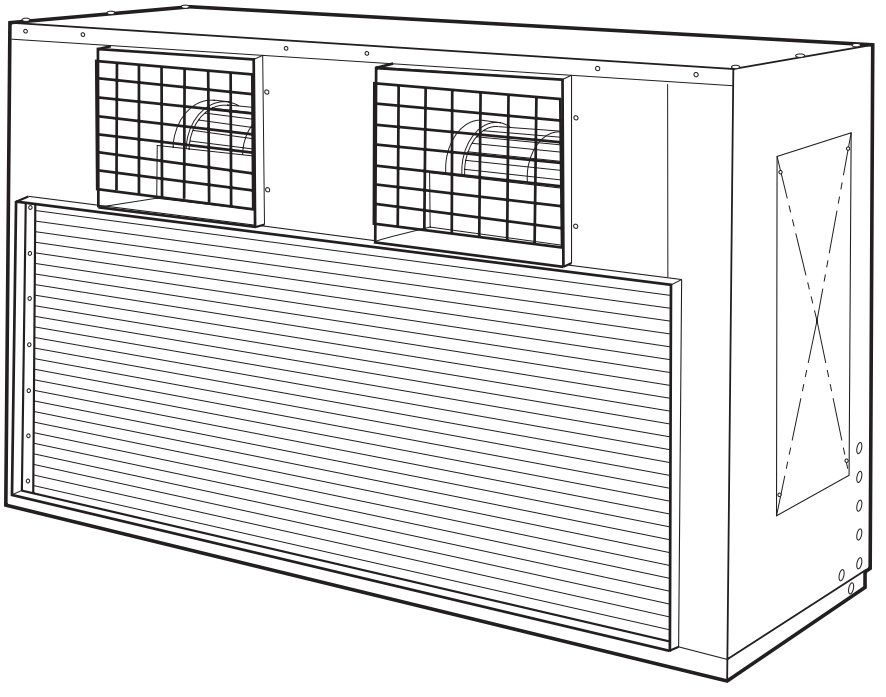
Product Data

09BY
Air-Cooled Condensers

5 to 20 Tons



Air-Cooled Condenser for Commercial or Industrial Remote System Application:

- 6 convenient sizes
- optimum performance in all types of building applications
- high static, efficient belt drive condenser fans
- weatherproof unit cabinets allow indoor or outdoor mounting
- small footprint allows for installation in tight spaces indoors
- units may be ducted or free blow for greater application flexibility
- units may be remote-mounted or close-coupled when used with 50BZ Package Air Cooled units, or may be used as the remote condenser with a variety of other chiller or compressor units

Features/Benefits

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

Carrier's 09BY units are remote air-cooled condensers with centrifugal condenser fans for high static condenser airflow applications. These units are available in nominal heat rejection capacity of 5, 7½, 10, 12, 15, and 20 tons. Units are designed for vertical installation with horizontal airflow. Inlet and discharge are on the same face of the unit. Units may be mounted in windows, indoors with ductwork, or outdoors. Belt drive centrifugal condenser fan provides high static capability for air inlet and discharge through louvers and extended duct runs. Unit may be mounted for either horizontal or vertical air discharge.

Economic operation

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

Three-phase motors with inherently better starting torque and efficiency make the units even more economical to operate.

Application flexibility

Place the unit where no other option would work because of high static capability. Unit may be mounted indoors with duct runs, or mounted at the wall with a louver. In addition, watertight control box and Total Enclosed Fan Motor mean the unit can be applied almost anywhere: indoors or outdoors. Any rain that enters the unit is caught in the full unit internal drain pan. Mount the unit at a distance from an outside wall and duct the condenser air; due to the high static belt drive motor, static pressure losses as high as 1 in. wg may be overcome.

High quality paint process allows the unit to meet 500-hour salt spray requirements for a weather resistant cabinet that will hold up year after year.

Two circuits are provided on units over 7½ ton which can be manifold together, or used independently, to provide circuiting options in a wide range of applications.

Unit may be matched with a variety of compressor units, (50BZ, 30HWA, and 06) to meet a wide range of application requirements.

Installation flexibility

Refrigerant connections are provided on either side to allow refrigerant pipe to be run in either direction.

Duct mounting flanges are provided for easily attaching inlet and discharge ducts to the unit.

A drain kit also provided to be used for applications where rain may enter the unit. This kit allows connection to the full unit drain pan and drain connections may be made on either side of the unit. Connections may be made to PVC pipe or pipe thread.

Low voltage 24-v control contactor is provided in the unit control box. This results in cost savings for running control power from the compressor unit to the condenser.

Easy changeover single voltage design for 208/230-v or 460-v operation means you always have the right unit even if job electrical specifications change.

Ease of service

Quick removal access panels on both side of the unit allow for all service through the side of the unit, with easy access to controls and motor.

Belt drive motors slide on motor mounting rails for easy adjustment and replacement.

Permanently lubricated fan and motor bearing provide maximum reliability with minimal routine service.

Dependable and safe operation

Total enclosed fan motors with built in overload protection mean dependable and safe operation even in an environment where the fans are exposed to heavy rain.

Coil grilles on the fan discharge prevent objects from entering the fans, which could result in injury or damage.

Units are listed by UL (Underwriters' Laboratories) for safe operation and are UL listed for U.S.A. and Canada.

Unit quality is assured day to day as the units are built in a factory with ISO 9001 certification.

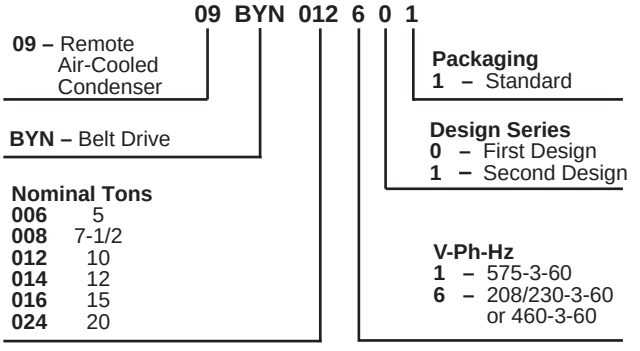
Special features for outstanding performance

- Space saver slab type condenser coils use Carrier's advanced heat transfer technology and provide peak heat transfer efficiency with large coil face area. Fins are mechanically bonded to nonferrous, seamless tubing for efficient leak-free operation.
- Large volumes of outdoor air are moved quietly. Specially designed fan section provides superior air handling capability at high efficiency and low sound.
- Convenient access electrical control center contains all factory pre-wired control devices.
- The weatherproof cabinets are constructed of galvanized steel and painted with Powercoat Paint System, capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-Hour Salt Spray Test.
- The 09BY units are fully warrantied as shipped from the factory, including 1 year on all parts.
- All motors are protected against thermal overload, and three-phase motors are protected against single-phasing conditions.
- Units are built in an ISO 9001 (International Standards Organization) certified manufacturing facility, and are fully factory run-tested.

Table of contents

	Page
Features/Benefits	1,2
Model Number Nomenclature	3
ARI Capacities	3
Physical Data	4
Field-Installed Accessories	4
Base Unit Dimensions	5,6
Selection Procedure	7
Performance Data	8-10
Electrical Data	11
Typical Wiring Schematics	12
Controls	13
Typical Piping and Wiring	14
Application Data	15-18
Guide Specifications	19

Model number nomenclature



ARI* capacities

UNIT 09BY	NOMINAL TONS	OUTDOOR CFM	HEAT REJECTION (Btuh)	TOTAL kW
006	5	3,000	84,600	0.66
008	7½	4,500	126,800	1.10
012	10	6,000	169,200	1.86
014	12	6,800	211,400	2.39
016	15	7,500	253,600	2.19
024	20	10,000	380,400	2.87

*Air Conditioning and Refrigeration Institute.

NOTE: ARI rating condition is 95 F air entering the condenser, 125 F saturated condensing temperature, charged to nominal system charge per installation instructions for 5° F of subcooling.

Physical data

UNIT 09BY	006	008	012	014	016	024
NOMINAL CAPACITY (tons)	5	7½	10	12	15	20
OPERATING WEIGHT (lb)	267	357	441	471	837	970
REFRIGERANT	R-22					
NUMBER OF CIRCUITS	1	1	2	2	2	3
STORAGE VOLUME (ft³/ckt)	1.8	2.7	1.8	1.8/2.7	2.7	2.7
HOLDING CHARGE	Nitrogen Holding Charge					
CONDENSER FAN	Centrifugal					
Nominal Airflow (Cfm)	3000	4500	6000	6800	7500	10,000
Cfm Range	2000-4000	3000-6000	4000-8000	5000-8000	6000-12,000	8,000-16,000
Number of Fans	2	2	2	2	2	2
Fan Size (in.)	8.8 x 8.8	11 x 11	11 x 11	11 x 11	12.4 x 12.4	14 x 14
Fan Pulley (in.)	5.7	7.6	8.6	6.7	9.6	11.6
Motor Pulley (in.)	2.6-5.5	4.2-5.5	4.2-5.5	4-5	4.7-6	4.7-6
RPM Range	1058-1450	960-1260	850-1110	1045-1306	875-1095	725-905
Maximum RPM	1705	1365	1365	1365	1210	955
Belt Number...Size	1...A43	1...B46	1...B48	2...A45	2...B88	2...B88
Center Distance (in.)	11.2/12.6	13.6/15.0	13.6/15.0	13.6/15.0	32.6/33.6	30.0/30.7
Fan Shaft (mm)	20	25	25	25	25	30
Motor Shaft (in.)	⅞	1⅛	1⅛	1⅛	1⅛	1⅛
Motor Hp (Type)	2 (TEFC)	3 (TEFC)	5 (TEFC)	5 (TEFC)	5 (TEFC)	7.5 (TEFC)
Motor Frame Size	145T	182T	182T	184T	184T	213T
Max. Motor Hp	3	5	5	5	7½	7½
CONDENSER COIL	Copper Tube, Aluminum Fin					
Rows...Fins per in.	4...14	5...14	5...15	5...14	4...14	5...14
Face Area	6.33	8.75	10.49	10.80	19.38	19.38
CONNECTIONS						
Hot Gas (Qty)	1	1	2	2	2	2
Size (in.)	½	½	½	½	½	½
Liquid Line (Qty)	1	1	2	2	2	3
Size (in.)	½	½	½	½	½	½
CONDENSATE DRAIN (in.)	¾ Female Pipe Thread					
CONTROLS	24 Volt Control Fan Contactor Provided In Unit					

TEFC — Totally Enclosed Fan Cooled

NOTE: Same unit may be mounted vertically or horizontally.

Field-installed accessories

Low ambient control

When low ambient head pressure controller is added to the unit, units can provide cooling operation down to 0° F. System consists of fan discharge dampers which modulate airflow with a refrigerant controlled damper operator in response to refrigerant discharge pressure. Kit consists of damper plus all parts and controls to install the damper. Kit is easily field installed before discharge duct connections are made.

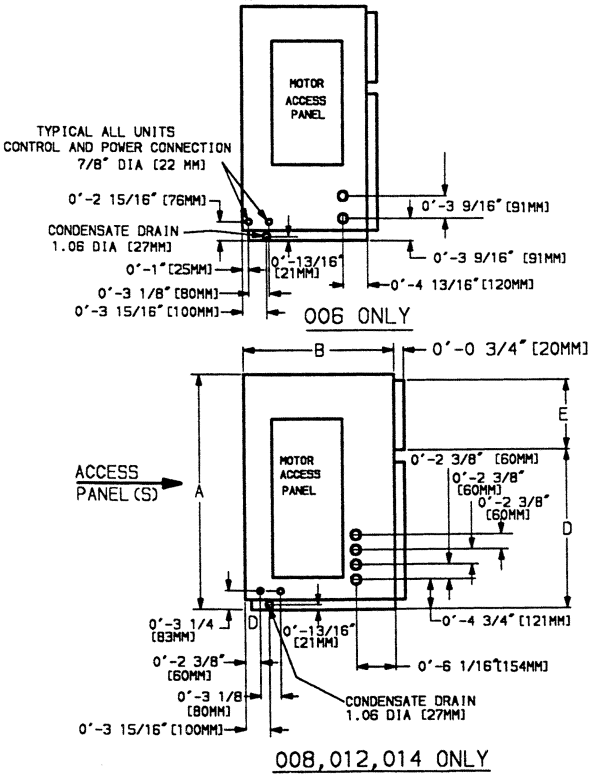
Inlet filter

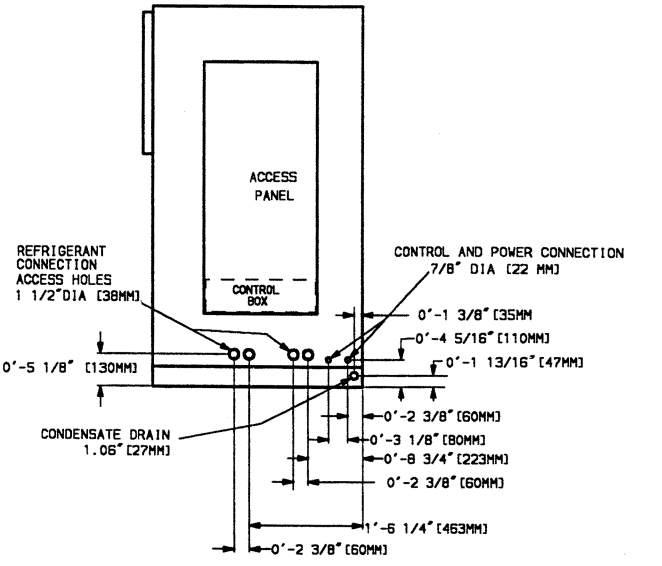
A filter rack which mounts on the unit inlet to prevent accumulation of dirt on the condenser coil is available. Filter rack contains 1-in. disposable filters. Filter track provides for either side access to the filters and flange for connection of inlet duct. Filter rack is field installed and attaches to the existing inlet duct flanges.

Base unit dimensions

UNIT 09BY	TOTAL	CORNER WEIGHT (lb)				CENTER OF GRAVITY (in.)		
		A	B	C	D	AA	AB	AC
006	267	46	31	76	113	29	6	14
008	357	59	41	105	152	33	7	17
012	441	73.5	49.5	128	190	38	7	17
014	471	79	52	134	205	43	7	17
016	837	141	96	242	358	54	10	24
024	970	164	111	280	415	54	10	24

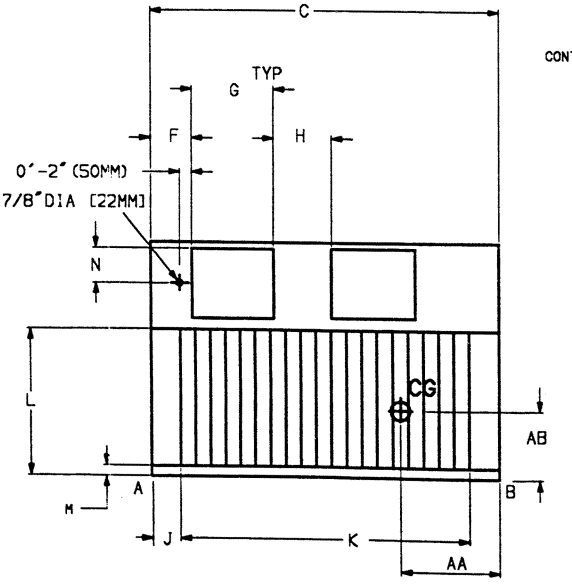
DIM	006		008		012		014		016,024	
	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.	mm	ft-in.
A	902	2′-11½″	1087	3′-6 13⁄16″	1087	3′-6 13⁄16″	1087	3′-6 13⁄16″	1526	5′-0″
B	500	1′-7 11⁄16″	600	1′-11 5⁄8″	600	1′-11 5⁄8″	600	1′-11 5⁄8″	850	2′-9 7⁄16″
C	1231	4′-0 7⁄8″	1422	4′-8″	1613	5′-3½″	1804	5′-11″	2300	7′-6 9⁄16″
D	590	1′-11¼″	701	2′-3 9⁄16″	701	2′-3 9⁄16″	701	2′-3 9⁄16″	941	3′-1¾″
E	282	0′-11⅛″	357	1′-2″	357	1′-2″	357	1′-2″	502	1′-7¾″
F	156	0′-6 3⁄16″	150	0′-5⅞″	195	0′-7 11⁄16″	290	0′-11 7⁄16″	347	1′-1 11⁄16″
G	338	1′-1 5⁄16″	396	1′-3 5⁄8″	428	1′-4⅞″	428	1′-4⅞″	610	2′-0″
H	236	0′-9 5⁄16	280	0′-11″	318	0′-11″	318	0′-11″	394	1′-3½″
J	76	0′-3″	76	0′-3″	51	0′-2″	51	0′-2″	63	0′-2 7⁄16″
K	1044	3′-5⅛″	1226	4′-0¼″	1463	4′-9⅞″	1657	5′-5¼″	2140	7′-0¼″
L	575	1′-10 5⁄8″	686	2′-3″	686	2′-3″	686	2′-3″	838	2′-9″
M	40	0′-1 9⁄16″	40	0′-1 9⁄16″	40	0′-1 9⁄16″	40	0′-1 9⁄16″	80	0′-3⅛″
N	141	0′-5 9⁄16″	178	0′-7″	178	0′-7″	178	0′-7″	251	0′-9⅞″

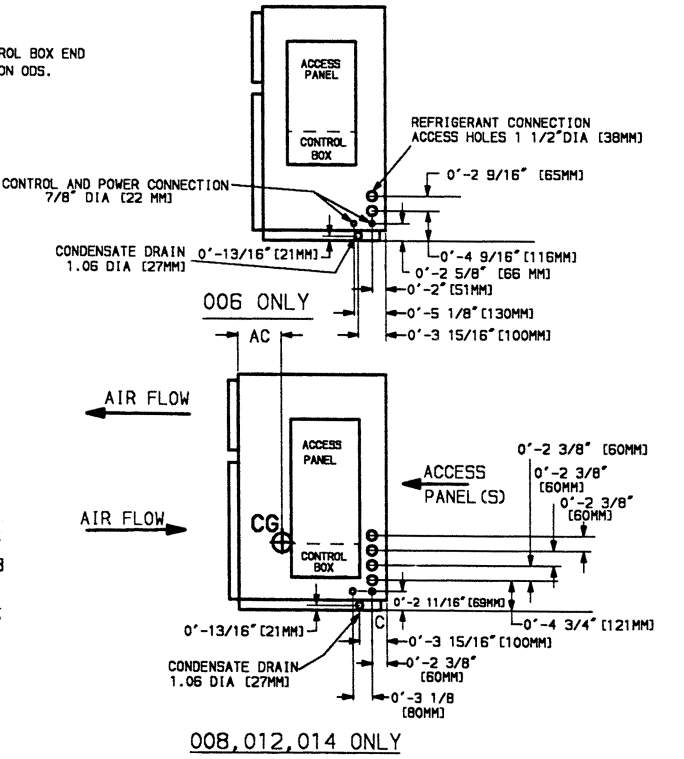




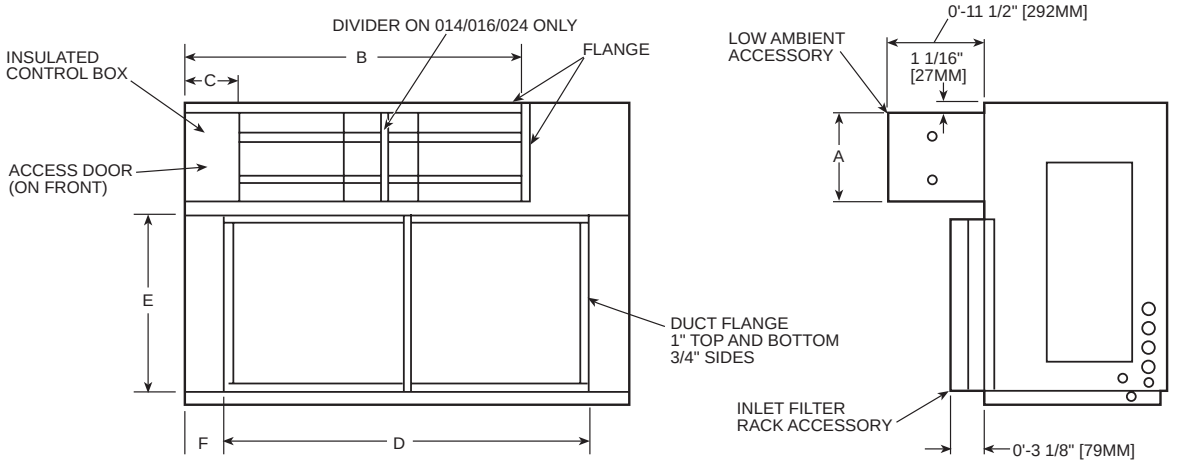
NOTE: ALL CABINET HOLES ARE THE SAME NEAR AND FAR SIDE.

REFRIGERANT COIL CONNECTIONS AT THE CONTROL BOX END
3/8" [10 MM] LIQUID, 5/8" [16 MM] SUCTION ODS.





Base unit dimensions with low ambient control and filter rack accessories



DIM	006		008		012		014		016,024	
	mm	ft.-in.	mm	ft.-in.	mm	ft.-in.	mm	ft.-in.	mm	ft.-in.
A	287	0′-11 5/16″	366	1′-2 3/8″	366	1′-2 3/8″	366	1′-2 3/8″	560	1′-10 1/16″
B	1068	3′-7 1/16″	1301	4′-3 1/4″	1446	4′-8 15/16″	1541	5′-0 11/16″	2014	6′-6 5/16″
C	151	0′-5 15/16″	189	0′-7 7/16″	232	0′-9 1/8″	286	0′-11 1/4″	286	0′-11 1/4″
D	1082	3′-6 5/8″	1264	4′-1 3/4″	1451	4′-9 1/8″	1645	5′-4 3/4″	2211	7′-3 1/16″
E	535	1′-9 1/16″	643	2′-1 5/16″	643	2′-1 5/16″	643	2′-1 5/16″	845	2′-9 1/4″
F	79	0′-3 1/8″	152	0′-6″	79	0′-3 1/8″	79	0′-3 1/8″	65	0′-2 9/16″

Selection procedure (with example)

Condenser capacity ratings are based on the total heat of rejection of the system. Total heat of rejection is sum of the net refrigerant effect and the heat of compression added to the refrigerant in the compressor.

The heat of compression varies with the compressor design, so the best data is from the compressor manufacturer's data, which should be used whenever possible. If the compressor data is not available, Capacity Multiplier tables below may be used to determine the heat of compression.

The following formulas may be used to calculate the total heat of rejection (THR) for units outside the range of the tables.

Suction cooled hermetic compressors:
THR = Compressor Capacity (Btuh) + (3413 x kW)

Open Compressors:
THR = Compressor Capacity (Btuh) + (2545 x BHP)

Elevation above sea level has an effect on the performance of air cooled condensers. The unit capacities in the tables must be multiplied by the factors in the following table to correct for various elevations.

Elevation (ft)	0	1000	2000	3000	4000	5000	6000	7000
Factor	1.0	0.98	0.96	0.93	0.91	0.89	0.87	0.85

To Select a Unit:

I Determine design conditions:

Find the type of refrigerant, number of circuits, total heat rejection (THR), and saturated discharge temperature (SDT) at the selected load conditions required by the compressor and evaporator.

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

III Determine Temperature Difference (TD) (condensing temperature minus condenser entering air temperature).

IV Enter the Heat of Rejection tables with the temperature difference, refrigerant, and required circuits (make selection based on minimum or optimal subcooling).

Make initial selection based on nominal condenser air cfm. Select the unit which meets or exceeds the required heat rejection. Condenser capacity can be adjusted by varying condenser air cfm for a better match to required capacity. Check the fan performance tables be sure the fan can deliver the required airflow at the required External Static Pressure (ESP). Do not select at maximum limit of the fan as when the coil becomes dirty high pressure trips may become a problem.

V Determine the actual TD with the selected condenser and check capacity of the compressor evaporator units.

$$\text{Actual TD} = \frac{\text{Design TD x Design THR}}{\text{Actual Condenser THR}}$$

Example:

I Refrigerant: R-22/single circuit
Ambient temperature: 95 F
Required THR/Circuit: 245,000 Btuh
SDT: 125 F
Discharge Line Loss: 2° F
ESP: 0.4 in. wg

II Condensing temperature SCT
= SDT − Line loss
= 125 F − 2 F = 123 F

III Temperature Difference = SCT − Ambient
= 123 F − 95 F = 28 F

IV From the Capacity Tables Select a unit.
Nominal CFM for a 15 ton unit is 9000.
Minimum Subcooling selection (page 8) by interpolation between 25 F and 30 F an 09BY unit size 016 will meet the requirements with 248,440 Btuh THR.

Optimum Subcooling selection (page 9) the 09BY unit size 016 will not meet the requirements with nominal airflow but by interpolation between 25 F and 30 F will exceed the requirements with 283,360 Btuh THR at 12,000 cfm. Exact capacity can be reached with 9500 cfm.

V Actual TD
Minimum subcooling
Actual TD = 28 F x 245,000/248,440 = 27.6 F
Optimum subcooling
Actual TD = 28 F x 245,000/283,360 = 24.2 F

The 09BY unit size 016 will meet the required heat rejection at the selected TD with 7 F subcooling, or will meet the required heat rejection with 10 F subcooling and 24.2 F TD, or will meet the required heat rejection with 9500 cfm. The condenser will deliver 9500 cfm at 0.4 in. wg ESP with 1020 RPM at 4.06 BHP (see page 10).

Based on the balance point of heat rejection and capacity with the indoor unit select the unit which best meets the system needs.

CAPACITY MULTIPLIERS (HERMETIC COMPRESSORS)

EVAP TEMP (°F)	CONDENSING TEMPERATURE (°F)								
	90	95	100	105	110	115	120	125	130
20	1.26	1.27	1.29	1.31	1.33	1.35	1.37	1.40	1.43
25	1.24	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.40
30	1.22	1.23	1.25	1.26	1.28	1.30	1.32	1.34	1.37
35	1.20	1.21	1.23	1.25	1.26	1.27	1.29	1.31	1.34
40	1.18	1.19	1.21	1.23	1.24	1.25	1.27	1.29	1.31
45	1.16	1.17	1.19	1.21	1.22	1.23	1.25	1.26	1.28
50	1.14	1.15	1.17	1.19	1.20	1.22	1.23	1.24	1.26

CAPACITY MULTIPLIERS (OPEN COMPRESSORS)

EVAP TEMP (°F)	CONDENSING TEMPERATURE (°F)								
	90	95	100	105	110	115	120	125	130
20	1.17	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32
25	1.15	1.17	1.18	1.20	1.22	1.24	1.26	1.28	1.30
30	1.14	1.15	1.17	1.18	1.20	1.22	1.24	1.25	1.27
35	1.13	1.14	1.16	1.17	1.18	1.20	1.21	1.24	1.25
40	1.12	1.14	1.15	1.16	1.17	1.18	1.20	1.21	1.23
45	1.11	1.13	1.14	1.15	1.16	1.17	1.18	1.20	1.21
50	1.09	1.11	1.12	1.13	1.14	1.16	1.17	1.19	1.20

Performance data

HEAT OF REJECTION (Btuh)*
Minimum Subcooling (5 F)

UNIT 09BY	CFM	Ckts	TEMPERATURE DIFFERENCE (TD)															
			Refrigerant R-22								Refrigerant R-134a							
			5	10	15	20	25	30	35	40	5	10	15	20	25	30	35	40
006	2000	1	10.8	21.6	32.4	43.2	54.0	64.8	75.6	86.4	10.3	20.5	30.8	41.0	51.3	61.6	71.8	82.1
	3000	1	14.8	29.6	44.4	59.1	73.9	88.7	103.5	118.3	14.1	28.1	42.2	56.1	70.2	84.3	98.3	112.4
	4000	1	17.8	35.7	53.6	71.4	89.3	107.1	125.0	142.8	16.9	33.9	51.0	67.8	84.8	101.7	118.8	135.7
008	3000	1	16.2	32.4	48.6	64.8	81.0	97.2	113.4	129.6	15.4	30.8	46.2	61.6	77.0	92.3	107.7	123.1
	4500	1	22.2	44.4	66.5	88.7	110.9	133.1	155.2	177.4	21.1	42.2	63.2	84.3	105.4	126.5	147.4	168.5
	6000	1	26.8	53.6	80.3	107.1	133.9	160.7	187.5	214.2	25.5	50.9	76.3	101.7	127.2	152.7	178.1	203.5
012	4000	1	21.6	43.2	64.8	86.4	108.0	129.6	151.2	172.8	20.5	41.0	61.6	82.1	102.6	123.1	143.6	164.2
	6000	1	29.6	59.2	88.8	118.2	147.8	177.4	207.0	236.6	28.1	56.2	84.4	112.3	140.4	168.5	196.7	224.8
	8000	1	35.6	71.4	107.2	142.8	178.6	214.2	250.0	285.6	33.8	67.8	101.8	135.7	169.7	168.5	196.7	271.3
	4000	2	10.8	21.6	32.4	43.2	54.0	64.8	75.6	86.4	10.3	20.5	30.8	41.0	51.3	61.6	71.8	82.1
	6000	2	14.8	29.6	44.4	59.1	73.9	88.7	103.5	118.3	14.1	28.1	42.2	56.1	70.2	84.3	98.3	112.4
	8000	2	17.8	35.7	53.6	71.4	89.3	107.1	125.0	142.8	16.9	33.9	51.0	67.8	84.8	101.7	118.8	135.7
014	5000	1	27.0	54.0	81.0	108.0	135.0	162.0	189.0	216.0	25.7	51.3	77.0	102.6	128.3	153.9	179.5	205.2
	7000	1	36.9	73.9	110.9	147.8	184.8	221.8	258.7	295.7	35.1	70.2	105.4	140.4	175.6	210.7	245.8	280.9
	9000	1	44.7	89.3	133.9	178.5	223.2	267.8	312.4	357.1	42.5	84.8	127.2	169.6	212.0	254.4	296.8	339.3
	5000	2	13.5	27.0	40.5	54.0	67.5	81.0	94.5	108.0	12.8	25.7	38.5	51.3	64.1	77.0	89.8	102.6
	7000	2	18.5	37.0	55.5	73.9	92.4	110.9	129.4	147.9	17.6	35.2	52.7	70.2	87.8	105.4	122.9	140.5
	9000	2	22.4	44.7	67.0	89.3	111.6	133.9	156.2	178.6	21.3	42.5	63.7	84.8	106.0	127.2	148.4	169.7
016	6000	1	32.4	64.8	97.2	129.6	162.0	194.4	226.8	259.2	30.8	61.6	92.4	123.2	154.0	184.6	215.4	246.2
	9000	1	44.4	88.8	133.0	177.4	221.8	266.2	310.4	354.8	42.2	84.4	126.4	168.6	210.8	253.0	294.8	337.0
	12000	1	53.6	107.2	160.6	214.2	267.8	321.4	375.0	428.4	51.0	101.8	152.6	203.4	254.4	305.4	356.2	407.0
	6000	2	16.2	32.4	48.6	64.8	81.0	97.2	113.4	129.6	15.4	30.8	46.2	61.6	77.0	92.3	107.7	123.1
	9000	2	22.2	44.4	66.5	88.7	110.9	133.1	155.2	177.4	21.1	42.2	63.2	84.3	105.4	126.5	147.4	168.5
	12000	2	26.8	53.6	80.3	107.1	133.9	160.7	187.5	214.2	25.5	50.9	76.3	101.7	127.2	152.7	178.1	203.5
024	8000	1	48.6	97.2	145.8	194.4	243.0	291.6	340.2	388.8	46.2	92.3	138.5	184.7	230.9	277.0	323.2	369.4
	12000	1	66.6	133.2	199.5	266.1	332.7	399.3	465.6	532.2	63.3	126.5	189.5	252.8	379.3	379.3	442.3	505.6
	16000	1	80.4	160.8	240.9	321.3	401.7	482.1	562.5	642.6	76.4	152.8	228.9	305.2	458.0	458.0	534.4	610.5
	8000	2	24.3	48.6	72.9	97.2	121.5	145.8	170.1	194.4	23.1	46.2	69.3	92.3	138.5	138.5	161.6	184.7
	12000	2	33.3	66.6	99.8	133.1	166.4	199.7	232.8	266.1	31.6	63.3	94.8	126.4	189.7	189.7	221.2	252.8
	16000	2	40.2	80.4	120.5	160.7	200.9	241.1	281.3	321.3	38.2	76.4	114.5	152.7	229.1	229.2	267.2	305.2

*Per circuit.

HEAT OF REJECTION (Btuh)*
Optimum Subcooling (15 F)

UNIT 09BY	CFM	Ckts	TEMPERATURE DIFFERENCE (TD)															
			Refrigerant R-22								Refrigerant R-134a							
			5	10	15	20	25	30	35	40	5	10	15	20	25	30	35	40
006	2000	1			30.2	40.2	50.2	60.3	70.3	80.4			28.7	38.2	47.7	57.3	66.8	76.4
	3000	1			42.3	56.4	70.5	84.6	98.7	112.8			40.2	53.6	67.0	80.4	93.8	107.2
	4000	1			50.7	67.5	84.3	101.2	118.1	134.9			48.2	64.1	80.1	96.1	112.2	128.2
008	3000	1			45.3	60.3	75.3	90.4	105.5	120.5			43.0	57.3	71.5	85.9	100.2	114.5
	4500	1			63.5	84.6	105.7	126.8	148.0	169.1			60.3	80.4	100.4	120.5	140.6	160.6
	6000	1			75.9	101.2	126.5	151.8	177.1	202.4			72.1	96.1	120.2	144.2	168.2	192.3
012	4000	1			60.4	80.4	100.4	120.6	140.6	160.8			57.4	76.4	95.4	114.6	133.6	152.8
	6000	1			84.6	112.8	141.0	169.2	197.4	225.6			80.4	107.2	134.0	160.8	187.6	214.4
	8000	1			101.4	135.0	168.6	202.4	236.2	269.8			96.4	128.2	160.2	192.2	224.4	256.4
	4000	2			30.2	40.2	50.2	60.3	70.3	80.4			28.7	38.2	47.7	57.3	66.8	76.4
	6000	2			42.3	56.4	70.5	84.6	98.7	112.8			40.2	53.6	67.0	80.4	93.8	107.2
	8000	2			50.7	67.5	84.3	101.2	118.1	134.9			48.2	64.1	80.1	96.1	112.2	128.2
014	5000	1			75.2	100.4	125.6	150.7	175.8	200.9			71.4	95.4	119.3	143.2	167.0	190.9
	7000	1			105.6	140.9	176.2	211.4	246.6	281.9			100.3	133.9	167.4	200.8	234.3	267.8
	9000	1			126.4	168.6	210.8	253.0	295.1	337.3			120.1	160.2	200.3	240.4	280.3	320.4
	5000	2			37.6	50.2	62.8	75.4	87.9	100.5			35.7	47.7	59.7	71.6	83.5	95.5
	7000	2			52.8	70.5	88.1	105.7	123.3	140.9			50.2	67.0	83.7	100.4	117.2	133.9
	9000	2			63.2	84.3	105.4	126.5	147.6	168.7			60.1	80.1	100.2	120.2	140.2	160.2
016	6000	1			90.6	120.6	150.6	180.8	211.0	241.0			86.0	114.6	143.0	171.8	200.4	229.0
	9000	1			127.0	169.2	211.4	253.6	296.0	338.2			120.6	160.8	200.8	241.0	281.2	321.2
	12000	1			151.8	202.4	253.0	303.6	354.2	404.8			144.2	192.2	240.4	288.4	336.4	384.6
	6000	2			45.3	60.3	75.3	90.4	105.5	120.5			43.0	57.3	71.5	85.9	100.2	114.5
	9000	2			63.5	84.6	105.7	126.8	148.0	169.1			60.3	80.4	100.4	120.5	140.6	160.6
	12000	2			75.9	101.2	126.5	151.8	177.1	202.4			72.1	96.1	120.2	144.2	168.2	192.3
024	8000	1			135.9	180.9	225.9	271.2	316.5	361.5			129.1	171.9	214.6	257.6	300.7	343.4
	12000	1			190.5	253.8	317.1	380.4	444.0	507.3			181.0	241.1	301.2	361.4	421.8	481.9
	16000	1			227.7	303.6	379.5	455.4	531.3	607.2			216.3	288.4	360.5	432.6	504.7	570.7
	8000	2			68.0	90.5	113.0	135.6	158.3	180.8			64.6	86.0	107.3	128.8	150.4	171.7
	12000	2			95.3	126.9	158.6	190.2	222.0	253.7			90.5	120.6	150.6	180.7	210.9	241.0
	16000	2			113.9	151.8	189.8	227.7	265.7	303.6			108.2	144.2	180.3	216.3	252.4	285.4

*Per circuit.

Performance data (cont)

Carrier®

CONDENSER FAN

UNIT 09BY	CFM	STATIC PRESSURE (in. wg)											
		0.0		0.2		0.4		0.6		0.8		1.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
006	2000	676	0.26	905	0.51	1085	0.80	1230	1.08	1348	1.34	1449	1.60
	2500	845	0.51	1039	0.82	1197	1.14	1339	1.51	1466	1.88	1570	2.21
	3000	1014	0.88	1188	1.28	1321	1.61	1450	2.02	1569	2.46	1684	2.93
	3500	1183	1.39	1336	1.86	1458	2.26	1575	2.70	1683	3.18	—	—
	4000	1352	2.08	1487	2.61	1608	3.15	1704	3.53	—	—	—	—
008	3000	589	0.43	766	0.79	900	1.21	1000	1.61	1101	2.00	1201	2.44
	4000	785	1.03	923	1.45	1051	2.04	1157	2.61	1234	3.10	1307	3.63
	4500	883	1.48	1009	1.93	1118	2.50	1236	3.26	1315	3.82	—	—
	5000	982	2.00	1098	2.54	1194	3.09	1300	3.87	—	—	—	—
	6000	1178	3.46	1279	4.13	1364	4.73	—	—	—	—	—	—
012	4000	594	0.74	720	1.06	879	1.76	957	2.15	1028	2.61	1099	3.01
	5000	743	1.44	846	1.87	957	2.41	1089	3.38	1154	3.79	1214	4.40
	6000	892	2.49	984	2.99	1058	3.48	1163	4.31	1283	5.63	1346	6.17
	7000	1040	3.96	1129	4.60	1187	5.17	1255	5.66	1348	6.72	—	—
	8000	1189	5.91	1274	6.74	1323	7.24	—	—	—	—	—	—
014	5000	777	1.19	894	1.62	990	1.98	1077	2.34	1166	2.73	1258	3.21
	6000	932	2.06	1033	2.60	1118	3.04	1196	3.47	1268	3.92	1343	4.35
	7000	1088	3.27	1176	3.88	1255	4.45	1323	4.96	—	—	—	—
	8000	1243	4.89	1323	5.61	—	—	—	—	—	—	—	—
	9000	—	—	—	—	—	—	—	—	—	—	—	—
016	6000	578	0.83	655	1.04	736	1.32	823	1.63	893	1.99	1085	3.79
	8000	771	1.97	830	2.31	881	2.51	944	2.88	1017	3.36	1081	3.75
	9000	867	2.81	918	3.19	976	3.47	1017	3.74	1072	4.20	1139	4.75
	10000	964	3.85	1009	4.27	1064	4.65	1096	4.87	1147	5.26	1195	5.79
	12000	1157	6.65	1198	7.08	—	—	—	—	—	—	—	—
024	8000	496	1.14	547	1.56	631	1.83	701	2.21	763	2.68	877	4.13
	10000	586	1.63	598	2.09	668	2.35	743	2.83	799	3.25	854	3.76
	12000	703	3.85	760	4.62	809	5.09	859	5.37	917	5.85	—	—
	14000	821	6.12	872	7.02	912	7.70	955	8.30	—	—	—	—
	16000	938	9.14	—	—	—	—	—	—	—	—	—	—

BHP — Brake Horsepower

Indicates field-supplied drive or drive and motor required.

Electrical data

UNIT 09BY	VOLTAGE (3 Ph, 60 Hz)	SUPPLY VOLTAGE*		FAN		POWER SUPPLY	
		Min	Max	FLA	Hp	MCA	MOCP
006	208/230	187	254	6.8	2	8.5	15
	460	414	508	3.4		4.3	15
	575	518	632	2.7		3.4	15
008	208/230	187	254	9.9	3	12.4	20
	460	414	508	5.0		6.3	15
	575	518	632	3.9		4.9	15
012	208/230	187	254	15.3	5	19.1	30
	460	414	508	7.6		9.5	15
	575	518	632	6.1		7.6	15
014	208/230	187	254	15.3	5	19.1	30
	460	414	508	7.6		9.5	15
	575	518	632	6.1		7.6	15
016	208/230	187	254	15.3	5	19.1	30
	460	414	508	7.6		9.5	15
	575	518	632	6.1		7.6	15
024	208/230	187	254	22.5	7.5	28.1	50
	460	414	508	11.3		14.1	25
	575	518	632	9.0		11.3	20

LEGEND

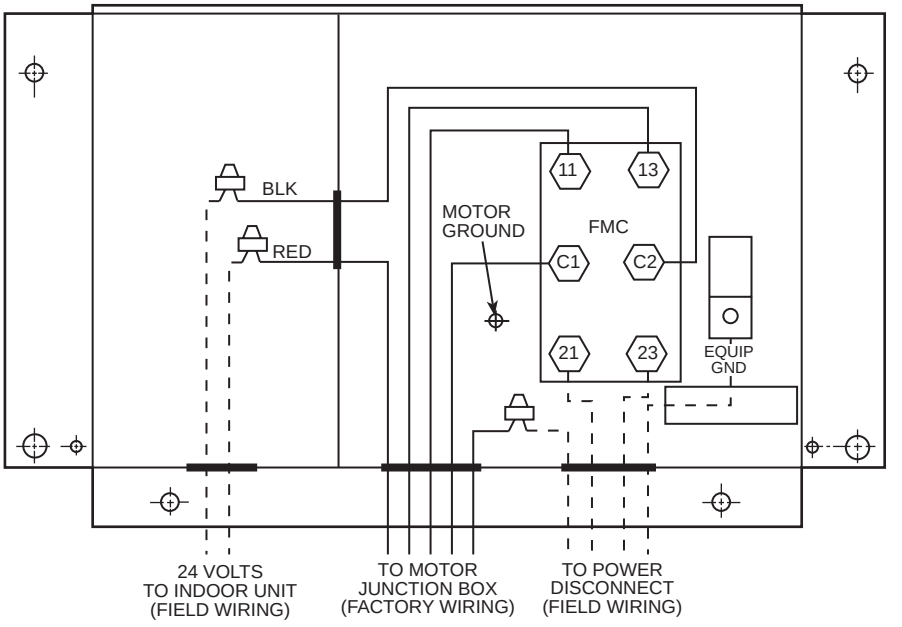
FLA — Full Load Amps
MCA — Minimum Circuit Amps. Used for wire sizing. (Complies with NEC Section 430-24.)
MOCP — Maximum Overcurrent Protection
NEC — National Electrical Code

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is within listed minimum and maximum limits.

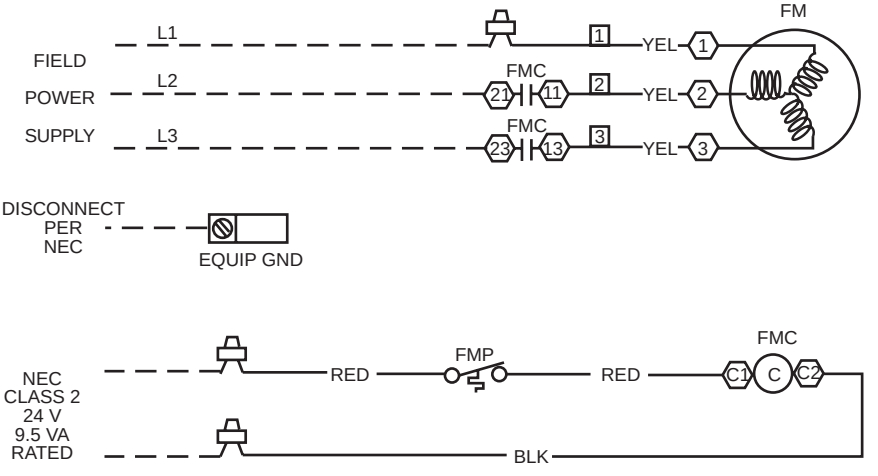
NOTES:
1. Maximum allowable phase imbalance: Voltage ± 2%; Amps ± 10%.
2. Maximum incoming wire size for power circuit is 2/0 max.

Typical wiring schematics, 09BY units

FIELD WIRING



LABEL DIAGRAM



LEGEND

EQUIP GND — Equipment Ground
FM — Fan Motor
FMC — Fan Motor Contactor
FMP — Internal Fan Motor Protector
NEC — National Electrical Code

Operating sequence

The 09BY condensing unit may be used with different types of compressor and evaporator combinations. The sequence of operation is dependent on the compressor and indoor unit that the condenser is used with. In general, whenever there is a call for cooling the condenser fan starts with the compressor and runs as long as there is a call for cooling. Fans are activated on the call for first stage and run with the lead compressor.

When matched with the 50BZ units, the 09BY sequence of operation is as follows:

On a call for cooling, the thermostat closes and energizes terminals Y1 and T1 on the 50BZ unit low voltage terminal strip. The fan motor contactor (FMC) is energized with 24 v through terminals T1 and C. The fan will continue to run until the thermostat is satisfied. At that time, the thermostat will open T1, and the fan will stop immediately.

If the condenser-fan motor overheats due to motor overload or lack of cooling air, the internal fan protector (FMP) will open the circuit to the motor, and the fan will stop. If a safety control in the unit opens, the 09BY condenser fan will not be affected, and the fan will continue to run as long as the thermostat is closed.

Operating sequence with accessories

If the condenser is equipped with low ambient damper control, the option controls condenser fan airflow in response to the saturated condensing temperature. Accessory Winter Start control should be used with low ambient to bypass the low-pressure switch for 3 minutes on compressor start-up. This allows system pressures to stablize.

A field-supplied solenoid valve (locate at indoor unit), wired in parallel with the compressor contactor coil, shuts off the liquid line to prevent the refrigerant migration back to the compressor during the off cycle. This valve is recommended for installations with piping length over 75 ft (22.9 m). If two liquid line solenoid valves are used (units over 7½ ton), check available transformer VA capability.

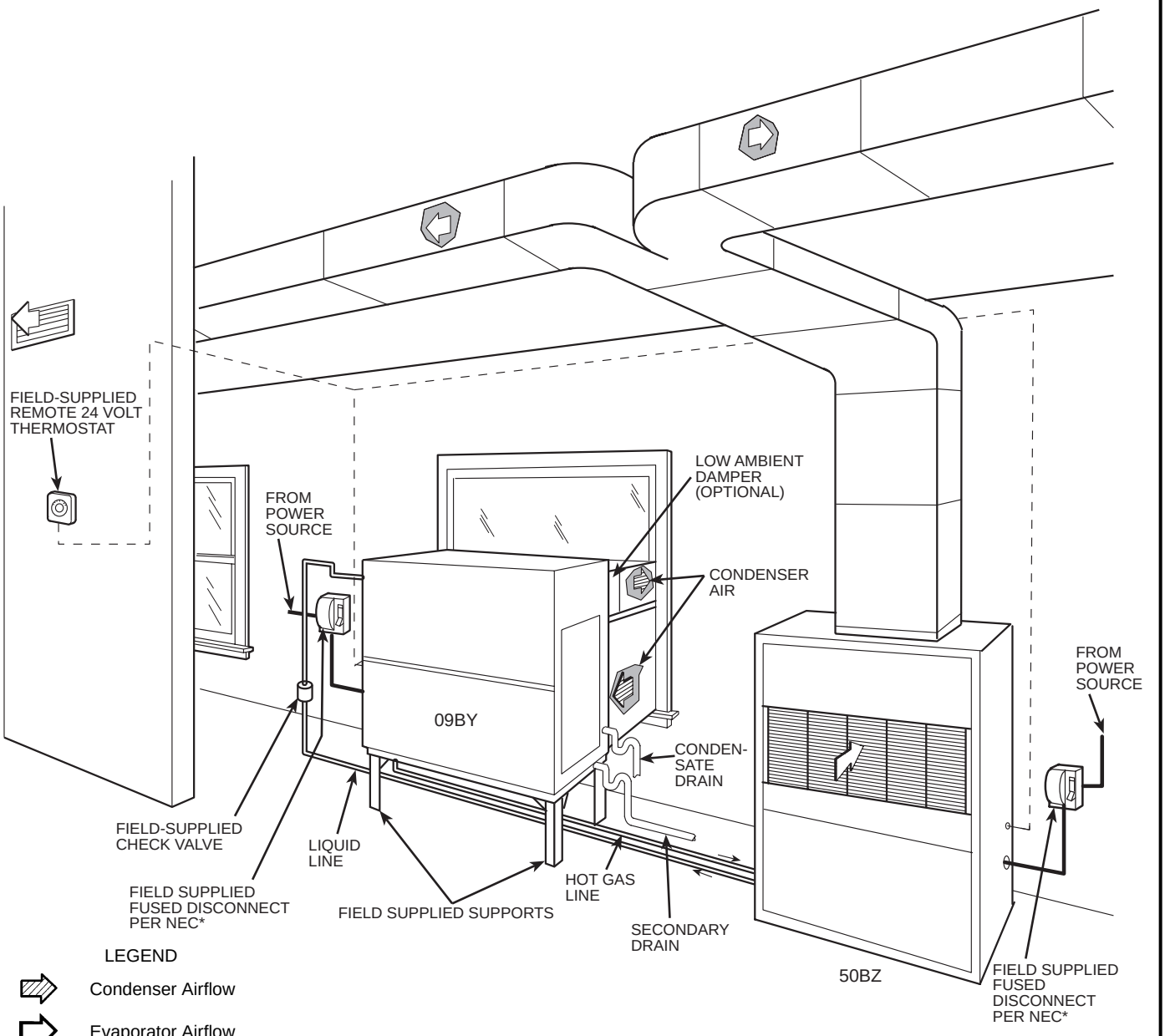
Low ambient control on 09BY units is accomplished with a refrigerant operated damper located on the condenser fan discharge. Low ambient operation does not affect operating sequence.

Winter Start (38AE-900---021) — If units matched with 09BY condenser are equipped with a 27 psig low-pressure switch (i.e., 50BZ units), a 3-minute low-pressure switch bypass is recommended for operation below 50 F.

Defrost Thermostat (50BB-900---001) — Installed on the evaporator coil and is recommended with winter start control. If an accessory defrost thermostat is used it will open if frost begins to form on the evaporator coil. This will stop the compressor but the 09BY unit will continue to run.

Typical piping and wiring

09BY MOUNTED REMOTELY INSIDE WINDOW



LEGEND

- Condenser Airflow
- Evaporator Airflow
- Power Wiring
- Control Wiring

***NEC** — National Electrical Code

NOTES:
1. Wiring and piping shown are general points of connection guides only and are not intended for or to include all details for a specific installation.
2. All wiring must comply with applicable local and national codes.
3. All piping must follow standard piping techniques. Refer to Carrier System Design Manual Part 3 for details.
4. Connect drain to building waste system and provide a trap of sufficient depth for unit static.

Application data

Location

For best results unit must be properly located and installed. Locate condenser where an adequate supply of inlet outdoor air is available. Do not locate unit where the possibility of air recirculation exists. Locate condenser in an area free from airborne dirt or other foreign material which could clog condenser coils. Selected location should not be adjacent to an acoustically sensitive space, for example a conference room or executive office. The best location is in mechanical rooms or garages near areas like elevators, restrooms, stairways or similar spaces. The mechanical room should use construction methods which will help to isolate the transmission of acoustical energy.

Since these units are typically used indoors and require large quantities of ducted condenser air, select a location with the best access to outside window or wall to accommodate condenser air louver. Locate the unit as close to the wall opening as possible but allow space for access to the condenser coil for cleaning. Units on the same floor should have a minimum of 6 feet between units to prevent recirculation of condenser air. Units floor to floor should have a minimum of 10 feet between units to prevent recirculation. Units should not be located with several units pulling condenser air from a small space between buildings which may be recirculated. Recirculation of condenser air will result in increased head pressure which may cause units to trip on high pressure.

Units may also be located outdoors. If roof installation is required, make certain that roof structure can support the condenser weight.

Unit mounting

When units are mounted to use an existing window height, a field-fabricated steel mounting stand is recommended. The stand should be built rigid enough to support the weight of the unit and braced to prevent any side to side movement of the stand. A mounting height higher than the window sill height is recommended which will allow the condenser duct to be pitched back to the louver in the window for rain elimination and drainage.

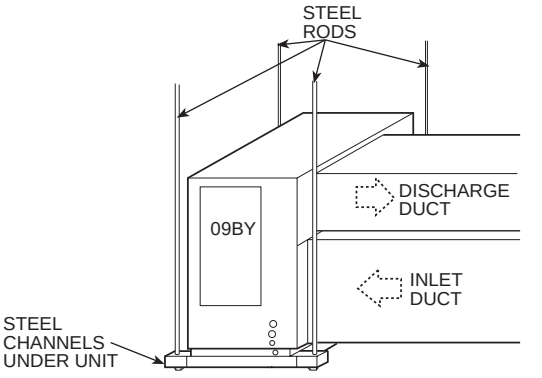
Make sure units are installed level to ensure proper drainage of liquid refrigerant and oil. When units are installed on a roof, they must be mounted on support beams that span load walls. Ground-mounted units should be installed on concrete pads of sufficient size to prevent grass and brush from blocking the unit inlet. When unit is in proper location, use mounting holes in legs for securing unit to supporting structure.

Unit may also be suspended from above. Support unit with steel channels under unit and attach to ceiling structure by steel rods. Be sure all supports can sustain unit weight.

Unit isolation

If vibration isolation is desired, rubber-in shear pads or spring isolators with 1-in. deflection are recommended under the four corners of the unit. All duct connections to the unit should be made with flexible connections to prevent any transmission of vibration to the ductwork.

SUSPENDED UNIT ON INSIDE WALL



Accessory inlet air rack

Inlet air filters are recommended on the condenser air inlet to prevent build-up of dirt and debris on coil when pulled in from outside with condenser air. This filter will reduce the need to clean the condenser coil.

Condenser ductwork

Condenser supply and discharge air ducts should be as short and straight as possible. Cross sectional area of the inlet and discharge should never be less than the face area of the unit openings. When bends must be made, they should be as gradual as space limitations will allows. If the unit will be operated in cold outdoor weather or if dampers are not provided at the louver, then the condenser ducts and unit should be insulated to prevent condensation.

Design of the louver used for the inlet and discharge of the condenser airflow is critical to preventing recirculating of air and high pressure trips. See page 18 for details of condenser louver. The louver blades must be heavy enough to prevent unit airflow from drawing them together. Louver blades should be a minimum of 18 gage and widths over 30 in. should have stiffeners. The inlet louver should not have a flange and the discharge louver should have a flange which directs the air away from the inlet. The use of a field-supplied deflector in conjunction with the condenser air discharge is also recommended.

Piping traps

The 09BY unit condenser section has a complete drain pan which will collect any rain water pulled into the condenser. If desired, this secondary drain should be trapped for 1 in. wg of static pressure, have a clean-out, and be vented and sloped for drainage. If the condensate line from the evaporator unit and secondary drain are connected, the connection must be at a level that will not allow condensate to drain back into the secondary drain.

Application data (cont)

Operational limits

Airflow — 200 to 500 CFM/ton

Condenser airflow

Nominal airflow 500 cfm/ton,
Condenser air temperature
Maximum: 115 F
Minimum without low ambient: 55 F
Minimum with low ambient: 0° F

Liquid lift and subcooler circuit

Amount of liquid lift available before refrigerant flashing occurs depends on amount of liquid subcooling in the system. All 09BY condensers have positive subcooling when applied with optimum charge. With subcooling, it is possible to overcome an appreciable pressure drop and/or static head pressure (due to elevation of the liquid metering device above the condenser when condenser is below evaporator coil). However subcooling will decrease the total heat rejection capability of the condenser. This is because subcooling results from a portion of the condenser tubes being filled with liquid refrigerant, decreasing the area for condensing to occur.

When 09BY condensers are applied with minimum charge, they do not provide positive subcooling. If subcooling is required, it must be obtained by external means such as a liquid suction interchanger. It is recommended that the evaporator be either at the same level as the condenser or lower than the condenser when minimum charge is used.

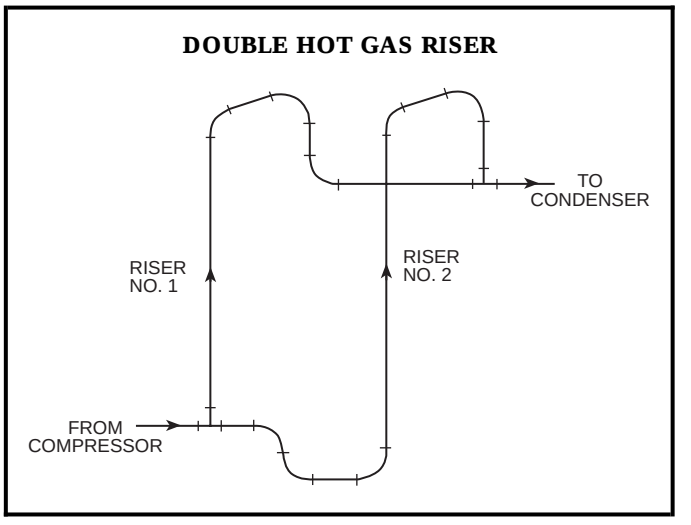
Refrigerant line sizing

Sizing depends on length of lines between various sections of the refrigerant system. Consider the amount of liquid lift and drop in the system as well as proper compressor oil return. Consult Carrier System Design Manual, Part 3, for proper piping sizes and design.

Use the following guideline for refrigerant piping:

Discharge lines

1. Base line size on a 2° F change in saturated condensing temperature.
2. Lines must be sized and routed so that oil is carried through the system. When the condenser is located at a higher level than the compressor, take special precautions that oil will return at reduced capacity. A double hot gas riser may be required with high lift and a large degree of unloading. Be sure to trap the connections between both risers.
3. Protect the compressor from liquid refrigerant or oil draining back during compressor off cycles by ensuring the following:
   a. The highest point in the discharge line should be above the highest point in the condenser coil. A purge valve should be applied at this point.



   b. The hot gas line should loop to the floor if the condenser is located above the compressor, especially if the hot gas riser is long.
   c. If the condenser is located where the ambient temperature could be higher than the ambient at the compressor location, a check valve should be installed in the hot gas line.

Liquid lines

1. Liquid line can generally be sized for a 1° to 2° F degree change in saturation temperature.
2. A receiver, if used in the system, should be located below the condenser. The condenser to receiver liquid line must be sized to allow free drainage. This line should be sized so the velocity does not exceed 100 FPM.
3. Generous sizing of this liquid (condensate) line is especially important if the receiver is exposed at any time to a warmer ambient temperature than the condenser. It must be large enough for the liquid to flow to the receiver and at the same time allow flow or refrigerant vapor in the opposite direction back to the condenser. The receiver will become vapor locked under these conditions if re-evaporated gas is not allowed to flow back to the condenser for re-condensation.
4. Liquid lines should be free of any traps or loops.

Piping should be routed to avoid excessive strain on system components or the piping itself. Discharge lines must be supported with rigid pipe supports to prevent transmission of vibration and movement of the line. The discharge line should be well supported near the condenser hot gas connection. Use offsets in interconnecting lines between two condensers and provide isolation where pipes pass through building walls or floors.

Condenser head pressure control

Efficient operation of evaporator thermostatic expansion valve (TXV) 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% capacity.

A drop in the entering outdoor air temperature results in a lower saturated condensing temperature. When outdoor-air temperature drops below the 50 F minimum outdoor-air operating temperature, head pressure control is required.

Units are not suitable for use with Motormaster® speed control. Low ambient operation is accomplished with fan discharge dampers which operate with a refrigerant controlled operator from lead compressor discharge pressure.

When units have a low pressure switch and the use of winter start kit is recommended (38AE-900---021). Kit bypasses low-pressure switch on start-up. The use of defrost thermostat kit (50BB-900---001) is also recommended to sense frost on the evaporator coil if suction temperature drops near freezing.

Process applications

Process applications are defined as heat rejection loads which are not related to or significantly affected by outside ambient conditions. Process applications tend to have constant heat rejection requirements throughout the year. Consult application engineering for assistance in designing and selecting process systems.

Setting condenser fan speed

The 09BY condenser has a centrifugal blower and a variable pitch drive which allow adjusting the condenser airflow to match the static from the louvers, ductwork, filters and sound traps (if used). It is best to adjust the fan to the nominal airflow and the rpm which will achieve this performance. Excess airflow and rpm will make units noisier.

Sound considerations

When unit is installed in or near areas requiring additional sound attenuation:

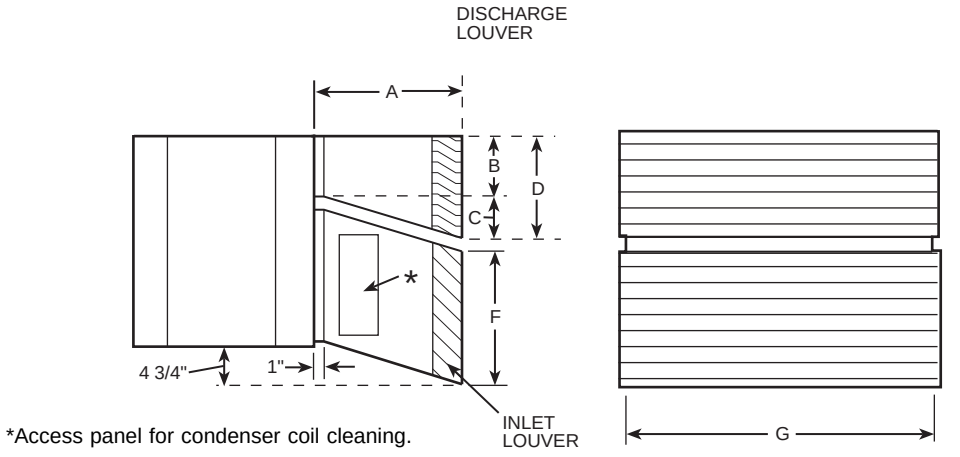
- Locate unit in equipment room or closet
- Use acoustic lining in ductwork
- Provide square duct elbows with acoustic lining and turning vanes
- For critical applications, use packaged sound attenuators or duct silencers. Sound attenuation may be used on both evaporator air and condenser air.

SOUND POWER LEVELS dB (10 [−12] Watts)

UNIT 09BY	OUTDOOR FAN (octave band)						
	125	250	500	1000	2000	4000	8000
006	75.0	73.0	72.5	68.0	67.0	64.0	54.0
008	75.5	76.0	77.0	70.0	67.5	63.5	53.0
012	77.5	76.5	77.0	73.0	74.0	72.0	59.0
014	60.0	80.0	80.0	79.0	77.5	78.0	76.5
016	84.0	81.0	78.5	76.0	75.5	75.0	65.0
024	83.0	86.5	85.5	80.5	83.5	83.5	72.0

Application data (cont)

TYPICAL RECOMMENDED CONDENSER DUCT DIMENSIONS

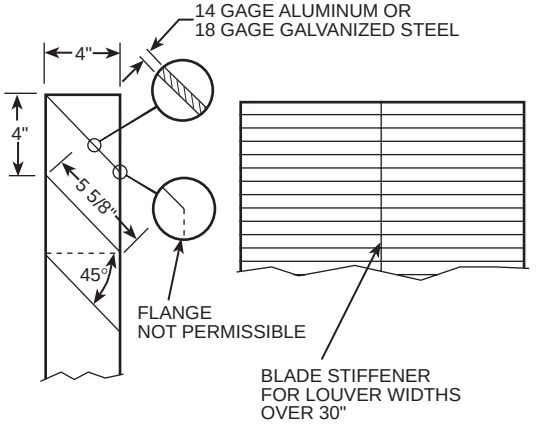


*Access panel for condenser coil cleaning.

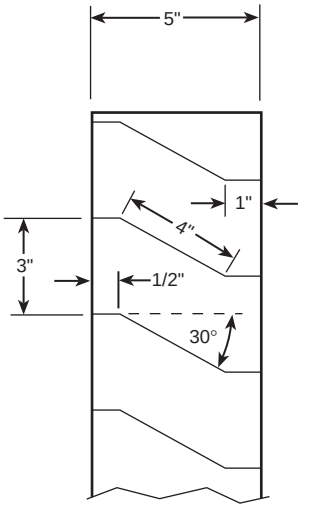
DIMENSIONS (in.)

UNIT 09BY	A	B	C	D	F	G
006	24	14⅛	6	20⅛	26	34⅝
008	24	15¾	6	21¾	26	41⅛
012	24	14	6	20	26	57¼
014	24	14	6	20	26	64¾
016	30	15⅞	6	21⅞	30⅛	69½
024	30	18	6	24	36¼	78

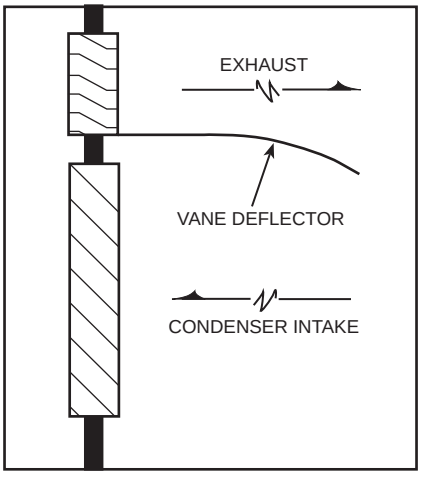
INLET LOUVER DETAIL



DISCHARGE LOUVER DETAIL



DEFLECTOR DETAIL



Guide specifications — 09BYN

Air-Cooled Condenser

HVAC Guide Specifications

Size Range: **5 to 20 Tons**

Carrier Model Number: **09BYN**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Indoor or outdoor mounted, air-cooled condenser with belt drive centrifugal fan. Air shall discharge horizontally with inlet and outlet on the same face of the unit.

1.02 QUALITY ASSURANCE

A. Units shall be rated using refrigerant R-22 or R-134a. Ratings shall be listed at a minimum (5° F subcooling) and optimum (15° F subcooling) refrigerant charge and in accordance with ARI Standard 460.

B. Unit shall be designed to conform to ANSI/ASHRAE 15, latest revision safety code, and UL Standard 1995, and shall be UL listed under both American and Canadian Standards.

C. Coils shall be leak tested at 420 psig and unit operation shall be tested at the factory.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. General:

Indoor or outdoor mounted, packaged, air-cooled remote condenser unit. Factory-assembled unit shall consist of condenser coil, fan with motor and drive, factory wiring, piping and electrical controls, and a charge of dry nitrogen.

B. Cabinet:

Cabinet shall be steel frame construction with removable access panels for control box and motor drive adjustment. Panels shall be of zinc-coated bonderized steel finish with baked enamel paint. Unit cabinet shall be capable of withstanding Federal Test Method Standard No. 141 (method 6061) 500 Hour Salt Spray Test.

C. Fans:

1. Fans shall be double inlet, centrifugal wheel with forward curved blades, designed for continuous operation. Fan wheel and scroll shall be constructed of steel with corrosion resistant finish, and statically and dynamically balanced.
2. Fan shall be belt drive with an adjustable pitch motor pulley, with permanently lubricated, ball-bearing type bearings.
3. Discharge side of condenser fan shall be protected by corrosion proof fan guards.

D. Coils:

Coils shall use seamless copper tube, aluminum plate fins and galvanized steel tube sheets. Fins shall be bonded to tubes by mechanical expansion. Hot gas and liquid connections shall be made at the same end of the coil. Units shall be circuited for one or two circuits with each circuit having an integral subcooling circuit. Multiple circuit coils shall be capable of being field connected to single circuit.

E. Motor:

Motors shall be TEFC (Totally Enclosed Fan Cooled). Motors with internal overload protection, protected to operate at the specified electrical characteristics. Motors shall be 3 phase.

F. Controls:

Unit shall be provided with a contactor to control the condenser fan motor. Contactor shall be controlled by 24 volt power. Motor internal overload protection shall open contactor on a motor overload.

G. Operating Characteristics:

Units shall be capable of rejecting the required heat at the nominal cfm. Unit shall be capable of adjustment to allow operation with ductwork and inlet and discharge louvers as shown on the contract drawings. Units shall be capable of operation at moderate ambient temperatures as standard and operation to 0° F with low ambient damper.

H. Electrical Characteristics:

Units shall be capable of operating on 3 phase. Electrical characteristics as specified in the equipment schedule. Control voltage shall be 24 volts from external source.

I. Special Features:

1. Low Ambient Control:

Kit shall consist of discharge damper and all controls and mounting hardware to install damper. Damper shall be activated from refrigerant pressure to control dampers from full open to closed and permit operation to 0° F.

2. Inlet Filter Rack:

Kit shall consist of a filter rack with 1-in. disposable filters which mounts on the coil inlet to reduce dirt build-up on the condenser coil.