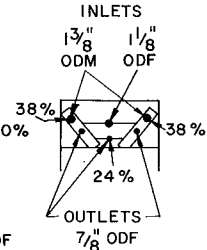
024,028 63/37 COIL SPLIT



034 40/40/20 COIL SPLIT



044 38/38/24 COIL SPLIT



RIGHT END VIEWS

CONDENSER RATINGS

MINIMUM REFRIGERANT CHARGE (0 F SUBCOOLING)

RE- FRIG	TD*	TOTAL HEAT REJECTION (Tons)										
		9AB					09DC					
		6	8	12	016	024	028	034	044	054	064	084
12 and 500	20	5.0	7.8	10.2	12.2	17.2	22.0	28.1	37.3	44.0	56.2	74.6
	25	6.3	9.9	12.8	15.2	21.5	27.5	35.1	46.7	55.0	70.2	93.4
	30	7.5	11.8	15.4	18.3	25.8	32.9	42.1	56.2	65.8	84.2	112.4
	35	8.8	13.8	17.9	21.2	30.1	38.3	49.1	65.3	76.6	98.2	130.6
	40	10.0	16.7	20.5	24.2	34.4	43.8	56.1	74.5	87.6	112.2	149.0
22	20	5.7	9.1	11.8	13.2	18.3	23.8	30.4	40.7	47.6	60.8	81.4
	25	7.2	11.3	14.7	16.5	23.0	29.6	38.0	50.8	59.2	76.0	101.6
	30	8.6	13.6	17.6	19.7	27.6	35.6	45.6	61.0	71.2	91.2	122.0
	35	10.0	15.9	20.5	23.1	32.3	41.4	53.2	71.0	82.8	106.4	142.0
	40	11.4	18.2	23.4	26.3	37.0	47.2	60.8	80.5	94.4	121.6	161.0

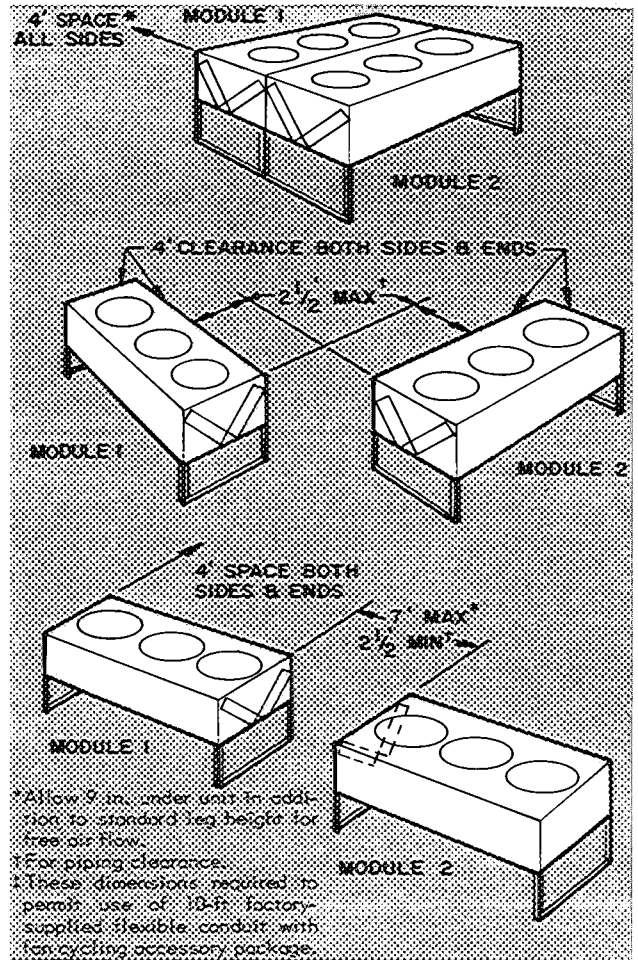
OPTIMUM REFRIGERANT CHARGE (15 F SUBCOOLING)

RE- FRIG	TD*	TOTAL HEAT REJECTION (Tons)										
		9AB					09DC					
		6	8	12	016	024	028	034	044	054	064	084
12 and 500	20	4.8	7.3	9.6	11.9	16.3	20.6	26.5	34.7	41.2	53.0	69.4
	25	6.0	9.2	12.0	14.8	20.4	25.8	33.2	43.3	51.6	66.4	86.6
	30	7.2	11.0	14.4	17.7	24.5	31.0	39.7	52.0	62.0	79.4	104.0
	35	8.3	12.8	16.8	20.7	28.7	36.2	46.5	60.7	72.4	93.0	121.4
	40	9.5	14.7	19.3	23.6	32.8	41.4	53.1	69.3	82.8	106.2	138.6
22	20	5.4	8.4	11.0	12.7	17.6	22.3	28.6	37.3	44.6	57.2	74.6
	25	6.8	10.5	13.8	15.8	22.0	28.0	35.8	46.7	56.0	71.6	93.4
	30	8.2	12.6	16.5	19.0	26.5	33.6	43.0	56.0	67.2	86.0	112.0
	35	9.5	14.7	19.2	22.2	30.8	39.2	50.1	65.5	78.4	100.2	131.0
	40	10.8	17.0	22.0	25.3	35.3	44.8	57.3	74.7	89.6	114.6	149.4

*TD (Temperature Difference) = Condensing Temp Minus Entering Air Temp

TYPICAL ARRANGEMENTS

(Two-Module Condensers)



SELECTION PROCEDURE (With Examples)

1a. Select minimum or optimum charge ratings.

Use optimum charge when compressor, condenser, and evaporator may be selected as a package and the components may be balanced* to secure maximum benefits of 15 F subcooling (for example, in selecting 09DC condensers with Carrier compressors rated at 15 F subcooling). Optimum charge activates the subcooling circuit, resulting in higher system capacity at slightly higher head pressure and corresponding condensing temperature. Liquid refrigerant leaves the system subcooled to a stable condition to allow greater length of refrigerant run or lift.

Otherwise, use minimum charge which gives higher heat rejection, since entire surface of condenser and subcooling circuit is used for condensing only. Minimum charge ratings, however, do not represent greatest potential system capacity. They are comparable to competitive ratings without subcooling.

- b. List the refrigerant, total heat rejection (THR), suction and discharge temperatures as determined from compressor data.
2. Determine condensing temperature (saturated discharge temperature minus discharge line loss).
3. Determine temperature difference (condensing temperature minus entering air temp).
4. Enter Condenser Ratings table (minimum or optimum charge as determined in Step 1) at selected refrigerant and established temperature difference. Read across to total heat rejection equal to or greater than required. Interpolate if necessary. Read unit size.

Example (Optimum Charge)

1. Given:
 - R-22, Optimum Charge
 - THR (including subcooling) 29.4 Tons
 - Saturated Disch Temp 123.8 F
 - Saturated Suction Temp. 40 F
 - Entering Air Temp. 95 F
 - Disch Line Loss 2 F
2. Cond Temp = 123.8 F - 2 F = 121.8 F
3. TD = 121.8 F - 95 F = 26.8 F
4. Interpolate in Condenser Ratings table (optimum charge) and obtain capacity of 09DC028 as 30.0 tons and 09DC024 as 23.6 tons. Select the 09DC028.

Example (Minimum Charge)

1. Given:
 - R-12, Minimum Charge
 - THR 15.0 Tons
 - Saturated Disch Temp. 122 F
 - Saturated Suction Temp. 40 F
 - Entering Air Temp. 95 F
 - Disch Line Loss 2 F
2. Cond Temp = 122 F - 2 F = 120 F
3. TD = 120 F - 95 F = 25 F
4. Enter Condenser Ratings table (minimum charge) and select 09DC016 with 15.2 tons THR. (Note that with optimum charge this unit has THR of 14.8 tons which does not meet specifications).

*See Carrier System Design Manual.

HEAD PRESSURE CONTROL

General – Efficient operation of evaporator expansion valves requires a 90 F minimum condensing temperature for 100% compressor capacity, 80 F for 75% capacity, and 70 F for 50% and 25% capacity. The capacity of an air-cooled condenser increases with increased temperature difference (cond temp minus entering air temp) and decreases with decreased temperature difference. Therefore, a drop in entering air temperature lowers the condensing temperature for a given heat rejection. When outdoor air temperatures drop below prescribed minimums, some form of head pressure control is required. (See Head Pressure Control Data table for minimum outdoor temperatures and specific head pressure controls for 9AB and 09DC units.)

9AB, 09DC Head Pressure Controls – Head pressure on 9AB and 09DC condensers may be controlled by the Motormaster Electronic Control, by fan cycling, or by fan cycling supplemented by the Motormaster or a modulating damper.

Motormaster – When outdoor temperatures are low enough to cause low condensing pressures, the Motormaster modulates the motor speed of one condenser fan from full to zero rpm to maintain a constant saturated condensing temperature. The Motormaster, available only with single-phase motors (on unit sizes thru 09DC016), may be the sole control on single fan units or may be used in conjunction with fan cycling control on multiple fan units for full year-round head pressure control.

Fan Cycling – The fan cycling control, used primarily during intermediate seasons, cycles one fan or two fans. On two-module condensers (09DC034, 064, 024), the fan cycling control cycles four of the six condenser fans (two of three in each module) from a two-step thermostat responding to variations in ambient temperature. The first step of the thermostat cuts out two corresponding fan motors, one in each module; the second step cuts out a second pair of corresponding fan motors. The two condenser modules are controlled from a single, completely wired fan cycling control box consisting of one two-stage thermostat, one power and one control terminal block, and two quick-connect receptacles (one at the end of a 10-foot flexible conduit).

Head Pressure Control Damper – An accessory head pressure control damper is available to supplement the fan cycling control on the 09DC024 and larger units. The 09DC054, 064, and 084 require two damper packages installed for parallel throttling of air to the two uncontrolled fans. Each damper assembly has a pressure-operated actuator to operate the damper blades which modulate inlet air flow to the uncontrolled fan in response to head pressure variations. The pressure sensing tubing (capillary) for both pressure actuators is connected to the same point in the liquid line serving the last refrigerant circuit to shut down. Each capillary is provided with a 1/4-inch flare connection. A single shut-off valve at the liquid line is recommended for service.

Multiple Circuit Condensers – Multiple circuit condensers applied to separate refrigeration cycles present special problems when head pressure is controlled from a single control point. For such applications, more positive system control may be ensured by using individual condensers and head pressure controls.

HEAD PRESSURE CONTROL DATA

UNIT SIZES	HEAD PRESSURE CONTROL	TD	COMPR CAP. (%)*			
			100	75	50	25
			Min Outdoor Temp (F)†			
All	None	30	60	57	55	62
		25	65	61	57	64
		20	70	65	60	65
9AB6	Motormaster	30				
		25	-20	-20	-20	-20
		20				
9AB8, 12	Fan Cycling, One Fan	30	33	38	42	56
		25	43	46	47	56
		20	52	52	51	61
9AB8, 12	Fan Cycling, One Fan with Motormaster	30				
		25	-20	-20	-20	-20
		20				
09DC016, 024, 028, 034, 044‡	Fan Cycling, Two Fans	30	3	15	26	48
		25	18	30	34	52
		20	32	36	41	56
09DC016	Fan Cycling, Two Fans with Motormaster	30				
		25	-20	-20	-20	-20
		20				
09DC024, 028, 034, 044‡	Fan Cycling, Two Fans With Mod Damper	30				-2
		25	-20	-20	-20	13
		20				25

Winter Season Intermediate Season

TD – Temperature Diff (cond temp minus ent air temp)

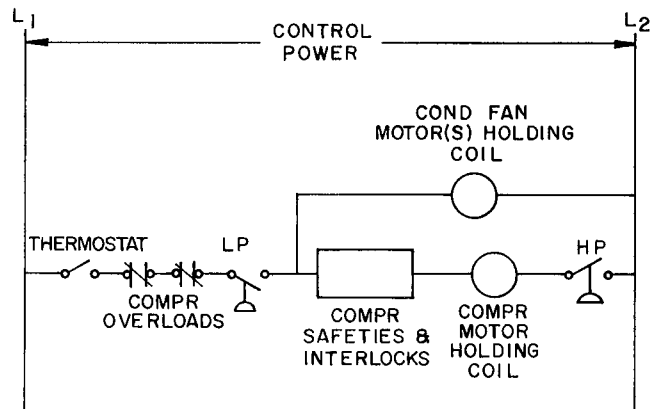
* Interpolation permitted.

† Based on 90 F minimum cond temp at 100% capacity, 80 F at 75% and 70 F at 50% and 25%. (Motormaster holds cond temp to 100 ± 10 F at all loads and at temperatures down to -20 F.) On some applications with multiple DX coils, the compressor may be unloaded while individual coil(s) are still fully loaded. In this case, expansion valve selection must be based on condensing temperatures listed, or the minimum outdoor air temperature must be raised by the difference between listed cond temp and cond temp used for valve selection.

‡ Applied also to each module of 09DC054, 064 and 084.

SCHEMATIC WIRING DIAGRAM — CONDENSER CONTROL

(Single Refrigerant Circuit, Single Phase)

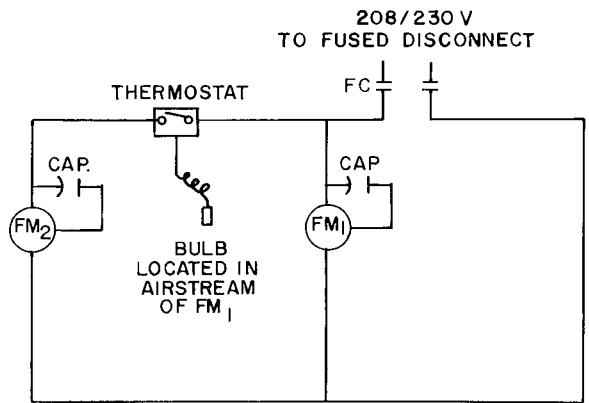
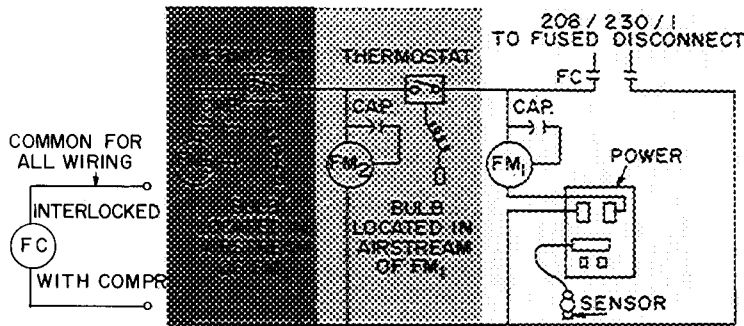


LP – Low Pressure Switch
HP – High Pressure Switch

NOTES:

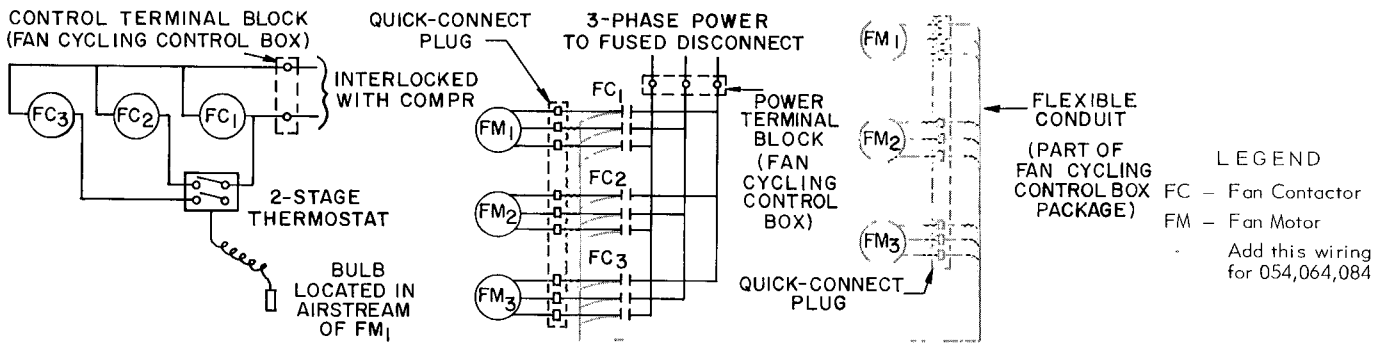
1. For three-phase service, holding coils are wired in parallel.
2. Multicircuit units may be similarly controlled by wiring fan motor holding coil(s) in series with thermostat, compressor overloads, and low pressurestat of each refrigerant circuit
3. Two or more condensers, piped in parallel on a single refrigerant circuit, must be of equal size and wired in parallel.

SCHEMATIC WIRING — HEAD PRESSURE CONTROL



- 9AB WITH MOTORMASTER
- + [hatched box] - 9AB8, 12 FAN CYCLING ONE FAN / MOTORMASTER
- + [hatched box] - 09DC016 FAN CYCLING TWO FANS / MOTORMASTER

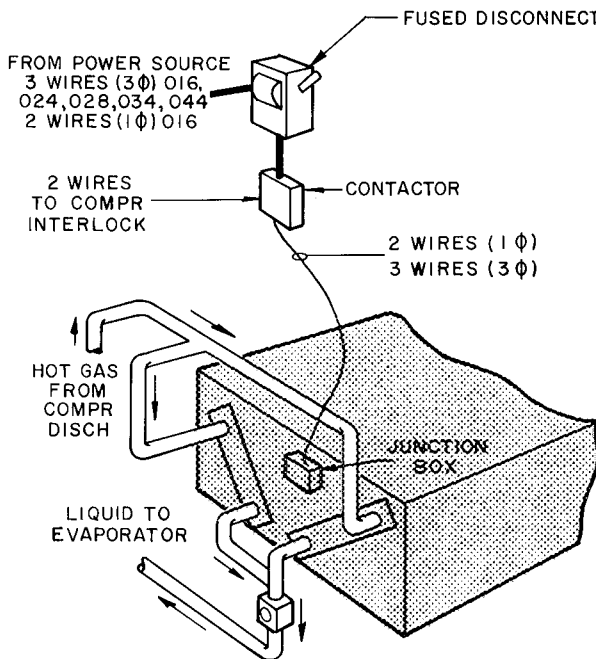
9AB8, 12 FAN CYCLING ONE FAN



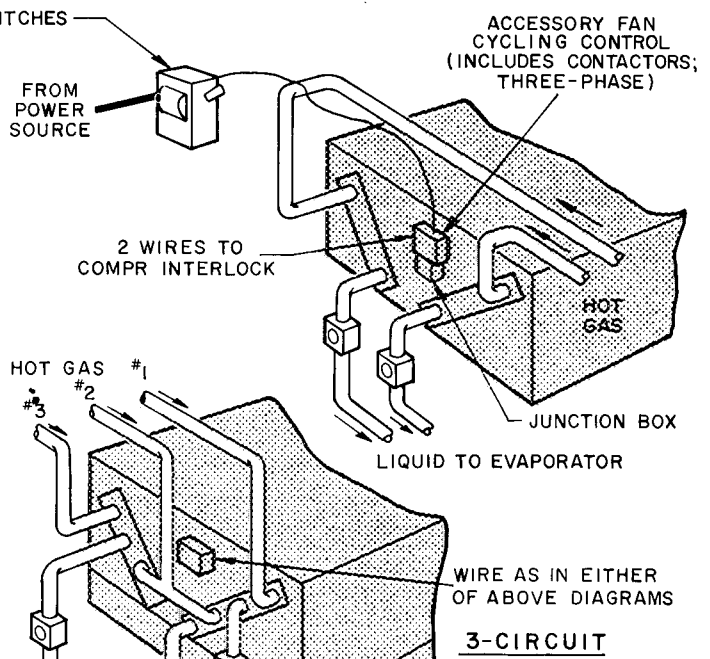
FAN CYCLING TWO FANS (EACH MODULE) 09DC016, 024, 028, 034, 044

TYPICAL PIPING AND WIRING CONNECTIONS (09DC Units shown)

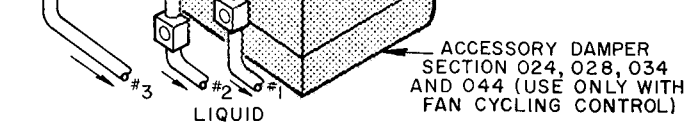
1-CIRCUIT



2-CIRCUIT



3-CIRCUIT



NOTES:

1. Single-phase motors (9AB, 09DC016) require one field-supplied contactor to start all fans. Three-phase motors (09DC016, 024, 028, 034 and 044) require one field-supplied contactor for each fan unless supplied with accessory fan cycling control.
2. All piping between two module units is field supplied.
3. Wiring and piping shown are general points-of-connection guides only and do not include details required for specific installations.
4. All wiring must comply with applicable national and local codes.
5. All piping must follow standard refrigerant piping practices. Piping to two-module units (09DC054, 064 and 084) should follow standard practice for multiple condensers. See Carrier System Design Manual for details.
6. For pressure relief requirements, see latest revision of Safety Code for Mechanical Refrigeration — ASA-B9 1.

ELECTRICAL DATA (60-cycle)

UNIT	VOLTS	PHASE	FANS		FLA (ea)	
			No.	Hp		
9AB6	208/230	1	1		1/3	2.1*
9AB8	208/230	1	2	1	1/3	2.1*
	208/230		Total	1	1/3	2.4
9AB12	208/230	1	2	1	1/3	2.1*
	208/230	1	Total	1	1/3	2.4
09DC016	208/230	1	3	1	1/2	3.3*
	208/230	1	Total	2	1/2	4.0
	460	3	3		1/2	1.2
575	3	1.0				
09DC024	208	3	3		3/4	4.0
	230	3				3.8
	460	3				1.9
	575	3				1.6
09DC028, 034, 044	208	3	3		1	5.3
	230	3				4.8
	460	3				2.4
	575	3				1.9

FLA – Full Load Amps

*These are special motors suitable for use with Motormaster head pressure control.

NOTE:

All 208/230-volt single-phase units are suitable for operation on either voltage.

GUIDE SPECIFICATIONS

Furnish and Install as shown on the drawing _____ air-cooled condensers suitable for _____ tons each of total heat rejection, when condensing refrigerant _____ at _____ F saturated condensing temperature with air entering at _____ F dry-bulb temperature. Units shall be arranged for horizontal (vertical) air flow.

Units shall consist of: coils, with integral subcooling, supporting casing with stand, and wind deflector (9AB only). Coil shall be constructed of plate aluminum fins on mechanically expanded copper tubes, cleaned, dehydrated, sealed, and leak tested at 400 psig (9AB), 410 psig (09DC016), or 420 psig (09DC024 and larger).

Fans shall be direct drive, propeller type, protected by guards. Motors shall be permanent split-capacitor (9AB, 09DC016) or 3-phase, 60-cycle (09DC016, 024, 028, 034, 044, 054, 064, 084). All motors shall be resiliently mounted and prelubricated, with built-in overload protection. Fan shaft shall be corrosion protected and mounted in prelubricated bearings. Fan blades shall have an iridite finish. A magnetic contactor shall be field supplied for 9AB, 09DC016, and shall be field supplied for 09DC024, 028, 034, 044, 054, 064, 084 if head pressure control is not used.

Casing shall be painted, Galvanneal steel (9AB, 09DC016) or heavy-gage, double-weight (2-1/2 oz zinc/sq ft) galvanized steel (09DC024, 028, 034, 044). Access panels shall be provided for electrical connections.

Accessories (To specify from items 1 thru 4 below, refer to Head Pressure Control Data table.)

1. Motormaster Electronic Head Pressure Control – Units shall be provided with a completely transistorized variable speed fan control to modulate unit capacity in response to variations in head pressure. The control en-

closure shall be weathertight and shall have Weather Armor finish. Mounting hardware shall also be provided. Control shall modulate fan motor speed from full to zero rpm to maintain a saturated condensing temperature of approximately 100 F at outdoor temperatures down to -20 F.

2. Fan Cycling Control – Unit(s) shall be provided with a control to cycle one of two fans (9AB8,12), two of three fans (09DC016,024,028,034,044), or four of six fans (09DC054,064,084), in response to outdoor ambient temperature. Control package shall include: thermostat and remote bulb (9AB8,12); contactor(s), terminal strip(s), plug, and two-stage thermostat (09DC016,024,028,034, 044); contactors, two-stage thermostat, power control terminal blocks and two quick-connect receptacles, one at end of 10-foot flexible conduit (09DC054,064,084). Controls shall be enclosed in weathertight sheet metal box with cover. Necessary mounting hardware shall be provided.
3. Head Pressure Control Damper – Unit(s) shall be provided with a control for further reduction in condenser capacity to meet system part load operation or lower outdoor ambient temperatures. This assembly shall include: flanged damper frame, movable damper blades, operating linkages, self-contained pressure-operated damper actuator with capillary, and necessary mounting hardware.
4. Winter Start Control (required when minimum ambient temperature is below design coil suction temperature) – Unit(s) shall be provided with a Winter Start Control Package which shall temporarily bypass the system low pressurestat to permit start-up at low temperature.
5. Floor Mounting Stand (9AB8 and 12).

Manufacturer reserves the right to change any product specifications without notice.

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