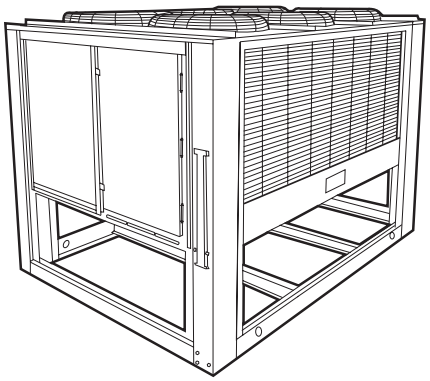
Carrier®

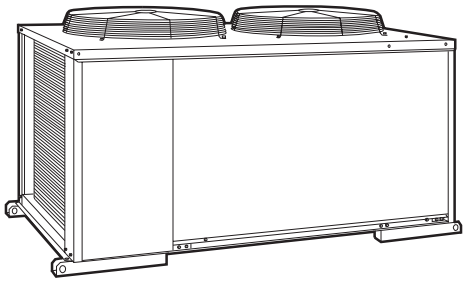
Product Data

09DE,DK Air-Cooled Condensers

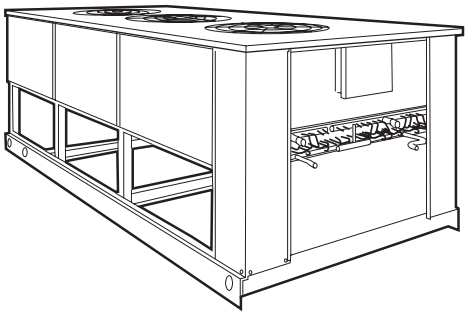
15 to 90 Nominal Tons



09DK054-094
(074-094 Shown)



09DE016



09DK020-044
(034, 044 Shown)

Air-Cooled Condenser Units for Remote System Application

- 11 popular sizes
- performance proven in every building application
- efficient direct-drive fans
- unit casings meet the ASTM B117 500-hour salt spray test requirements
- small footprints allow for installations in tight spaces

Features/Benefits

A family of ruggedly built condensers ideal for clinics, motels, schools, apartments, office buildings, and factories.

Greater system economy

Subcooling offers more cooling capacity. A specially designed liquid refrigerant circuit provides subcooling for increased capacity without additional power consumption. Subcooling liquid refrigerant also expands condenser applications by permitting condenser installation below the evaporator without subjecting the refrigerant to flashing before the expansion valve.

All units are UL (Underwriters' Laboratories) and UL, Canada approved.

Quieter, more efficient operation

Improved fan design — direct drive fans move air efficiently, yet quietly, at low power input. Bell-mouthed fan openings offer increased airflow, improved fan efficiency, and quiet operation.

Multi-circuit, multi-refrigerant capability

Choose the multi-circuit 09DE or 09DK and realize separate cooling system economy on each circuit. Save space and satisfy installation needs without the expense of smaller condensers with single circuitry. Models can be used with Refrigerants 12, 22, 500, 502 or 134a to meet individual system capacity requirements. A different refrigerant can be used with each cooling circuit.

Individual unit qualities

09DE016 condenser with 15-ton capacity uses a wraparound coil design (with integral subcooling) that may be used as single system or split into 2 systems. Unit with vertical air discharge contains a control box, 2 direct-drive fans, motors, and motor mounts. The U-shaped coil has a large face area to maximize heat transfer.

09DK020-044 condensers are available in 17.5-, 20-, 25-, 30-, 40-ton sizes. Models 09DK020, 024, and 028 have 2 direct drive fans, 2 motors and motor mounts. Models 09DK034 and 044 have 3 direct drive fans, 3 motors and motor mounts. Fan motors are 3-phase, TEAO (Totally Enclosed, Air Over). All units are equipped with a junction box and 2 condenser coils with integral subcooling circuits. Each circuit may be used as a separate condenser for a single system.

09DK054-094 condensers are available in 50-, 60-, 70-, 80-, and 90-ton sizes. Models 09DK054 and 064 have 4 direct-drive fans, 4 motors and motor mounts. Models 09DK074-094 have 6 direct-drive fans, 6 motors and motor mounts. All fan motors are 3-phase and are protected against single phasing conditions. Fans 1 and 2 use open drip-proof motors that are compatible with the Motormaster® V accessory. On 208-230/460 volt units, the remaining fan motors are totally enclosed. All 380/415 v and 575 v units have open drip-proof fan motors. All fan motors have permanently lubricated sealed bearings. Fans 3 and 4 on 09DK054 and 064 and fans 3, 4, 5, and 6 on 09DK074-094 models are controlled separately for efficient unit control.

These units are equipped with a hinged access door, which allows for easy entrance into the control box. Four condenser coils with integral subcooling circuits are available to create a variety of capacity split combinations. A tubing package is supplied with the unit for 100%, 50/50%, and 67/33% (09DK044-084 only) coil circuiting applications to facilitate field installations and maximize unit flexibility.

Coil split versatility

Model 09DE and 09DK coils can be split into 2 or more condensing circuits. Each circuit may handle a separate cooling system, using a different refrigerant if desired. Each circuit has a refrigerant subcooling circuit. Depending on condenser size, one to 6 condenser coil circuiting applications can be used as shown below. This saves space and provides installation flexibility.

CONDENSER		CIRCUIT NUMBER		
		1	2	3
		Percent Condenser Capacity		
09DE	016	100	—	—
		50	50	—
09DK	020,024	100	—	—
		50	50	—
		67	33	—
09DK	028,034	100	—	—
		50	50	—
		40	40	20
		60	40	—

CONDENSER		CIRCUIT NUMBER			
		1	2	3	4
		Percent Condenser Capacity			
09DK	044	100	—	—	—
		73	27	—	—
		67	33	—	—
		60	40	—	—
		53	47	—	—
		40	34	13	13
	054, 064, 074, 084	100	—	—	—
		50	50	—	—
		67	33	—	—
		33	33	33	
		33	33	17	17
	094	100	—	—	—
		50	50	—	—

Factory-supplied circuiting.

Circuiting by field piping modifications.

NOTE: Split percentages shown are approximate. Actual split capacities may vary slightly from those shown.

Table of contents

Model number nomenclature

09DE016

09DE - 016 - - — 5 0 1

Air-Cooled Condensers

Nominal Capacity
016 — 15.0 Tons

Tube and Fin Material
— — Copper Tube/Aluminum Fins
C — Copper Tube/Copper Fins
K — Pre-Coated Aluminum Fin/Copper Tube
E — E-Coated Al Fin/Cu Tube
F — E-Coated Cu Fin/Cu Tube

Packaging Options
1 — Standard Packaging

Series

Electrical Characteristics
5 — 208/230-3-60

LEGEND
Al — Aluminum
Cu — Copper

09DK

09DK - 024 - - — 6 0 1 — —

Air-Cooled Condensers

Nominal Capacity
020 — 17.5 Tons
024 — 20.0 Tons
028 — 25.0 Tons
034 — 30.0 Tons
044 — 40.0 Tons
054 — 50.0 Tons
064 — 60.0 Tons
074 — 70.0 Tons
084 — 80.0 Tons
094 — 90.0 Tons

Tube and Fin Material
– — Copper Tube/Aluminum Fins
C — Copper Tube/Copper Fins
K — Pre-Coated Aluminum Fins/Copper Tube
E — E-Coated Al Fin/Cu Tube
F — E-Coated Cu Fin/Cu Tube

Standard Unit

Packaging Options
1 — Standard Skid (020-044)
Coil Protection Only (054-094)
2 — Skid and Coil Protection (054-094)
3 — Full Crate (020-044)
Top and bottom skid, coil protection, and full plastic bag enclosure (054-094)
4 — Full Crate (054-094)

Series

Electrical Characteristics
1 — 575-3-60
2 — 380/415-3-60* (Export Unit, not for sale in U.S.A.)
5 — 208/230-3-60
6 — 460-3-60

LEGEND
Al — Aluminum
Cu — Copper

*380/415-3-60 for unit sizes 054-094 only. Unit sizes 020-044 are 380-3-60.

Quality Assurance

Carrier Corporation UL® REGISTERED FIRM ISO 9001:2000 #A2260

BSI REGISTERED FIRM — NATIONAL ACCREDITATION OF CERTIFICATION BODIES

Certificate No FM 21837

Approvals:
ISO 9001
EN 9000:2000

Physical data

CONDENSER	09DE	09DK				
	016	020	024	028	034	044
RATING (Tons)*	18.4	21.9	25.9	33.3	48.0	56.2
NET WEIGHT (lb)†	465	762	762	944	1438	1589
FAN						
Quantity	2	2	2	2	3	3
Prop. Diam (in.)	24	30	30	30	30	30
Rpm	1075	1140	1140	1140	1140	1140
Total Airflow (cfm)	9600	10,600	13,500	15,700	21,100	23,700
Motor Hp (per fan)	1/2	3/4	3/4	1	1	1
COILS						
Arrangement	Vertical	Horizontal				
Rows...Fins/in.	3...15.6	3...17	3...17	2...19	2...17	3...17
Total Face Area (sq ft)	29.2	23.5	23.5	39.2	58.4	58.4

CONDENSER	09DK				
	054	064	074	084	094
RATING (Tons)*	65.8	78.6	95.4	103.5	116.3
NET WEIGHT (lb)†	1645	1771	2106	2310	2714
FAN					
Quantity	4	4	6	6	6
Prop. Diam (in.)	30	30	30	30	30
Rpm	1140	1140	1140	1140	1140
Total Airflow (cfm)	35,000	35,000	52,000	51,000	57,000
Motor Hp (per fan)	1	1	1	1	1
COILS					
Arrangement	Vertical/Horizontal				
Rows...Fins/in.	2...17	3...17	2...17	3...17	3...17
Total Face Area (sq ft)	80.5	80.5	116.7	116.7	128.3

*Nominal heat rejection based on optimum refrigerant charge of R-22 with 15 F subcooling at 30 F temperature difference.
†Without refrigerant. Weights include copper tubes/aluminum fins.

ESTIMATED RADIATED SOUND POWER LEVEL, dB

UNIT	OCTAVE BAND CENTER FREQUENCY, Hz								
	63	125	250	500	1000	2000	4000	8000	dBa
09DE016	NA	89	86	84	82	76	71	64	86.3
09DK020	92	89	89	88	87	82	78	71	90.1
09DK024	94	91	91	90	88	83	81	74	92.5
09DK028	91	91	90	88	86	82	79	74	90.8
09DK034	92	92	90	88	87	83	80	75	91.5
09DK044	93	93	91	89	88	83	81	76	92.3
09DK054	101	90	94	92	90	88	85	78	95.5
09DK064	101	90	94	92	90	88	85	78	95.5
09DK074	102	96	98	97	93	91	87	80	98.8
09DK084	102	96	98	97	93	91	87	80	98.8
09DK094	102	96	98	97	93	91	87	80	98.8

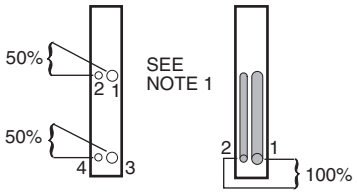
NOTE: Estimated sound power levels, dB re 1 Picowatt.

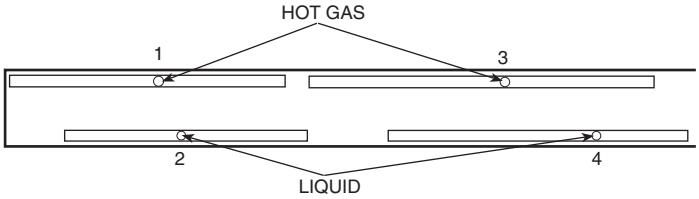
ESTIMATED RADIATED SOUND POWER LEVEL, dB — 09DK054-094 CONDENSERS WITH ACCESSORY SOUND POWER REDUCTION KIT

UNIT	OCTAVE BAND CENTER FREQUENCY, Hz								
	63	125	250	500	1000	2000	4000	8000	dBa
09DK054	96	89	90	89	87	84	80	73	91.7
09DK064	96	89	90	89	87	94	80	73	91.7
09DK074	101	96	94	94	90	87	82	73	95.6
09DK084	101	96	94	94	90	87	82	73	95.6
09DK094	101	96	94	94	90	87	82	73	95.6

NOTE: Estimated sound power levels, dB re 1 Picowatt.

09DE AND 09DK020-034 COIL CONNECTIONS





09DE 50% AND 100% SPLIT

CONDENSER 09DE	COIL CONNECTION		
	Type	No.	Size (in.)
016 50% SPLIT	Hot Gas	1, 3	7/8 ODF
	Liquid	2, 4	5/8 ODF
016 100% SPLIT	Hot Gas	1	1 1/8 ODF
	Liquid	2	5/8 ODF

09DK 50/50% COIL SPLIT

CONDENSER 09DK	COIL CONNECTION		
	Type	No.	Size (in.)
020,024, 028,034	Hot Gas	1, 3	1 1/8 ID
	Liquid	2, 4	5/8 ID

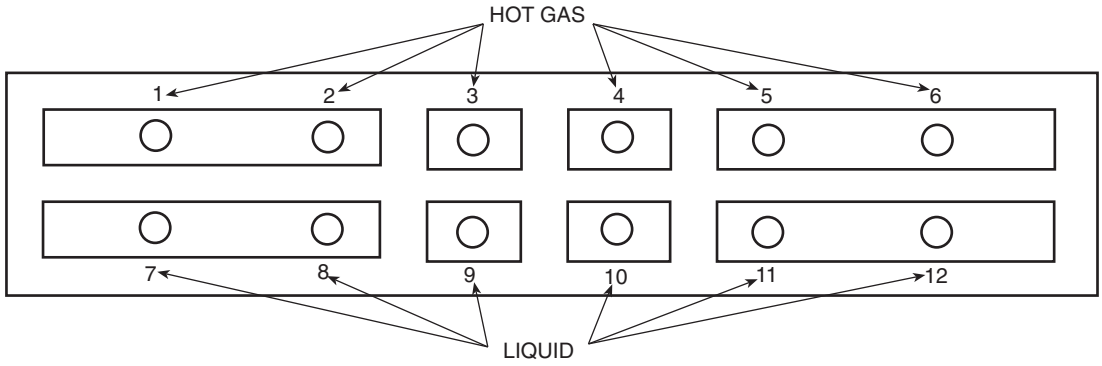
09DK 67/33% COIL SPLIT

CONDENSER 09DK	COIL CONNECTION		
	Type	No.	Size (in.)
020,024	Hot Gas	1	1 1/8 ODM
		3	1 1/8 ODF*
	Liquid	2	1/2 ODF
		4	7/8 ODF

*Street elbow is factory supplied, field installed.

NOTES:
1. Shaded manifolds may be field removed for 50/50 split.
2. All 50/50 splits may be field manifolded into a single 100% circuit.
3. Units may be manifolded to obtain desired coil circuiting.
4. Other circuiting arrangements are available for 09DK units. See the applicable Installation and Service Instructions for details.

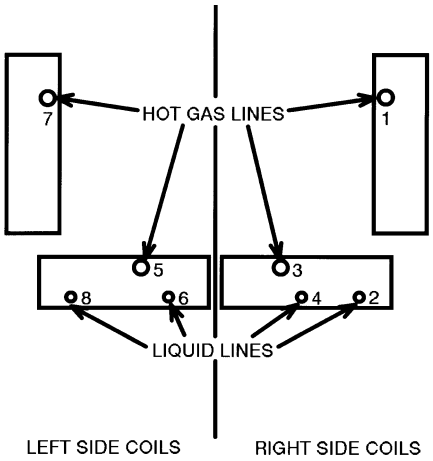
09DK044 COIL CONNECTIONS



PERCENT CAPACITY SPLIT	LINE TYPE	CONNECTION NUMBER	COIL CONNECTION in.-ODM
100	Hot Gas Liquid	1,6/2,3,4,5 7,12/8,9,10,11	1 3/8/1 1/8 7/8/5/8
74/26	Hot Gas Liquid	1,6/3,4 7,12/9,10	1 3/8/1 1/8 7/8/5/8
60/40	Hot Gas Liquid	1/6/3,4,5 7/12/9,10,11	1 3/8/1 3/8/1 1/8 7/8/7/8/5/8
53/47	Hot Gas Liquid	1/6/2,3/4,5 7/12/8,9/10,11	1 3/8/1 3/8 7/8/7/8/5/8/5/8
66/34	Hot Gas Liquid	1/6/2,3,4 7,12/8,9,10	1 3/8/1 3/8/1 1/8 7/8/7/8/5/8
40/13/13/34	Hot Gas Liquid	1/3/4/6 7/9/10/12	1 3/8/1 1/8/1 1/8/1 1/8 7/8/5/8/5/8/7/8

Physical data (cont)

09DK054-084 COIL CONNECTIONS



09DK054,064

PERCENT CAPACITY SPLIT	LINE TYPE	CONNECTION NUMBER	COIL CONNECTION* in.-ODM	TUBING CONNECTION in.-ODM†	
100	Hot Gas Liquid	1,3,5,7 2,4,6,8	1 1/8 7/8	1 5/8 1 7/8	
50/50	Hot Gas Liquid	1,3/5,7 2,4/6,8	1 1/8 7/8	1 3/8 7/8	1 3/8 7/8
66/34	Hot Gas Liquid	1,3,5/7 2,4,6/8	1 1/8 7/8	1 3/8 7/8	1 1/8 7/8
34/34/32	Hot Gas Liquid	1/7/3,5 2/8/4,6	1 1/8 7/8	— —	
34/34/16/16	Hot Gas Liquid	1/7/3/5 2/8/4/6	1 1/8 7/8	— —	

*Connection sizes reflect size of each coil header nozzle.
†A tubing package is factory supplied to facilitate field piping installation for the 100%, 50/50%, and 67/33% capacity split applications. See installation instructions for more information.

09DK074

PERCENT CAPACITY SPLIT	LINE TYPE	CONNECTION NUMBER	COIL CONNECTION* in.-ODM	TUBING CONNECTION in.-ODM†	
100	Hot Gas Liquid	1,3,5,7 2,4,6,8	1 3/8 7/8	2 1/8 1 1/8	
50/50	Hot Gas Liquid	1,3/5,7 2,4/6,8	1 3/8 7/8	1 5/8 7/8	1 5/8 7/8
68/32	Hot Gas Liquid	1,3,5/7 2,4,6/8	1 3/8 7/8	1 5/8 1 1/8	1 3/8 7/8
32/32/36	Hot Gas Liquid	1/7/3,5 2/8/4,6	1 3/8 7/8	— —	
32/32/18/18	Hot Gas Liquid	1/7/3/5 2/8/4/6	1 3/8 7/8	— —	

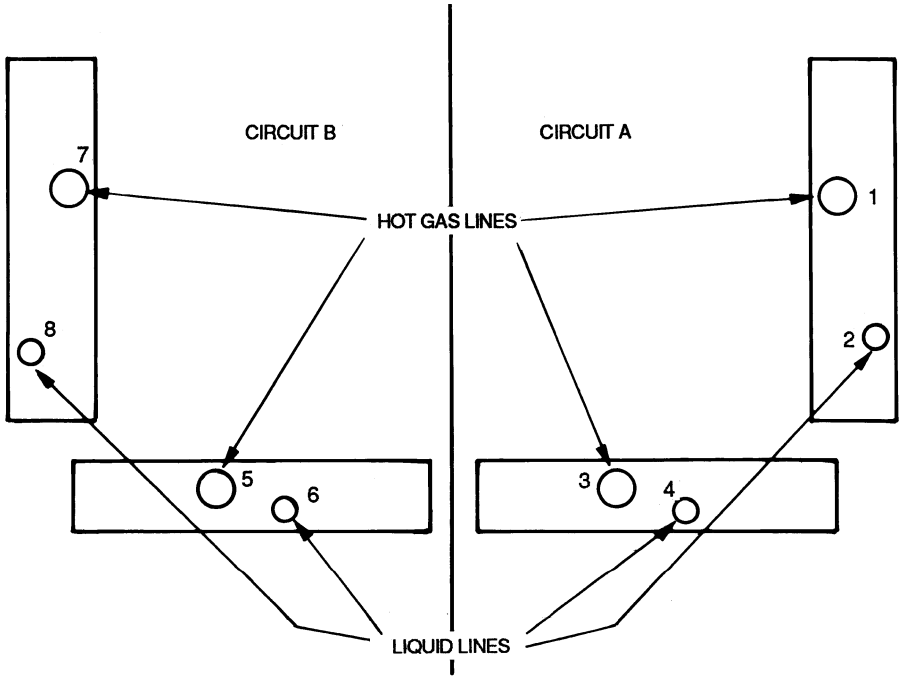
*Connection sizes reflect size of each coil header nozzle.
†A tubing package is factory supplied to facilitate field piping installation for the 100%, 50/50%, and 67/33% capacity split applications. See installation instructions for more information.

09DK084

PERCENT CAPACITY SPLIT	LINE TYPE	CONNECTION NUMBER	COIL CONNECTION* in.-ODM	TUBING CONNECTION in.-ODM†	
100	Hot Gas Liquid	1,3,5,7 2,4,6,8	1 3/8 7/8	2 1/8 1 1/8	
50/50	Hot Gas Liquid	1,3/5,7 2,4/6,8	1 3/8 7/8	1 5/8 7/8	1 5/8 7/8
67/33	Hot Gas Liquid	1,3,5/7 2,4,6/8	1 3/8 7/8	1 5/8 1 1/8	1 3/8 7/8
33/33/33	Hot Gas Liquid	1/7/3,5 2/8/4,6	1 3/8 7/8	— —	
33/33/17/17	Hot Gas Liquid	1/7/3/5 2/8/4/6	1 3/8 7/8	— —	

*Connection sizes reflect size of each coil header nozzle.
†A tubing package is factory supplied to facilitate field piping installation for the 100%, 50/50%, and 67/33% capacity split applications. See installation instructions for more information.

09DK094 COIL CONNECTIONS

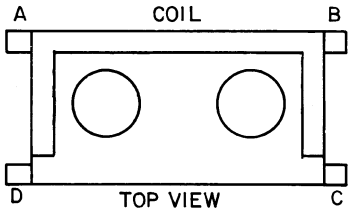


PERCENT CAPACITY SPLIT	LINE TYPE	COIL CONNECTION NUMBER	COIL CONNECTION in.-ODM*	TUBING CONNECTION in.-ODM†
100	Hot Gas Liquid	1,3,5,7 2,4,6,8	$1\frac{3}{8}$ $\frac{7}{8}$	$2\frac{1}{8}$ $1\frac{1}{8}$
50/50	Hot Gas Liquid	1,3/5,7 2,4/6,8	$1\frac{3}{8}$ $\frac{7}{8}$	$1\frac{5}{8}/1\frac{5}{8}$ $\frac{7}{8}/\frac{7}{8}$

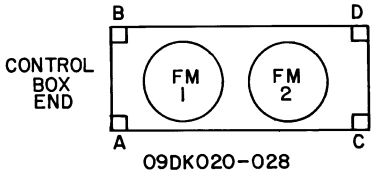
*Connection sizes reflect size of each coil header nozzle.
†A tubing package is factory supplied to facilitate field piping installation for the 100% capacity split applications. See installation instructions for more information.

Physical data (cont)

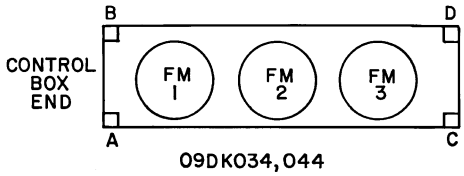
WEIGHT DISTRIBUTION (Lb)



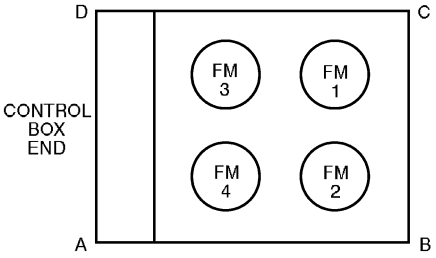
09DE016



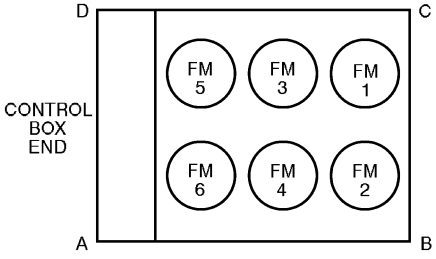
09DK020-028



09DK034,044



09DK054,064



09DK074-094

UNIT	COIL TYPE	TOTAL WEIGHT (lb)	OPERATING CORNER WEIGHTS			
			A	B	C	D
09DE						
016	Cu/Al	465	122	120	111	112
	Cu/Cu	605	159	156	144	146
09DK						
020, 024	Cu/Al	797	186	186	212	212
	Cu/Cu	921	215	215	245	245
028	Cu/Al	983	299	229	262	262
	Cu/Cu	1137	268	268	300	300
034	Cu/Al	1495	349	349	399	399
	Cu/Cu	1700	396	396	454	454
044	Cu/Al	1676	391	391	447	447
	Cu/Cu	1984	462	462	529	529

UNIT 09DK	COIL TYPE	TOTAL WEIGHT (lb)	OPERATING CORNER WEIGHTS			
			A	B	C	D
054	Cu/Al	1695	452	425	396	422
	Cu/Cu	1983	524	497	468	494
064	Cu/Al	1845	489	462	434	459
	Cu/Cu	2278	598	571	542	568
074	Cu/Al	2200	618	526	486	571
	Cu/Cu	2617	722	630	589	675
084	Cu/Al	2421	673	581	541	626
	Cu/Cu	3099	843	751	709	796
094	Cu/Al	2850	769	676	658	747
	Cu/Cu	3560	960	845	821	934

LEGEND

Al — Aluminum
Cu — Copper
FM — Fan Motor

REFRIGERANT CIRCUIT DATA

CONDENSER	09DE	09DK												
	016	020,024				028					034				
COIL															
No. of Circuits*	2	2	1	1	2	1	1	2	1	2	1	1	2	1
Cap. (%/ckt)	50	50	67	33	50	60	40	40	20	50	60	40	40	20
REFRIGERANT														
Min Chg (lb/ckt)	4.75	10.59	14.12	7.06	11.77	14.12	9.41	9.41	4.71	17.53	21.04	14.03	14.03	7.01
Opt Chg (lb/ckt)	6.00	12.46	16.61	8.31	13.84	16.61	11.08	11.08	5.54	20.63	24.76	16.50	16.50	8.25
Vol (cu ft/ckt)	0.39	0.30	0.40	0.20	0.33	0.40	0.26	0.26	0.14	0.49	0.59	0.39	0.39	0.20
STORAGE CAP. (lb/ckt)†														
R-12	24.3	19.2	25.7	12.7	21.1	25.3	16.9	16.9	8.4	31.3	37.6	25.0	25.0	12.5
R-22	22.1	17.5	23.3	11.7	19.3	23.2	15.4	15.4	7.7	28.7	34.4	23.0	23.0	11.5
R-500	21.4	16.5	22.1	10.9	18.2	21.8	14.5	14.5	7.3	26.9	32.3	21.5	21.5	10.8
R-502	22.5	18.3	24.5	12.1	20.2	24.2	16.1	16.1	8.1	29.9	35.9	23.9	23.9	12.0
R-134a	24.3	19.2	25.7	12.7	21.1	25.3	16.9	16.9	8.4	31.3	37.6	25.0	25.0	12.5

CONDENSER	09DK										
	044										
COIL											
No. of Circuits*	1	1	2	1	1	1	1	1	1	1	1
Cap. (%/ckt)	40	34	13	73	27	67	33	60	40	53	47
REFRIGERANT											
Min Chg (lb/ckt)	21.04	17.36	6.84	38.40	14.20	35.07	17.53	31.56	21.04	27.88	24.72
Opt Chg (lb/ckt)	24.75	20.62	8.25	45.17	16.71	41.25	20.62	37.13	24.75	32.80	29.08
Vol (cu ft/ckt)	0.60	0.52	0.19	1.09	0.40	1.0	0.49	0.89	0.60	0.79	0.70
STORAGE CAP. (lb/ckt)†											
R-12	38.1	32.4	12.4	69.6	25.7	64.0	31.3	57.2	38.1	50.5	44.8
R-22	34.8	29.6	11.3	63.6	23.5	58.1	29.0	52.3	34.8	46.2	40.9
R-500	32.8	27.8	10.6	59.8	22.1	54.6	27.3	49.1	32.8	43.4	38.4
R-502	36.4	31.0	11.8	66.5	24.6	51.0	30.1	54.7	36.4	48.3	42.8
R-134a	38.1	32.4	12.4	69.6	25.7	64.0	31.3	57.2	38.1	50.5	44.8

CONDENSER	09DK							
	054				064			
COIL								
No. of Circuits*	2	1	1	2	2	1	2	2
Cap. (%/ckt)	50	66	34	16	50	66	34	16
REFRIGERANT								
Min Chg (lb/ckt)	24.0	32.0	16.0	8.0	36.0	48.0	25.0	11.0
Opt Chg (lb/ckt)	28.0	37.0	19.0	9.0	43.0	56.0	29.0	13.0
Vol (cu ft/ckt)	0.68	0.89	0.46	0.21	1.01	1.32	0.69	0.32
STORAGE CAP. (lb/ckt)†								
R-12	43.0	57.0	30.0	14	64.0	85.0	44.0	20.0
R-22	40.0	52.0	27.0	12	59.0	78.0	40.0	19.0
R-500	37.0	49.0	26.0	12	55.0	73.0	38.0	17.0
R-502	41.0	55.0	28.0	13	61.0	81.0	42.0	19.0
R-134a	43.0	57.0	30.0	14	64.0	85.0	44.0	20.0

CONDENSER	09DK								
	074				084				094
COIL									
No. of Circuits*	2	1	2	2	2	1	2	2	2
Cap. (%/ckt)	50	68	32	18	50	67	33	17	50
REFRIGERANT									
Min Chg (lb/ckt)	35.0	48.0	22.0	12.0	52.0	70.0	35.0	17.0	57.8
Opt Chg (lb/ckt)	41.0	56.0	26.0	15.0	62.0	82.0	41.0	21.0	68.0
Vol (cu ft/ckt)	0.97	1.32	0.62	0.35	1.46	1.95	0.97	0.49	1.64
STORAGE CAP. (lb/ckt)†									
R-12	63.0	85.0	40.0	22.0	95.0	127.0	63.0	32.0	104.7
R-22	57.0	78.0	37.0	21.0	87.0	116.0	58.0	29.0	95.7
R-500	54.0	74.0	35.0	19.0	82.0	109.0	55.0	27.0	90.0
R-502	60.0	82.0	39.0	21.0	91.0	121.0	61.0	30.0	100.1
R-134a	63.0	85.0	40.0	22.0	95.0	127.0	63.0	32.0	104.7

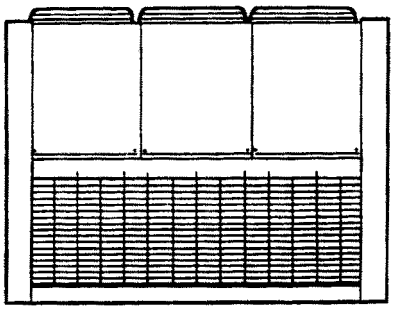
*See pages 4-7 for circuiting arrangements.
†Storage capacity calculated for 80% liquid and 20% vapor at 90 F.

Options and accessories

OPTION/ACCESSORY	FOR USE WITH	OPTION	ACCESSORY
EnviroShield™ Condenser Coil	09DE,09DK	X	
Motormaster® I Head Pressure Control	09DE016 09DK020-044		X
Coil Grille	09DE016		X
Fan Cycling Control	09DE016 09DK020-044		X
Fan Sound Reduction Kit	09DK054-094		X
Security Grille Package	09DK054-094		X
Control Transformer	09DK054-094		X
Condenser Coil Hail Guard	09DK054-094		X
Motormaster V Head Pressure Control	09DK054-094		X

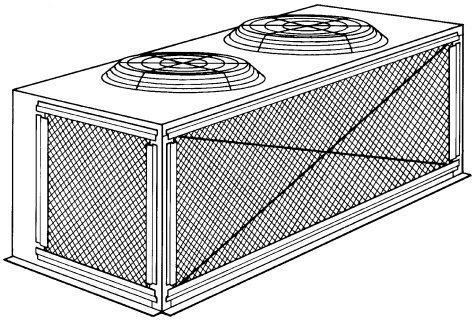
SECURITY GRILLE
(09DK054-094: 09DK074,084 SHOWN)

SIDE VIEW



The security grilles protect the condenser coils from debris or vandalism after the unit has been installed. Upper condenser coil grilles are available to protect vertical coils. Lower end and side grilles are available to protect the area beneath the coils.

COIL GRILLE
(09DE016)

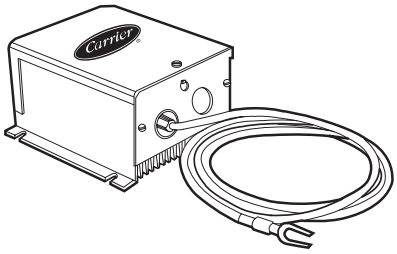


Protects coil from external damage and prevents leaves and other debris from entering fins (available for field installation on 09DE016 only).

FAN CYCLING CONTROL

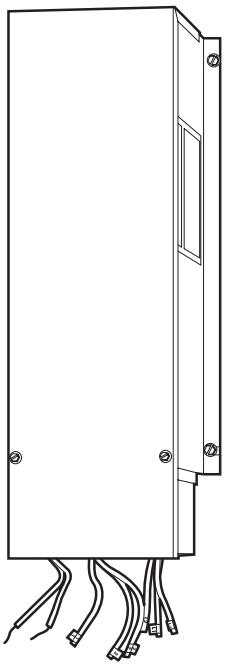
During intermediate seasons, proper condensing temperature is controlled by fan control packages which permit shutoff of one or 2 condenser fans. These packages are also required when using the Motormaster head pressure control (09DE016, 09DK020-044 units).

MOTORMASTER I
HEAD PRESSURE CONTROL
(09DE, 09DK020-044)



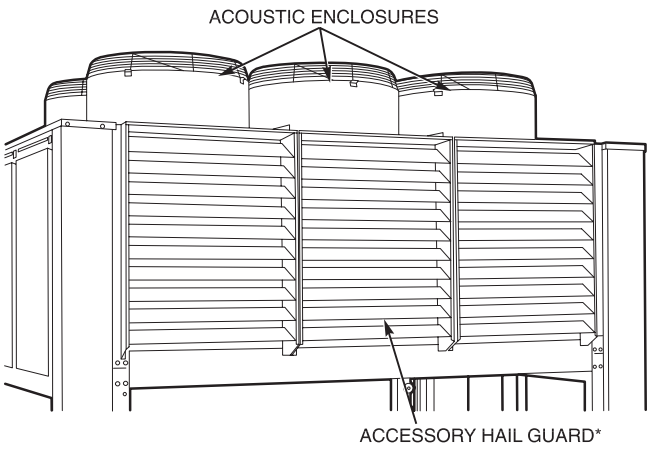
This exclusive solid-state device automatically modulates fan speed from full to zero rpm to maintain proper condensing temperature at low ambient temperature conditions to –20 F.

MOTORMASTER V
HEAD PRESSURE CONTROL
(09DK054-094)



The Motormaster V head pressure control is used to permit low ambient operation down to –20 F by modulating the fan speed on each of the primary fans (1 and 2). The standard factory-installed motors are compatible with the Motormaster V control.

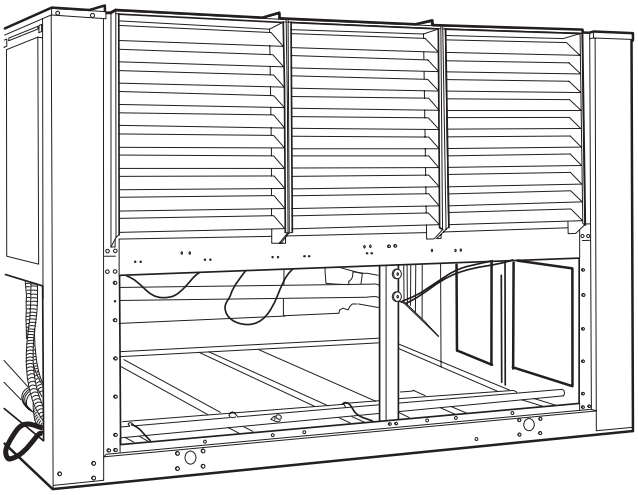
FAN SOUND REDUCTION KIT (09DK054-094)



*Hail guard not required.

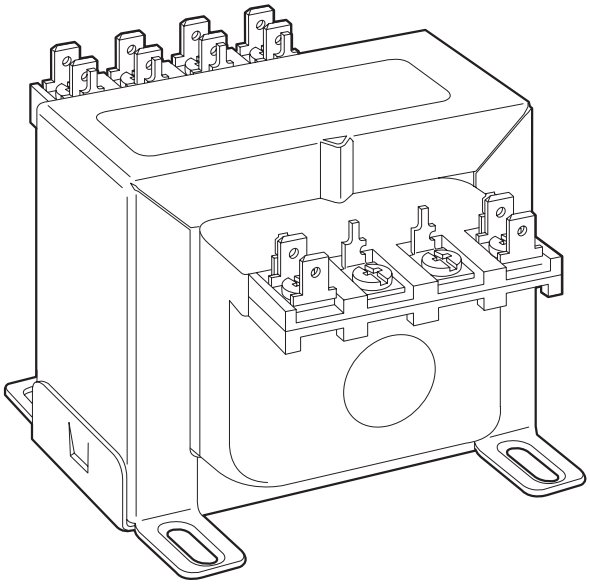
The fan sound reduction kit consists of a specially designed system of fans and acoustic enclosures for reducing sound levels without compromising unit performance. A fan motor change is not required and the fan system is compatible with Motormaster® V device. Two kits are required for the 09DK054,064 units and three kits are required for the 09DK074-094 units.

CONDENSER COIL HAIL GUARD (09DK054-094)



This accessory protects the coils against damage from hail and other flying debris. Two packages are required for 09DK054 and 064 and three packages required for 09DK074-094.

CONTROL TRANSFORMER (09DK054-094)



The control transformer is used to convert 200-208/230/460 v to 115 v for use on 115-v control systems, utilizing power from the main unit power connection.

***Enviro-Shield*™ condenser options —** Several options are available to match coil protection to site conditions for optimum durability. See table below and refer to the Application Data for selection guidance. Consult your Carrier representative for further information.

CONDENSER COIL OPTIONS

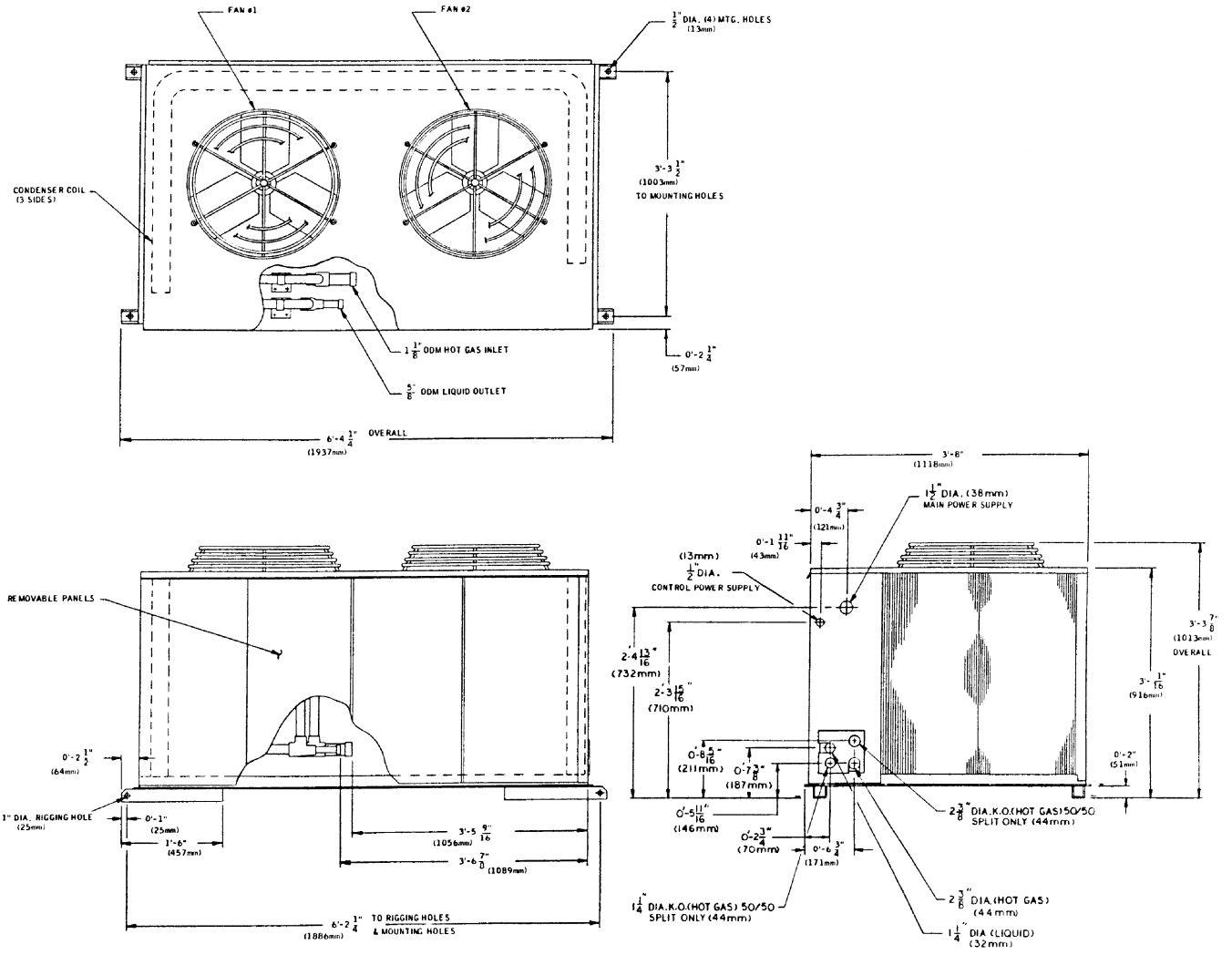
COPPER-TUBE COILS WITH *ENVIRO-SHIELD* OPTION*	ENVIRONMENT					
	Standard	Mild Coastal	Moderate Coastal	Severe Coastal	Industrial	Combined Industrial/ Coastal
Al Fins (Standard Coils)	X					
Cu Fins			X			
Al Fins, E-Coated					X	
Cu Fins, E-Coated				X		X
Al Fins, Pre-coated		X				

LEGEND

Al — Aluminum
Cu — Copper
E-Coated — Epoxy Coating Applied to Entire Coil Assembly
Enviro-Shield — Family of Coil Protection Options
Pre-Coated — Epoxy Coating Applied to Fin Stock Material

Base unit dimensions

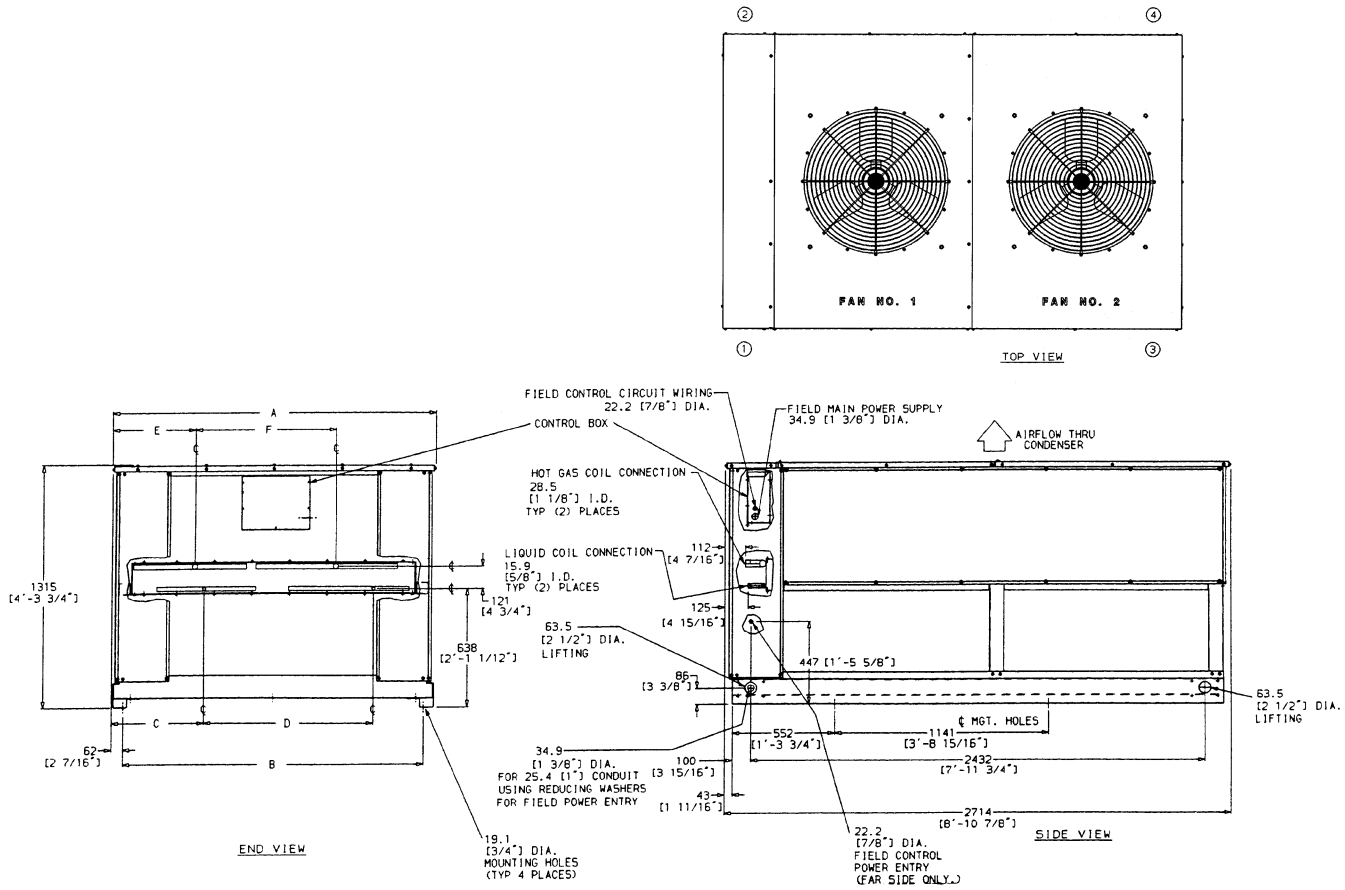
09DE016



UNIT	WEIGHT
09DE016	465 lb (211 kg)

NOTE: See page 28 for service clearances.

09DK020-028



UNIT	A	B	C	D	E	F
09DK-020, 024	1131	1007	240	432	228	559
09DK-020C, 024C	[3′-8 1/2″]	[3′-3 11/16″]	[9′- 7/16″]	[1′-5″]	[0′-9″]	[1′-10″]
09DK-028	1742	1619	496	914	445	762
09DK-028C	[5′-8 5/8″]	[5′-3 3/4″]	[1′-7 9/16″]	[3′-0″]	[1′-5 1/2″]	[2′-6″]

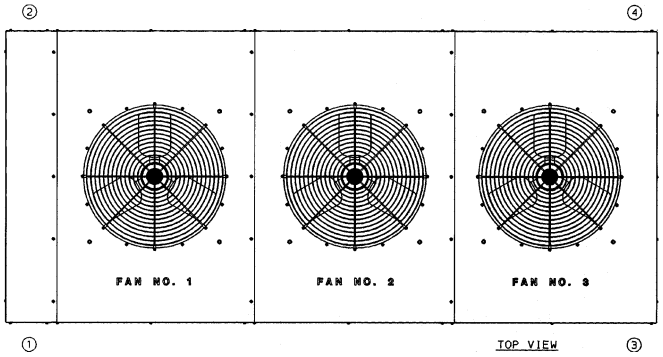
NOTES:
1. There must be 1220 mm [4′-0″] for service and for unrestricted airflow on all sides of unit.
2. There must be minimum 2440 mm [8′-0″] clear air space above unit.
3. Dimensions are in millimeters. Dimensions in [ ] are in ft-in.
4. The approximate operating weight of the unit is as follows:

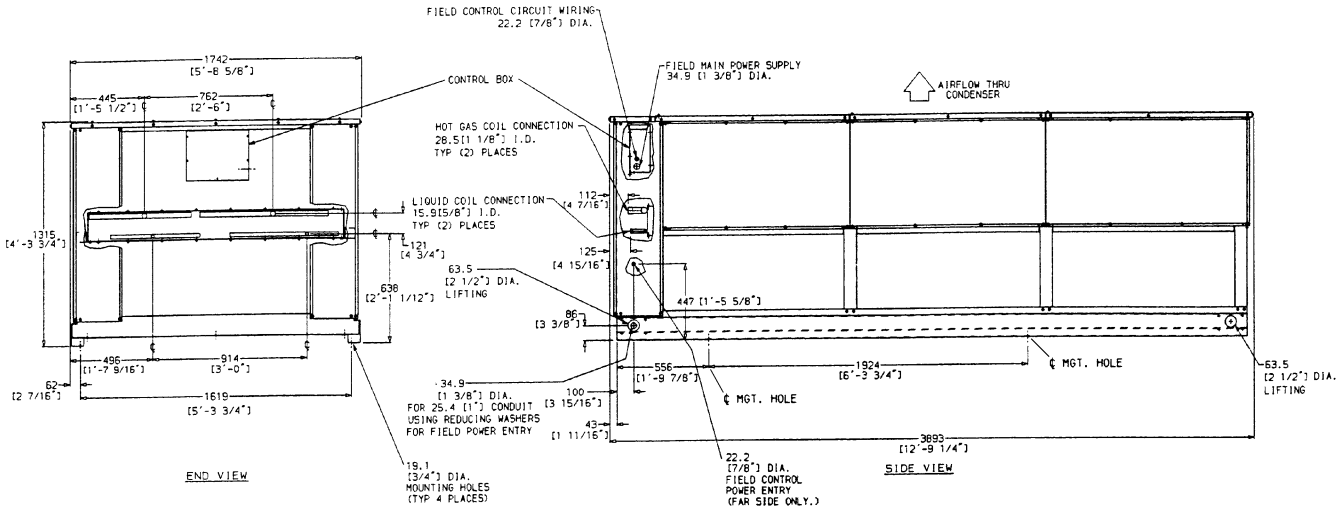
UNIT	TOTAL		OPERATING WT. AT SUPPORT POINTS			
			① and ②		③ and ④	
	Wt lb	**Wt kg**	**Wt lb**	**Wt kg**	**Wt lb**	**Wt kg**
09DK-020, 024	797	361.5	186	84.4	212	96.2
09DK-020C, 024C	921	417.8	215	97.5	245	111.1
09DK-028	983	445.9	229	103.9	262	118.8
09DK-028C	1137	515.7	268	121.6	300	136.1

5. The letter C after model size refers to copper tube/copper fin coils.

Base unit dimensions (cont)

09DK034



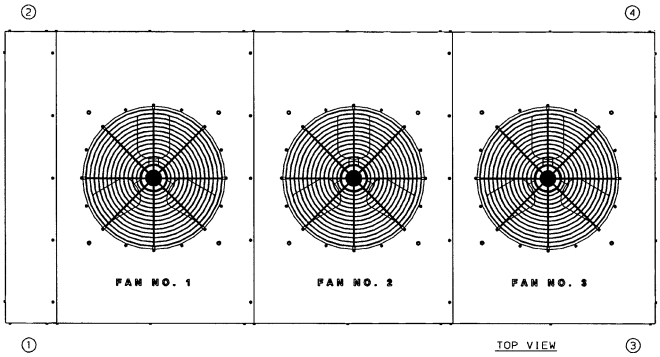


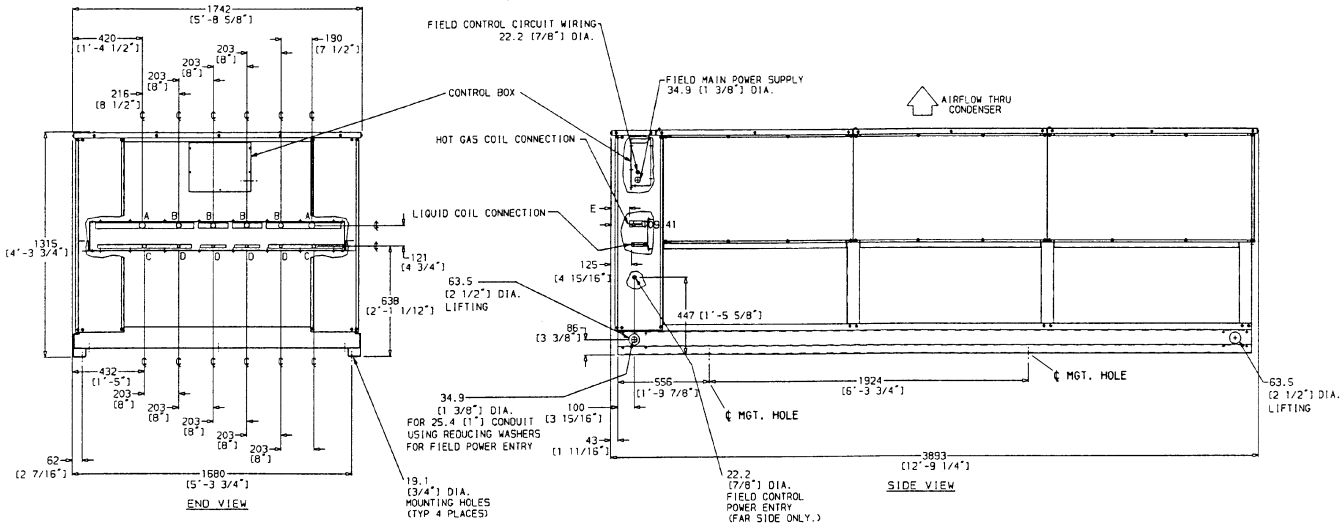
NOTES:
1. There must be 1220 mm [4′-0″] for service and for unrestricted airflow on all sides of unit.
2. There must be minimum 2440 mm [8′-0″] clear air space above unit.
3. Dimensions are in millimeters. Dimensions in [ ] are in ft-in.
4. The approximate operating weight of the unit is as follows:

UNIT	TOTAL		OPERATING WT. AT SUPPORT POINTS			
			① and ②		③ and ④	
	Wt lb	Wt kg	Wt lb	Wt kg	Wt lb	Wt kg
09DK-034	1495	678.1	349	158.3	399	181.0
09DK-034C	1700	771.1	396	179.6	454	205.9

5. The letter C after model size refers to copper tube/copper fin coils.

09DK044





UNIT	A	B	C	D	E
09DK-044	34.9 ID [1 3/8"]	28.5 ID [1 1/8"]	22.2 ID [7/8"]	15.9 ID [5/8"]	See Note 4
09DK-044C					

NOTES:
1. There must be 1220 mm [4′-0″] for service and for unrestricted airflow on all sides of unit.
2. There must be minimum 2440 mm [8′-0″] clear air space above unit.
3. Dimensions are in millimeters. Dimensions in [ ] are in ft-in.
4. Dimension “E” for 34.9 mm ID is 118 mm [4 5/8″].
   Dimension “E” for 28.5 mm ID is 112 mm [4 7/8″].
5. The approximate operating weight of the unit is as follows:

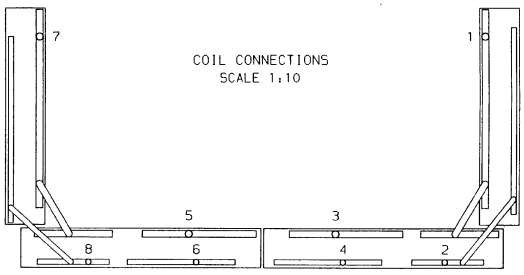
UNIT	TOTAL		OPERATING WT. AT SUPPORT POINTS			
			① and ②		③ and ④	
	Wt lb	**Wt kg**	**Wt lb**	**Wt kg**	**Wt lb**	**Wt kg**
09DK-044	1676	760.2	391	177.4	447	202.8
09DK-044C	1984	900.0	462	209.6	529	240.0

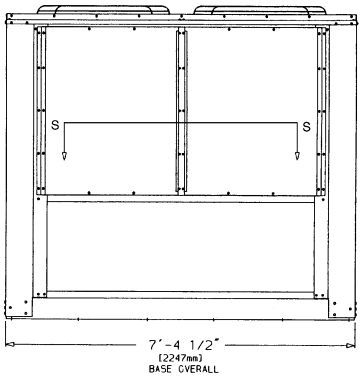
6. The letter C after model size refers to copper tube/copper fin coils.

Base unit dimensions (cont)

09DK054,064 (SEE PAGE 19 FOR POWER WIRING ACCESS HOLES)

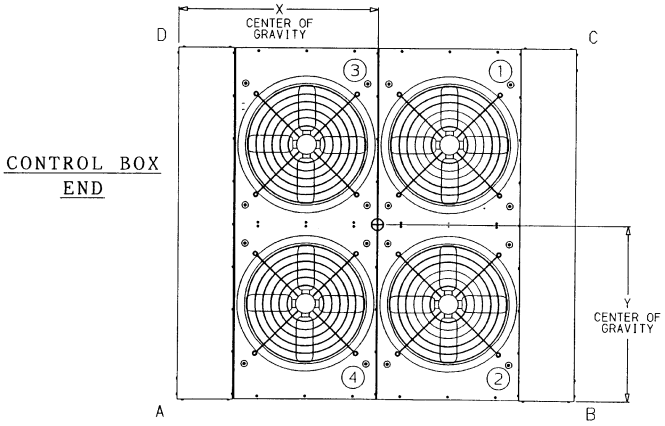
NOTES:
1. The approximate operating weight of the unit is:
   09DK-054 — 1695 lb [769 kg]
   09DK-054C — 1983 lb [900 kg]
   09DK-064 — 1845 lb [837 kg]
   09DK-064C — 2278 lb [1033 kg]
2. Unit must have clearances for airflow as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
3. All units are shipped with a capacity split tubing kit. This kit may be used by the field to obtain 100%, 50/50% and 66/34% capacity splits. To obtain a 34/34/32% capacity split, coils must be manifolded by the field. Coils are factory circuited for a 34/34/16/16% capacity split.
4. The letter C after model size refers to copper tube/copper fin coils.

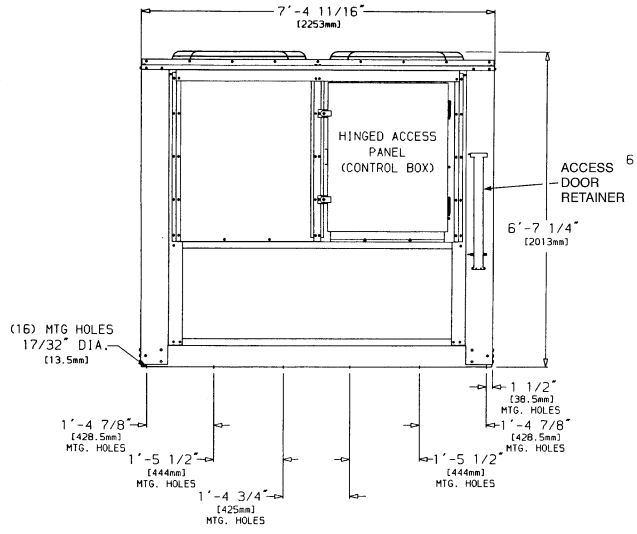


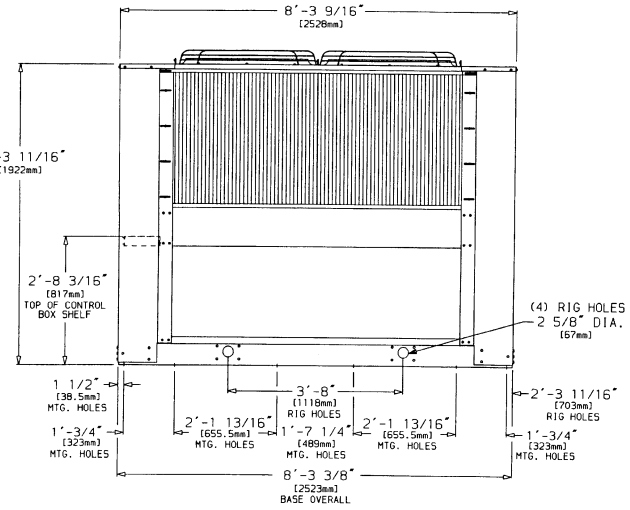


UNIT	DIMENSION Y	DIMENSION X	OPERATING CORNER WEIGHTS			
			A	B	C	D
09DK-054	3′-6 11/16″ [1084 mm]	4′-1/8″ [1222 mm]	452 lb [205 kg]	425 lb [193 kg]	396 lbs [180 kg]	422 lb [191 kg]
09DK-054C	3′-6 7/8″ [1090 mm]	4′-5/16″ [1227 mm]	524 lb [238 kg]	497 lb [225 kg]	468 lbs [212 kg]	494 lb [224 kg]
09DK-064	3′-6 3/4″ [1087 mm]	4′-3/16″ [1224 mm]	489 lb [222 kg]	462 lb [210 kg]	434 lbs [197 kg]	459 lb [208 kg]
09DK-064C	3′-7 1/8″ [1095 mm]	4′-1/2″ [1232 mm]	598 lb [271 kg]	571 lb [259 kg]	542 lbs [246 kg]	568 lb [258 kg]

CAPACITY SPLIT	CONNECTIONS					
	Type	Number				Size
100%	Hot Gas	1, 3, 5, 7				1 1/8″ ID
	Liquid	2, 4, 6, 8				7/8″ ID
50/50%	Hot Gas	1, 3		5, 7		1 1/8″ ID
	Liquid	2, 4		6, 8		7/8″ ID
66/34%	Hot Gas	1, 3, 5		7		1 1/8″ ID
	Liquid	2, 4, 6		8		7/8″ ID
34/34/32%	Hot Gas	1	7		3, 5	1 1/8″ ID
	Liquid	2	8		4, 6	7/8″ ID
34/34/16/16%	Hot Gas	1	7	3	5	1 1/8″ ID
	Liquid	2	8	4	6	7/8″ ID

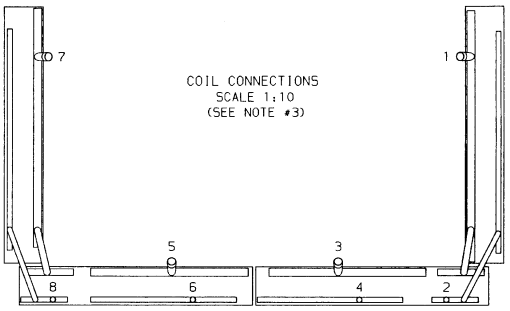


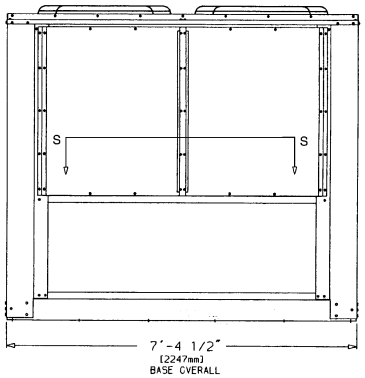




09DK074,084 (SEE PAGE 19 FOR POWER WIRING ACCESS HOLES)

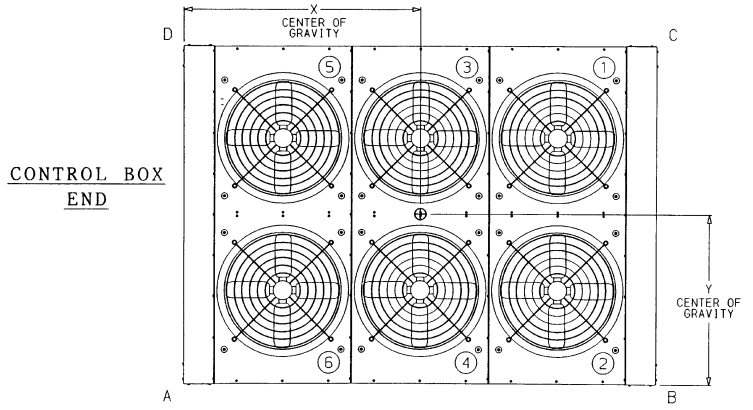
NOTES:
1. The approximate operating weight of the unit is:
   09DK-074 — 2200 lb [998 kg]
   09DK-074C — 2617 lb [1187 kg]
   09DK-084 — 2421 lb [1098 kg]
   09DK-084C — 3099 lb [1406 kg]
2. Unit must have clearances for airflow as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
3. All units are shipped with a capacity split tubing kit. This kit may be used by the field to obtain 100%, 50/50% and 66/33% capacity splits. To obtain a 33/33/33% capacity split, coils must be manifolded by the field. Coils are factory circuited for a 33/33/17/17% capacity split.
4. The letter C after model size refers to copper tube/copper fin coils.

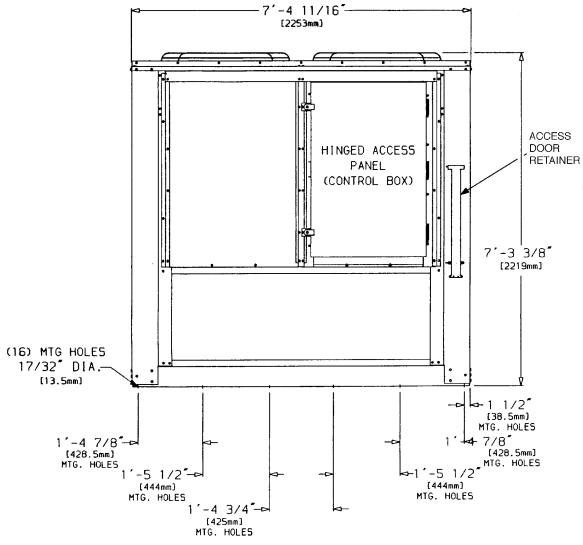


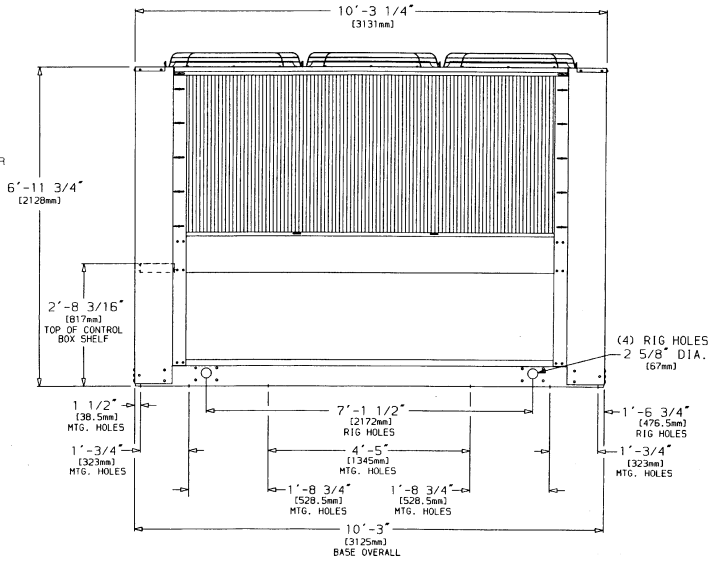


UNIT	DIMENSION Y	DIMENSION X	OPERATING CORNER WEIGHTS			
			A	B	C	D
09DK-074	3′-6 1/2″ [1080 mm]	4′- 8 11/16″ [1440 mm]	618 lb [280 kg]	526 lb [239 kg]	486 lbs [220 kg]	571 lb [259 kg]
09DK-074C	3′-6 13/16″ [1087 mm]	4′- 9 3/8″ [1458 mm]	722 lb [328 kg]	630 lb [286 kg]	589 lbs [267 kg]	675 lb [306 kg]
09DK-084	3′-6 5/8″ [1082 mm]	4′- 9 1/8″ [1450 mm]	673 lb [305 kg]	581 lb [264 kg]	541 lbs [245 kg]	626 lb [284 kg]
09DK-084C	3′-7″ [1092 mm]	4′-10 1/8″ [1476 mm]	843 lb [382 kg]	751 lb [341 kg]	709 lbs [322 kg]	796 lb [361 kg]

CAPACITY SPLIT	CONNECTIONS					
	Type	Number				Size
100%	Hot Gas	1, 3, 5, 7				1 3/8″ ID
	Liquid	2, 4, 6, 8				7/8″ ID
50/50%	Hot Gas	1, 3		5, 7		1 3/8″ ID
	Liquid	2, 4		6, 8		7/8″ ID
67/33%	Hot Gas	1, 3, 5		7		1 3/8″ ID
	Liquid	2, 4, 6		8		7/8″ ID
33/33/33%	Hot Gas	1	7	3, 5		1 3/8″ ID
	Liquid	2	8	4, 6		7/8″ ID
33/33/17/17%	Hot Gas	1	7	3	5	1 3/8″ ID
	Liquid	2	8	4	6	7/8″ ID

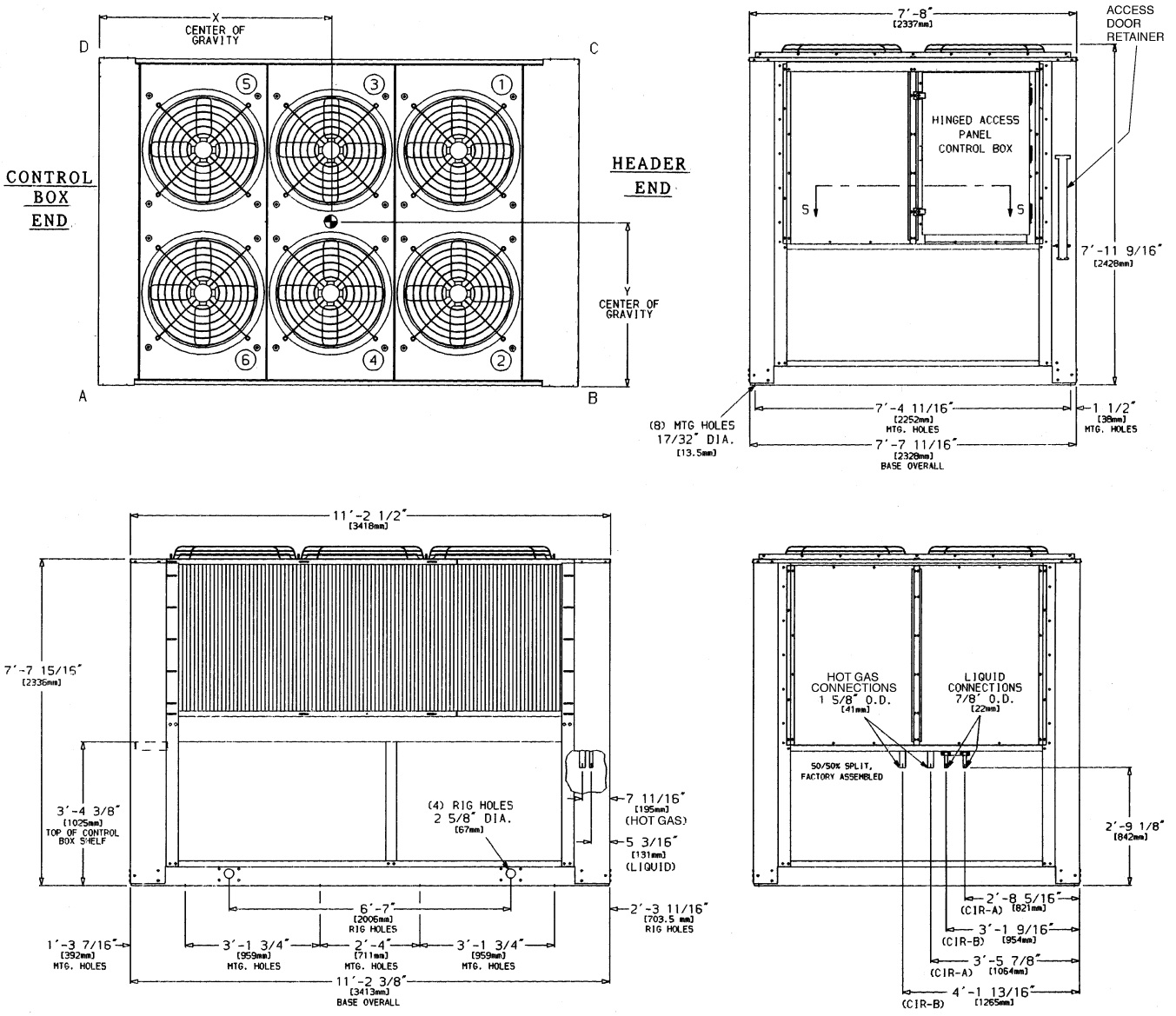






Base unit dimensions (cont)

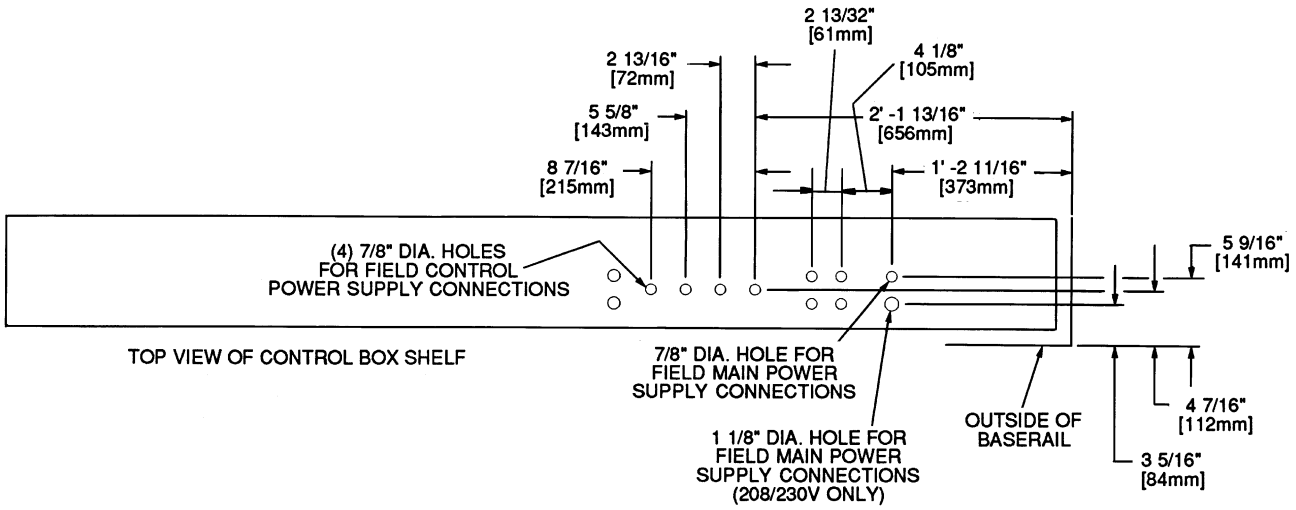
09DK094 (SEE PAGE 19 FOR POWER WIRING ACCESS HOLES)



UNIT	DIMENSION Y	DIMENSION X	OPERATING CORNER WEIGHTS			
			A	B	C	D
09DK-094	5′-2 7/8″ [1597 mm]	3′-9 3/16″ [1148 mm]	769 lb [349 kg]	676 lb [307 kg]	658 lbs [299 kg]	747 lb [399 kg]
09DK-094C	5′-2 7/8″ [1597 mm]	3′-9 3/16″ [1148 mm]	960 lb [436 kg]	845 lb [383 kg]	821 lbs [372 kg]	934 lb [424 kg]

NOTES:
1. The approximate operating weight of the unit is:
   09DK-094 — 2850 lb [1293 kg]
   09DK-094C — 3560 lb [1615 kg]
2. Unit must have clearances for airflow as follows:
   Top— Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
3. Mounting holes may be used to mount unit to concrete pad. They are not recommended for mounting unit to spring isolators. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. The letter C after model size refers to copper tube/copper fin coils.

POWER WIRING ACCESS HOLES, 09DK054-094 UNITS



Selection procedure (with example)

I Select minimum or maximum charge ratings.

List the refrigerant, total heat rejection (THR), suction and discharge temperatures as determined from compressor data.

II Determine condensing temperature (saturated discharge temperature minus discharge line loss).

III Determine temperature difference (condensing temperature minus entering-air temperature).

IV Enter Condenser Ratings table (minimum or maximum charge as determined in Step 1) at selected refrigerant and established temperature difference (TD).

Read across to total heat rejection equal to or greater than required. Interpolate if necessary. Read unit size.

EXAMPLE: (Maximum Charge)

Given:

R-22, Maximum Charge
THR (including subcooling). . . . . .29.4 Tons
Saturated Discharge Temperature. . . . . 123.8 F
Saturated Suction Temperature . . . . . .40 F
Entering-Air Temperature . . . . . .95 F
Discharge Line Loss . . . . . .2 F

Cond Temp = 123.8 F –2 F = 121.8 F

TD = 121.8 F –95 F = 26.8 F

Interpolate in Condenser Ratings table (maximum charge) and obtain capacity of 09DK028 as 29.8 tons and 09DK024 as 23.1 tons. Select the 09DK028.

EXAMPLE: (Minimum Charge)

Given:

R-22, Minimum Charge
THR . . . . . .15.6 Tons
Saturated Discharge Temperature. . . . . .122 F
Saturated Suction Temperature . . . . . .40 F
Entering-Air Temperature . . . . . .95 F
Discharge Line Loss . . . . . .2 F

Cond Temp = 122 F –2 F = 120 F

TD = 120 F –95 F = 25 F

Enter Condenser Ratings table (minimum charge) and select 09DE016 with 15.9 tons THR.

Performance data

Condenser ratings

MINIMUM REFRIGERANT CHARGE (5 F Subcooling)

REFRIG	TD*	TOTAL HEAT REJECTION (Tons)										
		09DE	09DK									
		016	020	024	028	034	044	054	064	074	084	094
12 and 500	10	5.9	7.1	8.4	10.8	13.9	17.3	21.6	24.5	31.1	33.7	37.4
	15	8.8	10.6	12.6	16.2	20.9	26.0	32.1	38.2	46.4	50.2	56.1
	20	11.7	14.3	16.7	21.5	27.8	34.9	42.6	50.6	61.6	66.6	74.7
	25	14.7	17.7	20.9	27.0	34.9	43.3	52.9	63.1	76.6	83.0	93.2
	30	17.6	21.3	25.2	32.3	41.7	52.0	63.3	75.6	91.7	99.4	111.8
	35	20.5	24.9	29.3	37.8	48.8	60.7	74.1	88.2	106.9	116.0	130.6
	40	23.5	28.2	33.4	43.1	55.7	69.4	84.5	100.5	122.2	132.4	149.1
22 and 502	10	6.4	7.5	9.0	11.7	15.1	19.8	23.5	26.6	33.8	36.7	40.7
	15	9.6	11.3	13.5	17.5	22.6	29.7	34.9	41.5	50.5	54.6	61.0
	20	12.7	15.4	18.1	23.2	30.0	39.2	46.4	55.1	67.0	72.5	81.3
	25	15.9	19.2	22.6	29.2	37.6	49.0	57.7	68.8	83.6	90.5	101.7
	30	19.1	23.0	27.2	35.0	45.1	59.0	69.1	82.5	100.1	108.5	122.0
	35	22.3	26.9	31.6	40.8	52.6	68.9	80.7	96.1	116.5	126.4	142.3
	40	25.5	30.5	36.1	46.6	60.2	78.7	92.2	109.7	133.3	144.5	162.7

REFRIG	TD*	TOTAL HEAT REJECTION (Tons)									
		09DK									
		020	024	028	034	044	054	064	074	084	094
134a	10	7.3	8.7	11.4	14.7	19.2	22.8	25.8	32.8	35.6	39.5
	15	11.0	13.1	17.0	22.0	28.8	33.9	40.3	49.0	53.0	59.2
	20	14.9	17.6	22.5	29.1	38.0	45.0	53.5	65.0	70.4	78.9
	25	18.6	21.9	28.3	36.5	47.6	56.0	66.8	81.1	87.8	98.7
	30	22.3	26.4	34.0	43.8	57.3	67.1	80.1	97.2	105.3	118.4
	35	26.1	30.7	39.6	51.0	66.9	78.3	93.3	113.1	122.7	138.2
	40	29.6	35.0	45.2	58.4	76.4	89.5	106.5	129.4	140.3	157.9

MAXIMUM REFRIGERANT CHARGE (15 F Subcooling)

REFRIG	TD*	TOTAL HEAT REJECTION (Tons)										
		09DE	09DK									
		016	020	024	028	034	044	054	064	074	084	094
12 and 500	20	11.2	13.6	15.9	20.5	26.5	34.5	40.5	48.7	59.1	64.3	71.8
	25	14.1	16.9	19.9	25.7	33.2	43.2	50.6	60.6	73.6	80.0	89.7
	30	16.9	20.3	24.0	30.8	39.7	52.0	60.9	72.7	88.3	95.8	107.6
	35	19.7	23.7	27.9	36.0	46.5	60.7	70.8	84.7	103.0	111.7	125.7
	40	22.5	26.9	31.8	41.1	53.1	69.4	80.8	96.7	117.3	127.6	143.5
22 and 502	20	12.3	14.7	17.2	22.1	28.6	37.3	43.8	52.6	63.8	69.4	77.5
	25	15.3	18.3	21.5	27.8	35.8	46.7	54.7	65.5	79.5	86.5	96.9
	30	18.4	21.9	25.9	33.3	43.0	56.2	65.8	78.6	95.4	103.5	116.3
	35	21.5	25.6	30.1	38.9	50.1	65.6	76.4	91.4	111.2	120.6	135.7
	40	24.6	29.1	34.4	44.4	57.3	75.0	87.3	104.5	126.8	137.9	155.1

REFRIG	TD*	TOTAL HEAT REJECTION (Tons)									
		09DK									
		020	024	028	034	044	054	064	074	084	094
134a	20	14.3	16.8	21.5	27.9	36.4	42.7	51.3	62.2	67.6	75.6
	25	17.8	20.9	27.0	34.7	45.3	53.3	63.8	77.5	84.3	94.5
	30	21.3	25.2	32.3	41.8	54.6	64.1	76.6	93.0	100.9	113.3
	35	25.0	29.2	37.7	48.6	63.6	74.5	89.1	108.4	117.5	132.2
	40	28.4	33.4	43.1	55.6	72.8	85.1	101.8	123.6	134.4	151.1

*TD (Temperature Difference) = Saturated Condensing Temperature (entering) — Entering-Air Temperature.

NOTES:
1. Minimum charge 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.
2. Use maximum charge when compressor, condenser, and evaporator are selected as a package and the components balanced to secure maximum benefits of 15 F subcooling (for example, in selecting 09DK condensers with Carrier compressor rated at 15 F subcooling). Maximum 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. See Application Data section, page 27, for available liquid lift information.
3. Condenser subcooling = Saturated condensing temperature of refrigerant — Actual temperature of refrigerant leaving the coil.

Electrical data

UNIT							FAN MOTORS			
Model		Volts	Phase	kW	MCA	MOCP	Total Fans	Phase	Hp	FLA (ea)
09DE	016	208-230	3	1.41	10.4	15	2	1	1/2	4.3
		460*			5.2					2.3
09DK	020	208/230		1.92	14.8	25	2	3	3/4	6.6
		460			7.4	15				3.3
		575			7.6	15				3.4
		380			8.8	15				3.9
	024	208/230		2.26	14.8	25	2		3/4	6.6
		460			7.4	15				3.3
		575			7.6	15				3.4
		380			8.8	15				3.9
	028	208/230		2.98	14.8	25	2		1	6.6
		460			7.4	15				3.3
		575			7.6	15				3.4
		380			8.8	15				3.9
	034	208/230		3.86	21.4	30	3		1	6.6
		460			10.7	15				3.3
		575			11.0	15				3.4
		380			12.7	20				3.9
	044	208/230		4.53	21.4	30	3		1	6.6
		460			10.7	15				3.3
		575			11.0	15				3.4
		380			12.7	20				3.9
	054,064	208/230		6.20	25.8	30	4		1	(1,2) 5.5 (3,4) 6.6
		460			12.9	15				(1,2) 2.8 (3,4) 3.3
		575			14.5	15				(1-4) 3.4
		380/415			13.7	15				(1,2) 3.0 (3,4) 3.4
	074-094	208/230		9.30	39.0	45	6		1	(1,2) 5.5 (3-6) 6.6
		460			19.5	20				(1,2) 2.8 (3-6) 3.3
		575			21.3	25				(1-6) 3.4
		380/415			20.5	25				(1,2) 3.0 (3-6) 3.4

LEGEND

FLA — Full Load Amps
kW — Total Fan Motor Power Input
MCA — Minimum Circuit Amps, Complies with NEC, Article 430-24
MOCP — Maximum Overcurrent Protection (Amps)
NEC — National Electrical Code
UL — Underwriters' Laboratories

*The 09DE016 unit is factory wired for 208-230 volts. It may be readily field converted to 460 volts.

NOTES:
1. Maximum allowable phase imbalance:
   Voltage = 2%; Amps =10%
2. Units are UL and UL, Canada approved for 208/230, 460 and 575 v.

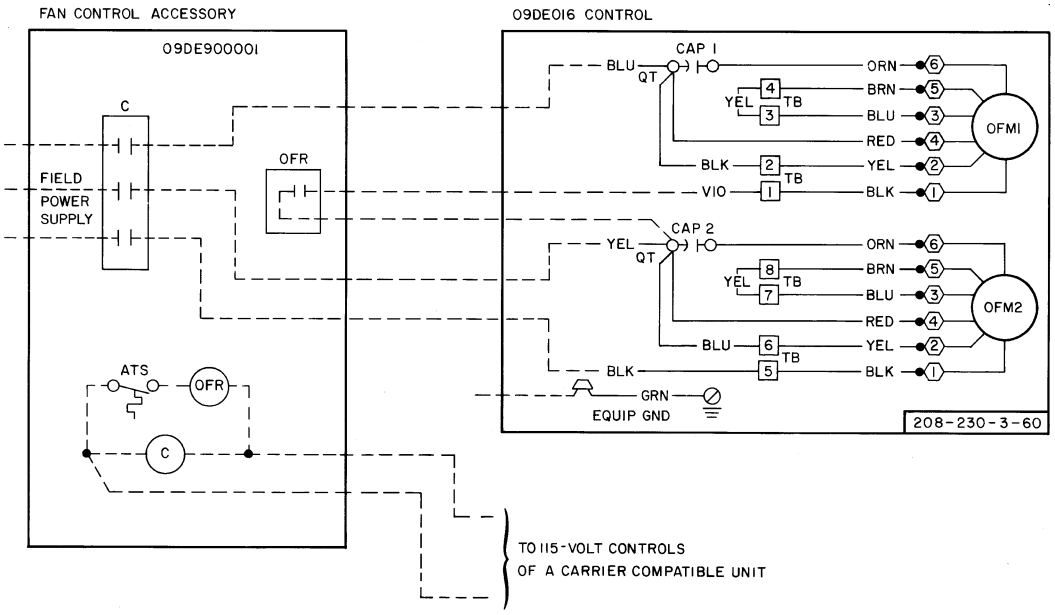
CONTROL CIRCUIT DATA (09DK020-094)

MAIN POWER VOLTAGE V-Ph-Hz	CONTROL VOLTAGE V-Ph-Hz	OVERCURRENT PROTECTION AMPS	
		020-044	054-094
208/230-3-60	115-1-60	7	10
460-3-60	115-1-60	7	10
575-3-60	115-1-60	7	10
380-3-60	230-1-60	7	10

NOTES:
1. 10 va is required for the 09DK020-044 control circuit, and 100 va is required for the 09DK054-094 control circuit.
2. Control circuits for the 09DE are not factory supplied. Fan contactors for these units are field supplied.

Typical wiring schematic

09DE016

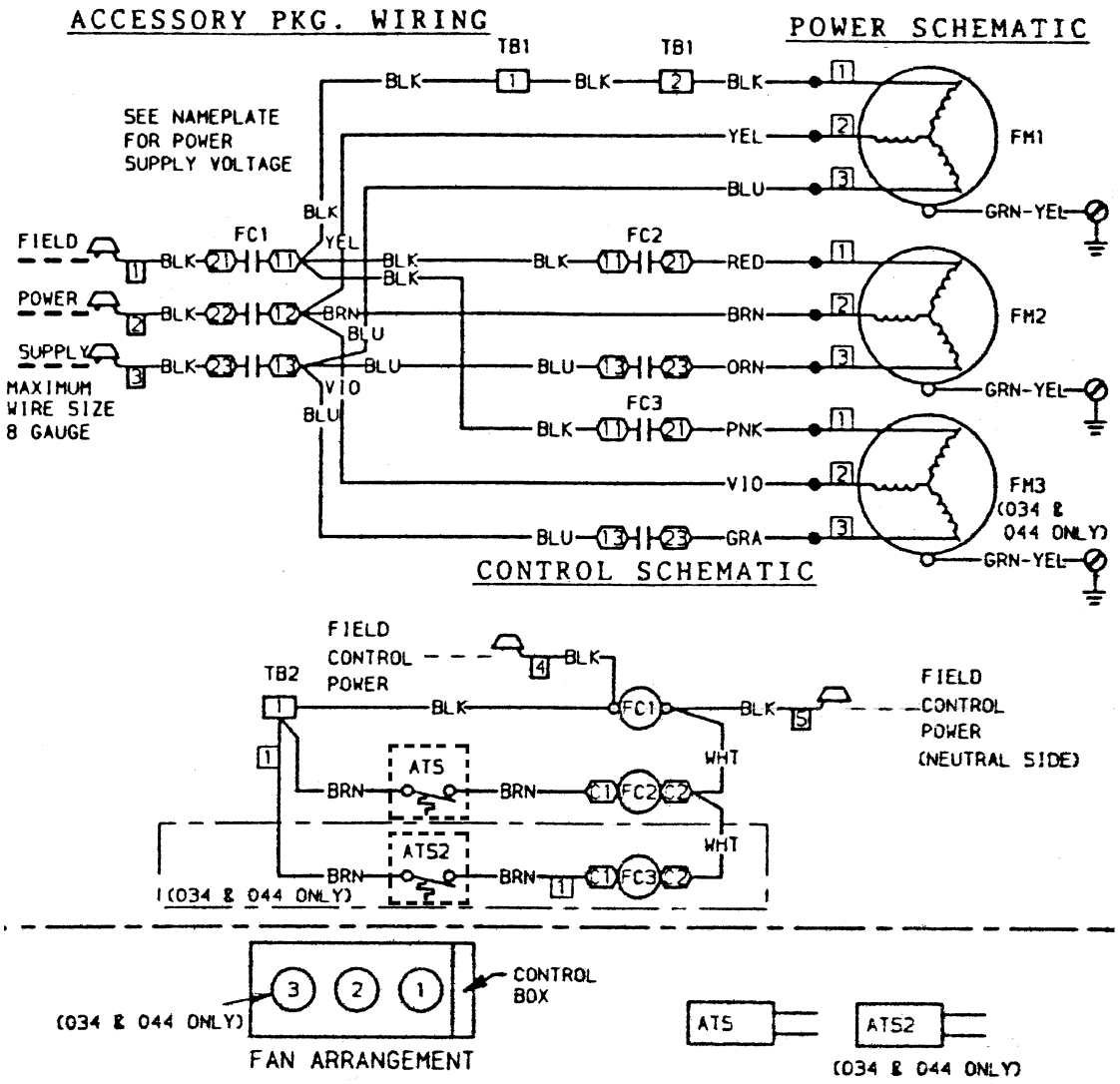


LEGEND

ATS	— Air Temperature Switch		Field Splice
C	— Contactor		Terminal Block Connection
CAP	— Capacitor		Marked Terminal
EQUIP	— Equipment		Unmarked Terminal
GND	— Ground		Factory Wiring
OFM	— Outdoor-Fan Motor		Field Control Wiring
OFR	— Outdoor Fan Motor Relay		Field Power Wiring
QT	— Quadruple Terminal		
TB	— Terminal Block		

Typical wiring schematic (cont)

09DK020-044



LEGEND

ATS — Air Temperature Switch
FC — Fan Contactor
FM — Fan Motor
TB — Terminal Block

Field Splice

Terminal Block Connection

Marked Terminal

Unmarked Terminal

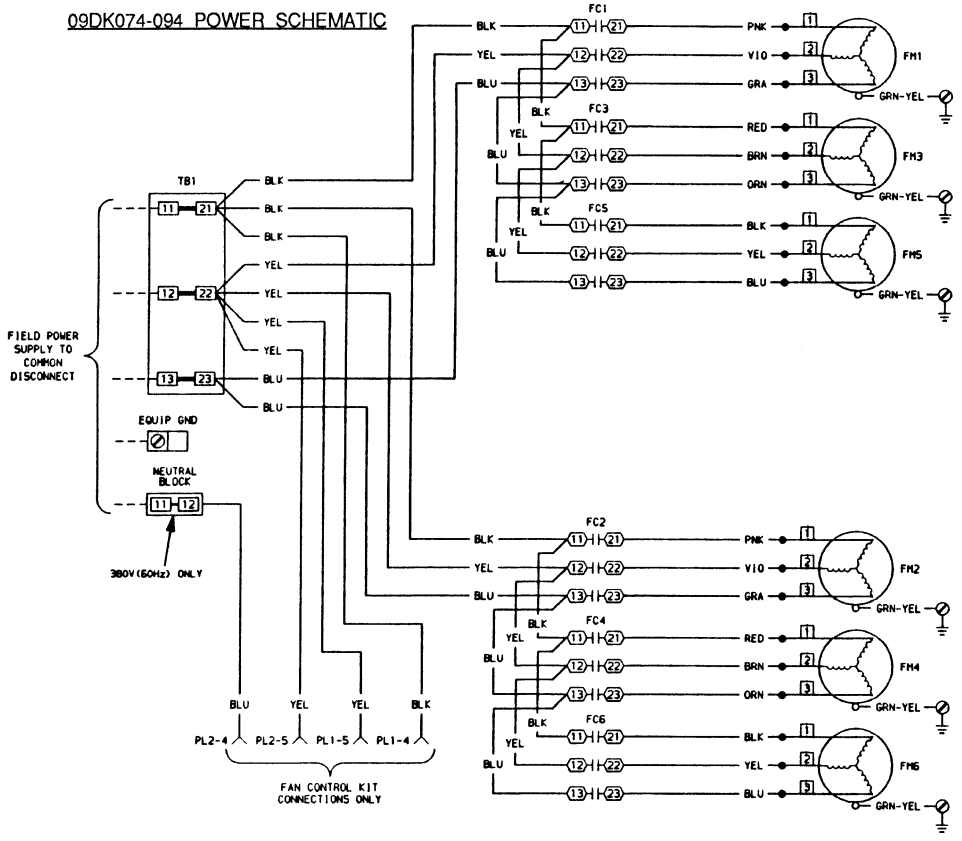
Factory Wiring

Field Control Wiring

Field Power Wiring

09DK074-094

09DK074-094 POWER SCHEMATIC



LEGEND

ATS	— Air Temperature Switch
EQUIP	— Equipment
FC	— Fan Contactor
FCPS	— Fan Cycling Pressure Switch
FM	— Fan Motor
GND	— Ground
PL	— Plug
TB	— Terminal Block

Terminal Block Connection

Marked Terminal

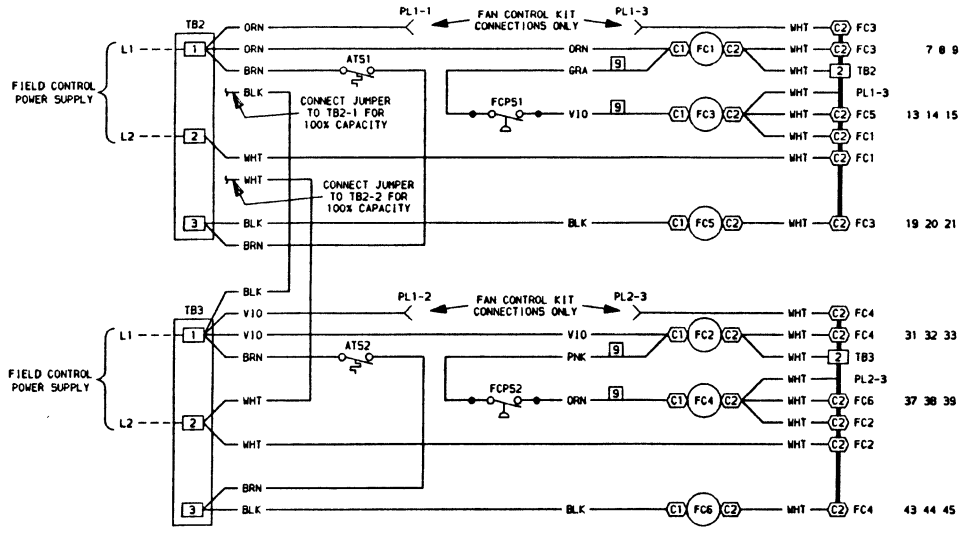
Unmarked Terminal

Factory Wiring

Field Control Wiring

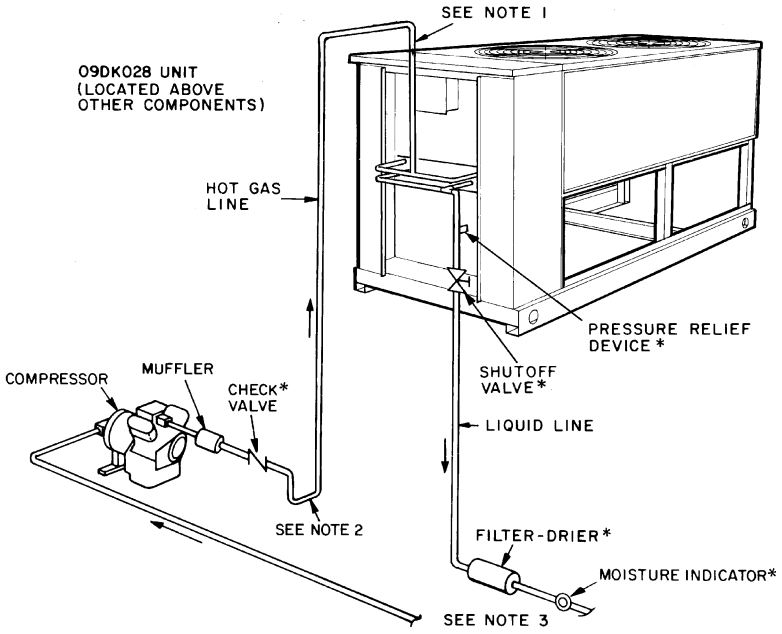
Field Power Wiring

09DK074-094 STANDARD CONTROL SCHEMATIC
(100% & 50%/50% CAPACITY SPLITS)



Typical piping

09DK CONDENSER WITH SINGLE COMPRESSOR

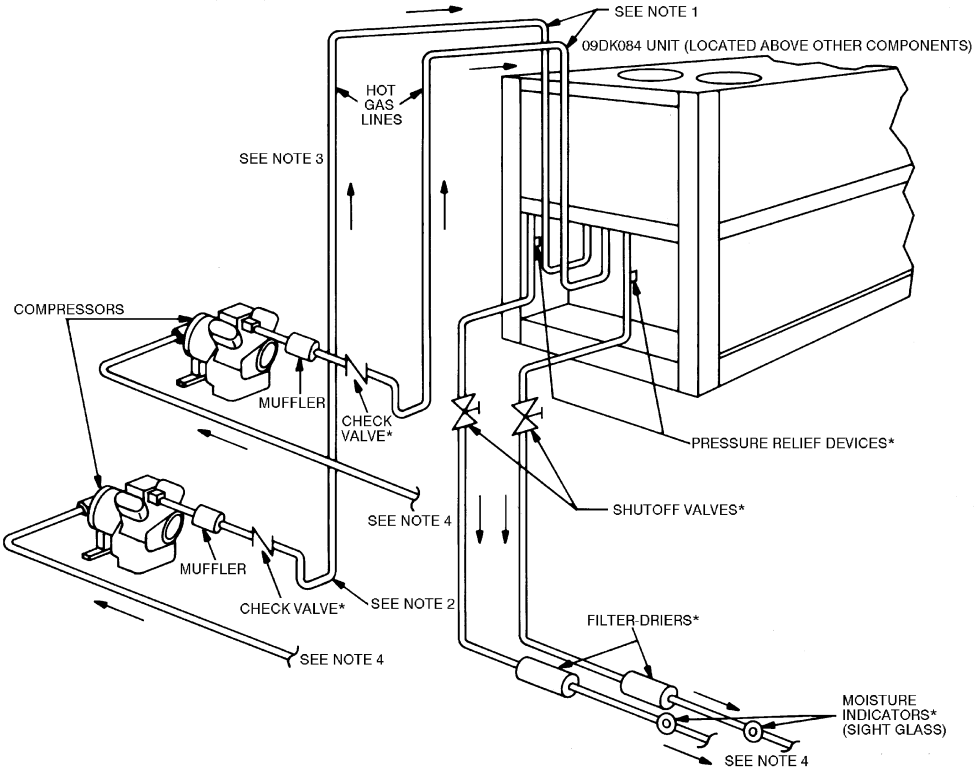


*Field supplied.

NOTES:

1. Hot gas lines should rise above refrigerant level in condenser circuit. Double riser may be required; check compressor minimum capacity.
2. Trap should be installed on hot gas lines to prevent condenser oil and refrigerant vapor migration from accumulating on compressor heads during off cycle.
3. Refer to Carrier System Design Manual, part 3, or the Carrier E20-II® Software Refrigerant Piping program, for proper piping sizes and design.
4. Pitch all horizontal lines downward in the direction of refrigerant flow.
5. For piping lengths greater than 50 ft, provide support to liquid and gas lines near the connections to the coil.
6. Single-phase motors (09DE016) require one field-supplied contactor to start all fans. Field-supplied contactors are not required when accessory fan cycling control package is furnished.
7. Wiring and piping shown are general points-of-connection guides only and do not include details required for specific installations.
8. All wiring must comply with applicable national and local codes.
9. All piping must follow standard refrigerant piping practices.
10. For pressure relief requirements, see latest revision of ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Standard 15, Safety Code for Mechanical Refrigeration.
11. All 09DK units have factory-installed contactors.

09DK CONDENSER WITH DUAL SPLIT SYSTEM



Application data

Unit performance with ductwork

Ductwork added to equipment installed indoors results in added external static pressure, which affects fan performance and condenser capacity. The table below lists performance comparisons for operating with free air discharge and various external static pressures.

PERFORMANCE COMPARISONS — FREE AIR DISCHARGE VS STATIC PRESSURES

EXTERNAL STATIC (in. wg)	% CFM DECREASE	% THR DECREASE	APPROX % SYSTEM DECREASE
0.1	8.5	5.2	2.6
0.2	14.2	8.9	4.9
0.3	19.8	12.2	6.1
0.4	24.9	16.1	8.1
0.5	29.9	19.1	9.6

THR — Total Heat Rejection

Liquid lift

The amount of liquid lift available before refrigerant flashing occurs depends on the amount of liquid subcooling in the system.

All 09DE and 09DK condensers have positive subcooling when applied with an optimum charge. With subcooling, it is possible to overcome an appreciable friction drop and/or static head (due to the elevation of the liquid metering device above the condenser).

When 09DE and 09DK condensers are applied with a minimum charge, minimal subcooling in the condenser is realized; therefore, if subcooling is required it must be obtained by external means such as a liquid suction interchanger.

The average amount of liquid lift available from the 09DE and 09DK condensers is shown in the accompanying table.

AVAILABLE LIQUID LIFT (ft)*

REFRIGERANT		R-22		R-502		R-134a	
Unit		Temperature Difference (F)†					
		20	**30**	**20**	**30**	**20**	**30**
09DE	**016**	75	71	75	70	—	—
09DK	**020,024**	77	67	77	61	—	—
	028	78	68	78	62		
	034	80	70	80	64		
	044	75	65	75	60		
	054	60	50	60	44	29	26
	064	41	31	41	25	20	6
	074	44	34	44	28	18	7
	084	51	41	51	35	22	10
	094	41	31	41	25	18	1

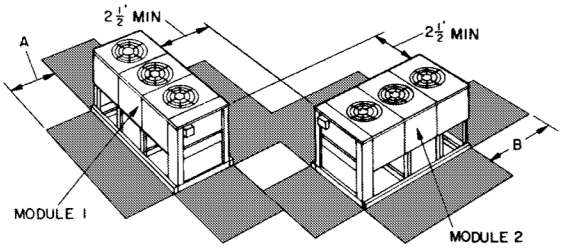
*Allows 7 psi drop for liquid line accessories and 2° F liquid line loss with maximum charge.
†Saturated Condensing Temperature (entering) – Entering Air Temperature (dry bulb) °F.

NOTES:
1. Data based on 15 F subcooling, and unit circuiting of 100% for the 09DE units, and 50/50% or 53/47% for the 09DK units.
2. Available subcooling is greatly reduced when R-12 or R-500 is used in these units. It is recommended that the evaporator is at the same level as the condenser, or lower.
3. Subcooling = Saturated condensing temperature of refrigerant — Actual temperature of refrigerant leaving the coil.

Application data (cont)

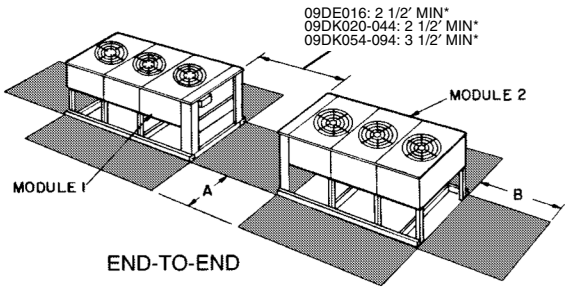
Multiple condenser arrangements

09DE,DK



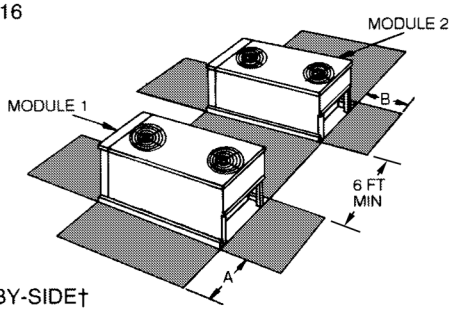
PERPENDICULAR

09DE,DK



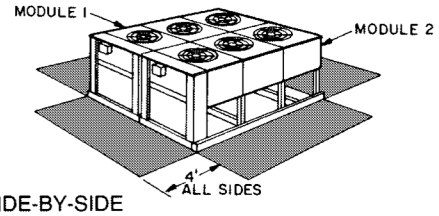
END-TO-END

09DE016



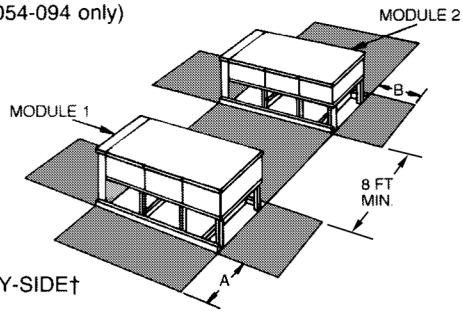
SIDE-BY-SIDE†

09DK (020-044 only)



SIDE-BY-SIDE

09DK (054-094 only)



SIDE-BY-SIDE†

Space for Service and Airflow

*For clearances between controls and grounded surfaces, check local codes.

†Observe minimum recommended space requirements.

09		DIMENSIONS (ft)	
		A	B
DE	016	3	2
DK	020,024 028 034 044	4	4
	054 064 074 084 094	6	5

Head pressure control

General — Efficient operation of the evaporator thermostatic expansion valves requires a 90 F minimum saturated condensing temperature when compressors are operating at 100% capacity, 80 F for 75% compressor capacity, and 70 F for 50 and 25% compressor capacity.

A drop in entering outdoor-air temperature results in a lower saturated condensing temperature. When the outdoor-air temperature drops below the minimum temperatures listed in the Minimum Outdoor-Air Operating Temperature table on page 30, head pressure control is required.

Head pressure controls — Head pressure on the 09DE016 and 09DK020-094 units may be controlled by fan cycling supplemented by Motormaster® control. Fan cycling control is available as an accessory on the 09DE and 09DK020-044 units. Motormaster I is also available on these units with fan cycling.

On 09DK054-094 condensers, fan cycling controls are standard (norminal 67/33%, 33/33/33%, 33/33/17/17%). Head pressure can also be controlled by fan cycling controls supplemented by the accessory Motormaster V solid-state head pressure controller. See accessory installation instructions for more information.

Fan cycling — The fan cycling control, used primarily during intermediate seasons, cycles one fan on the 09DE016 unit, one fan on 09DK020-028 units, 2 fans on 09DK034-064 units, and 4 fans on 09DK074-094 units.

Motormaster I head pressure control (09DE, 09DK020-044) — When outdoor temperatures are low enough to cause low condensing pressures, the Motormaster control modulates the motor speed of one condenser fan from full to zero rpm to maintain a constant saturated condensing temperature for full year-round head pressure control. The Motormaster I control can be used only with suitable motors. It may be used as the sole control on single-fan units but must be used in conjunction with fan cycling control on multiple-fan units. If condensers 09DK020-044 are applied to separate refrigeration cycles, special problems arise when controlling head pressure from a single control point. For such applications, more positive system control can be ensured by using individual condensers and head pressure controls.

Motormaster V head pressure control — Available for 09DK054-094 units only, this head pressure control maintains the proper condensing temperature at low ambient temperature conditions to –20 F and is compatible with the standard factory-installed 3-phase motors (in positions 1 and 2).

Process applications

Process applications are defined as heat rejection loads that are not related to or significantly affected by outside ambient conditions. Process applications tend to have constant heat rejection requirements throughout the year. Consequently, these applications may require switching the set points on standard accessory fan cycle controls. Consult Application Engineering for assistance in designing and selecting process systems.

E-coated aluminum-fin and copper fin coils

E-coated aluminum-fin coils have a flexible and durable epoxy coating uniformly applied to all coil surfaces. Unlike brittle phenolic dip and bake coatings, E-coat provides superior protection with unmatched flexibility, edge coverage, metal adhesion, thermal performance, and most importantly, corrosion resistance.

E-coated coils provide this protection since all coil surfaces are completely encapsulated from environmental contamination. This coating is especially suitable in industrial environments.

E-coated copper-fin coils have the same flexible and durable epoxy coating as E-coated aluminum-fin coils. However, this option combines the natural salt and environmental resistance of all-copper construction with high levels of corrosion protection. This coating is recommended for harsh combinations of coastal and industrial environments.

Application data (cont)

MINIMUM OUTDOOR-AIR OPERATING TEMPERATURE

UNIT		HEAD PRESSURE CONTROL	TD	COMPRESSOR CAPACITY %*			
				100	75	50	25
				Minimum Outdoor Temperature (F) (See Note 2)			
09DE016		None	30 25 20	60 65 70	57 61 65	55 57 60	62 64 65
		Fan Cycling, One Fan	30 25 20	35 45 54	40 47 54	44 49 53	58 60 63
		Motormaster® I Control	30 25 20	–20	–20	–20	–20
09DK	020-028	None	30 25 20	60 65 70	57 61 65	55 57 60	62 64 65
		Fan Cycling, One Fan	30 25 20	29 38 47	34 40 47	38 42 46	51 53 56
		Motormaster I Control	30 25 20	–20	–20	–20	–20
	034, 044	None	30 25 20	60 65 70	57 61 65	55 57 60	62 64 65
		Fan Cycling, 2 Fans	30 25 20	12 22 31	19 25 31	22 29 36	43 47 51
		Motormaster I Control	30 25 20	–20	–20	–20	–20
	054, 064	FCPS, 2 Fans†	30 25 20	29 38 47	34 40 47	38 42 46	51 53 56
		Motormaster V Control	30 25 20	–20	–20	–20	–20
	074-094	FCPS 2 Fans, ATS 2 Fans†	30 25 20	12 22 31	19 25 31	22 29 36	43 47 51
		Motormaster V Control	30 25 20	–20	–20	–20	–20

LEGEND

Intermediate Season

Winter Season

ATS — Air Temperature Switch
FCPS— Fan Cycling Pressure Switch
TD — Temperature Difference
= Saturated Condensing Temperature (Entering)
– Entering-Air Temperature

*Interpolation permitted.
†Additional FCPSs are needed for nominal 67/33, 33/33/33, and 33/33/17/17% capacity split applications.

NOTES:
1. Fans on the 09DK054-094 units are controlled by an ATS or FCPS.
2. Minimum outdoor temperatures are determined for indoor and outdoor unit combinations of the same capacity. However, for 09DK020 ($17^1/_2$ ton) outdoor unit, the minimum outdoor temperatures shown are determined for combination with a 15-ton indoor unit.

Guide specifications — 09DE and 09DK020-044

Air-Cooled Condensing Units

HVAC Guide Specifications

Size Range: **15 to 40 Tons, Nominal**
Carrier Model Numbers: **09DE, 09DK**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor mounted, air-cooled condenser. Air shall discharge vertically.

1.02 QUALITY ASSURANCE

Unit shall be rated using refrigerants 12, 22, 134a, 500, 502. Ratings shall be listed at minimum (5° F subcooling) and maximum (15° F subcooling) refrigerant charge.

Units shall be UL approved and coils shall be leak tested at 420 psig (480 psig on 09DK) air pressure.

1.03 DELIVERY, STORAGE, AND HANDLING

Unit shall be stored and handled per manufacturer's instructions.

Part 2 — Products

2.01 EQUIPMENT

A. General:

Outdoor mounted, packaged, air-cooled remote condenser. Unit shall be complete with cooling coils, fans, fan motors, and electrical controls.

B. Cabinet:

Cabinet shall be of welded steel frame construction with removable electrical control cover. Hinged panel allows access to electrical control box on 09DK units. Panels shall be of zinc-coated bonderized steel finished with baked enamel. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.

C. Fan(s):

Fan(s) shall be of the propeller type, direct driven by weatherproof motors, and dynamically balanced. Fan(s) shall be arranged for vertical discharge with horizontal suction.

D. Coils:

Coils shall use copper tubes, aluminum plate fins (or optional copper tubes, copper fins) and galvanized steel tube sheets. Fins shall be bonded to tubes by mechanical expansion. Hot gas and liquid connections shall be made from the same end.

All coils shall be shipped with no refrigerant holding charge (dry air only).

09DE016 — each coil shall be capable of field connection for splits of 100% or 50/50%.

09DK — each coil shall be capable of field connection for splits of 100%, 50/50%, 67/33%, (020 and 024 size); 100%, 60/40%, 50/50%, 40/40/20% (028 and 034 sizes); and 100%, 73/27%, 67/33%, 60/40%, 53/47%, 40/34/13/13% (044 size).

E. Motors:

Motors shall be weatherproof and inherently protected to operate at the specified electrical characteristics. The 09DE fan motors are single phase. 09DK fan motors shall be 3-phase, TEAO (Totally Enclosed, Air Over).

F. Operating Characteristics:

Unit shall be capable of rejecting the required heat at the required cfm and be capable of operating at moderate ambient temperatures as standard, and down to –20 F with the head pressure controller.

G. Electrical Characteristics:

Unit shall be capable of operating on three-phase. Electrical characteristics shall be specified on the equipment schedule.

H. Special Features:

Certain standard features are replaced with features designated by * are specified. See your local Carrier Sales Office for amending specifications.

* 1. Fan Cycling Control:

Cycles one or two fans to maintain head pressure.

* 2. Head Pressure Controller:

Modulates the speed of one fan in response to low outdoor temperature and provides operation down to –20 F when used with accessory fan cycling control.

3. Condenser Coil Options:

a. Pre-Coated Aluminum-Fin Coils:

Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

b. Copper-Fin Coils:

Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. All copper construction shall provide protection in moderate coastal applications.

A polymer strip shall prevent the coil assembly from contacting the sheet metal coil pan to minimize the potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

Guide specifications — 09DE and 09DK020-044 (cont)

c. E-Coated Aluminum-Fin Coils:

Shall be constructed of aluminum fins mechanically bonded to copper tubes. Coating process shall have a flexible epoxy polymer coating uniformly applied to all coil surfaced without material bridging between the fins. The coating process shall ensure complete coil encapsulation. Color shall be high-gloss black with gloss at 60° of 65% to 90% per ASTM D523-89. Uniform dry film thickness shall be 0.8 mil to 1.2 mil on all surfaces, including the fin edges. Superior hardness characteristics shall meet those requirements of 2H, per ASTM D3363-92A. Cross-hatch adhesion shall meet the requirements of 4B-5B, per ASTM D3359-93. Impact resistance shall be up to 160 in./lb, per ASTM D2794-93. Humidity resistance shall be up to a minimum of 1000 hours per ASTM D2247-92. Water immersion resistance shall be up to a minimum of 250 hours per ASTM D870-92. Durability shall be confirmed through testing to no less than 1000 hours of salt spray per ASTM B117-90.

d. E-Coated Copper Fin Coils:

Shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Coating process shall have a flexible epoxy polymer coating uniformly applied to all coil surfaces without a material bridging between the fins. The coating process shall ensure complete coil encapsulation. Shall be high-gloss black with gloss at 60° of 65% to 90% per ASTM D523-89. Uniform dry film thickness shall be 0.8 mil to 1.2 mil on all surfaces, including the fin edges. Superior hardness characteristics shall meet those requirements of 2H, per ASTM D3363-92A. Cross-hatch adhesion shall meet the requirements of 4B-5B, per ASTM D3359-93. Impact resistance shall be up to 160 in./lb, per ASTM D2794-93. Humidity resistance shall be up to a minimum of 1000 hours per ASTM D2247-92. Water immersion resistance shall be up to a minimum of 250 hours per ASTM D870-92. Durability shall be confirmed through testing to no less than 1000 hours of salt spray per ASTM B117-90.

4. Coil Grille (09DE only):

Protects condenser coil from damage. Shall be constructed from expanded aluminum (not intended as hail guard).

Guide specifications — 09DK054-094

Air-Cooled Condensing Units

HVAC Guide Specifications

Size Range: **50 to 90 Tons, Nominal**

Carrier Model Number: **09DK**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor mounted, split system air-cooled condenser, utilizing electromechanical fan cycling controls. Air shall enter horizontally and vertically and discharge vertically.

1.02 QUALITY ASSURANCE

A. Unit shall be rated using refrigerants 12, 22, 134a, 500, and 502. Ratings shall be at minimum (5° F subcooling) and maximum (15° F subcooling) refrigerant charge.

B. Unit construction shall be designed to conform to ASHRAE 15 latest revision safety standard and NEC.

C. Units shall be UL and UL, Canada approved (208/230, 460, 575 v).

D. Unit shall be manufactured according to ISO 9001:2000 manufacturing quality standard.

E. Unit operation shall be tested at the factory.

1.03 DELIVERY, STORAGE, AND HANDLING

Unit shall be stored and handled according to manufacturer's instructions.

Part 2 — Products

2.01 EQUIPMENT

A. General:

Outdoor mounted, packaged, air-cooled remote condenser unit shall be complete with coils, fans, fan motors, and electrical controls.

B. Unit Cabinet:

1. Frame shall be heavy-gage galvanized steel members.
2. Galvanized steel casing, zinc phosphated, with an electrostatically applied baked enamel finish.
3. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
4. Control box shall be equipped with a hinged access door.

C. Fans:

Condenser fans shall be direct-driven propeller type discharging air vertically upward and shall be equipped with the following features:

1. Permanently lubricated bearings.
2. PVC coated steel wire safety guards.
3. Inherent corrosion-resistant shafts.
4. Statically and dynamically balanced propeller fans.

D. Coils:

1. Coil shall be air-cooled with integral subcooler, constructed of aluminum fins mechanically bonded to seamless copper tubes which are then cleaned, dehydrated, and sealed. Copper tube/fin combination available as an option.
2. Coils shall be leak tested at 280 psig (1931 kPa) and pressure tested at 450 psig minimum (3103 kPa).
3. Hot gas and liquid connections shall be made from the same end.
4. Coil shall be capable of field connection for nominal splits of 100%, 50/50%, 67/33%, 33/33/33%, and 33/33/17/17% (50 to 80 ton units) or 100%, 50/50% (90 ton units).
5. All coils shall be shipped with dry air holding charge, not refrigerant.

E. Refrigeration Components:

A tubing package for headering shall be provided for 100%, 50/50%, and nominal 67/33% capacity split applications. The package shall include hot gas and liquid line piping 1/4-in. male flare fittings, valve cores, fan cycle pressure switches, and the necessary hardware for installation.

F. Motors:

Condenser-fan motors shall be 3-phase and shall be protected against single-phasing conditions. All motors shall have permanently lubricated sealed bearings. Fans 1 and 2 shall use open drip-proof motors that are compatible with the head pressure controller accessory. The remaining fan motors shall be totally enclosed fan-cooled (208-230/460-v units). All motors on 380-v and 575-v units shall be open drip-proof.

G. Operating Characteristics:

Unit shall be capable of rejecting the required heat at the required cfm and be capable of operating down to moderate ambient temperatures with standard factory-supplied fan cycling. Operation to –20 F shall be possible with the head pressure control accessory.

H. Electrical Characteristics:

1. A dual power supply of the correct voltage is required for each series unit; a 3-phase power circuit voltage and a single-phase control circuit voltage. The number of control circuits will depend on the capacity split application utilized. Power supplies for all units shall enter the control box through factory-punched entrance holes in the control box shelf. Terminal blocks shall be supplied for field wiring connections.
2. The units shall utilize electromechanical fan cycling head pressure controls to control each fan separately.

I. Special Features:

Certain standard features are replaced when features designated by * are specified. See your local Carrier Sales Office for amending specifications.

1. Condenser Coil Options:
   a. Pre-Coated Aluminum-Fin Coils:

      Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

   b. Copper-Fin Coils:

      Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. All copper construction shall provide protection in moderate coastal applications.

      A polymer strip shall prevent the coil assembly from contacting the sheet metal coil pan to minimize the potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

   c. E-Coated Aluminum-Fin Coils:

      Shall be constructed of aluminum fins mechanically bonded to copper tubes. Coating process shall have a flexible epoxy polymer coating uniformly applied to all coil surfaced without material bridging between the fins. The coating process shall ensure complete coil encapsulation. Color shall be high-gloss black with gloss at 60° of 65% to 90% per ASTM D523-89. Uniform dry film thickness shall be 0.8 mil to 1.2 mil on all surfaces, including the fin edges. Superior hardness characteristics shall meet those requirements of 2H, per ASTM D3363-92A. Cross-hatch adhesion shall meet the requirements of 4B-5B, per ASTM D3359-93. Impact resistance shall be up to 160 in./lb, per ASTM D2794-93. Humidity resistance shall be up to a minimum of 1000 hours per ASTM D2247-92. Water immersion resistance shall be up to a minimum of 250 hours per ASTM D870-92. Durability shall be confirmed through testing to no less than 1000 hours of salt spray per ASTM B117-90.

   d. E-Coated Copper Fin Coils:

      Shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Coating process shall have a flexible epoxy polymer coating uniformly applied to all coil surfaces without a material bridging between the fins. The coating process shall ensure complete coil encapsulation. Shall be high-gloss black with gloss at 60° of 65% to 90% per ASTM D523-89. Uniform dry film thickness shall be 0.8 mil to 1.2 mil on all surfaces, including the fin edges. Superior hardness characteristics shall meet those requirements of 2H, per ASTM D3363-92A. Cross-hatch adhesion shall meet the requirements of 4B-5B, per ASTM D3359-93. Impact resistance shall be up to 160 in./lb, per ASTM D2794-93. Humidity resistance shall be up to a minimum of 1000 hours per ASTM D2247-92. Water immersion resistance shall be up to a minimum of 250 hours per ASTM D870-92. Durability shall be confirmed through testing to no less than 1000 hours of salt spray per ASTM B117-90.

2. Fan Sound Reduction Kit:

   Fan sound reduction kits reduce system noise without compromising performance.

3. Security Grilles:

   The PVC-coated grilles protect the condenser coil from damage due to debris and vandalism.

4. Control Transformer:

   The transformer is used to convert 200/230/460 v to 115 v for use on 115-v control systems, utilizing power from the condenser main unit power connection.

5. Head Pressure Controller:

   This accessory allows the unit to operate at low ambient conditions to –20 F.

6. Hail Guard:

   Louver-type sheet metal hail guard design prevents damage to condenser coil due to hail and other flying debris.

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