

FORM NUMBER: 76-100-3
DATE:
REVISED:

WARREN//SHERER

INSTALLATION & OPERATION MANUAL

MODEL:

MASTERMETICS - WEATHERMETICS

S A H - S W H - R A H

THIS REFRIGERATOR CONFORMS TO THE COMMERCIAL
REFRIGERATOR MANUFACTURERS ASSOCIATION HEALTH AND
SANITATION STANDARD.

CRS-SI-78

WARREN//SHERER

DIVISION OF KYSOR INDUSTRIAL CORPORATION

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1. INTRODUCTION

Condensing units are available in a power range of 3/4 HP through 25 HP. These units are mounted on one base, are compact in design, and enable the compressor to operate at its maximum efficiency.

Accessories to facilitate the condensing unit and refrigerator installation are available at a slight additional cost. A discussion of these accessories is contained in the manual; pricing information will be found in the Warren/Sherer Sales Catalog.

Mastermetic-Weathermetic nomenclature is listed in table 1-1 below:

Designation	Description
SAH	Self-Contained Air-Cooled Units
SWH	Self-Contained Water-Cooled Units
RAH	Remote Air-Cooled Units
OSAH	Self-Contained Outdoor Air-Cooled Units
FH	R-12 High-Temperature
FC	R-12 Medium-Temperature
FL	R-12 Low-Temperature
RC	R-502 Medium-Temperature
RL	R-502 Low-Temperature

Table 1-1
Mastermetic-Weathermetic Nomenclature

2. INSTALLATION

2.1 Refrigerant Line Hookup

All Mastermetics are shipped with a DRY NITROGEN HOLDING CHARGE. This holding charge prevents unit contamination and allows verification of the pressure integrity of the high side after customer receipt. Cracking the discharge service valve should allow the nitrogen holding charge to escape. If no nitrogen escapes, a leak in the high side is probable, and steps should be taken to find and repair the leak. Each Mastermetic is factory checked for leaks by electronic leak detectors with

a pressure of 400 psig, so the possibility of a leak is very remote. However, on occasion rough handling in transportation may break a line or solder joint.

For safe operation and trouble-free installations the following steps should be carried out by the installation men.

1. Use only clean sealed copper tubing. Do not remove the seals until you are ready to make your weld connections.
2. While making weld joints, use a low pressure nitrogen flow inside the copper tubing. This will help prevent scaling within the copper tubing. Caution - see note 1
3. After all welds are made, open both ends of the tubing run and connect one end to dry nitrogen line. Blow out the lines with 250 to 300 psig until there is no visible scale present in the gas coming out of the open end.
4. Connect the refrigerant lines to the Mastermetic and refrigerator; then open all valves on the Mastermetic. Charge with a small refrigerant charge and then check for leaks. If no leaks are detected, release the refrigerant vapor to atmosphere.
5. With all valves open, connect a suitable vacuum pump to the Mastermetic and pull a vacuum of at 1500 Microns. If the gauge does not approach this value after a reasonable period, stop the vacuum pump. Re-charge the lines per step 4 above and check again for system leaks. Caution see note 2.
6. After leak repair, connect the vacuum pump again to the Mastermetic and follow the procedure of step 5 above.
7. After holding a vacuum for a long time (at least 2 hours for each refrigerator in system) connect the refrigerant charging line to the compressor and charge until the gauge reads 5 psig.
8. Repeat step 7 above at least one more time before the final refrigerant charge.
9. When charging from a large cylinder, use a new drier in the line between the cylinder and the Mastermetic, to insure dry refrigerant.

10. After 24 hours operation, install a new drier in liquid line after checking all expansion valve strainers, and compressor suction strainer.

Caution note 1: When using a high pressure nitrogen container, proper regulating equipment in good operating condition must be used.

Caution note 2: Do not breathe the products of combustion from a halide leak detector when refrigerant is present.

2.2 Water-Cooled Units

All water-cooled units are furnished with an automatic water control valve to give correct condensing temperatures. For maximum efficiency of your system, set the water valve to maintain the corresponding pressure of the refrigerant employed to no less than 80°F. Condensing temperatures below 80°F may cause improper operation of the refrigeration expansion valve.

The water pump employed on water tower applications should be sized to give approximately 3 gallons of water per minute per ton of refrigeration. This means that for most applications in food stores, a figure of 2 gallons per horsepower should be satisfactory.

Water-cooled condensers should be checked every six months for scale growth on the water tubes. Such growth should be removed as this seriously affects the efficiency of the unit.

2.3 Accessories

There are many accessories available for the Mastermetic. Use of these accessories will facilitate a rapid installation of both the condensing and refrigerator units. Complete details are available from your local sales representative.

Standard control panel components include a suitable circuit breaker, contactor or starter, proper defrost time clock when specified and dual pressure control. The pressure control is mounted on the compressor body to help eliminate line vibration.

Oil safety controls are standard on all Mastermetic compressors rated in excess of 3 horsepower. The NRD 0310 (300FC-310RL) 3-horsepower compressor also has an oil safety control. These controls prevent compressor damage due to low oil pressure. This is a manual reset control and should the control cycle off, it is recommended that the system be examined to determine the cause of the problem. Continued reset of the reset button will probably result in repeated cycling off if the cause of the low oil pressure is not found and repaired. Minimum oil pressure should be 8-10psi above system suction pressure.

On Weathermetics subject to ambient temperatures of less than 60°F, a thermostat is required on refrigerators for proper temperature control.

All liquid-line kits have a drier of adequate size, a liquid indicator, and hand valve to isolate the drier when changing is necessary. The drier in a system functions as a filter and moisture remover. When replacing the original drier, make sure to replace it with one of the same characteristics.

Liquid line pump down solenoid valves are available either installed or shipped separate for walk-in cooler applications.

Defrost relays are available; both single and three phase, for applications up to 90 amperes. The relays are sized for non-inductive (defrost heater) loads and should not be used for compressor loads.

2.4 Compressor Room Layout Guide

2.4.1 Mastermetic Advantages

Mastermetic air-cooled condensing units meet the most stringent requirements, in performance, size efficiency, and cost of ownership.

Major Advantages of the Mastermetic

low cost of ownership ← installation
first cost
maintenance

size efficient - space saving

equal or greater capacity than remote
air-cooled units

2.4.2 Application of Air-Cooled Mastermetics

In locations where the temperature does not vary to a great extent between summer and winter, no special arrangements are necessary except that the units should be located within an enclosure to keep dust to a minimum. Excessive dust tends to clog the condenser air passages and thereby reduce refrigeration efficiency.

There are three important factors that must be maintained to keep performance at its peak.

During the summer, the air entering the condenser must never exceed the outside temperature.

Fresh air must constantly be brought into the room so that no stagnant air pockets will exist.

During winter, the air entering the condenser should not be lower than 55°F unless artificial head pressure control is employed.

2.4.3 Compressor Room Ventilation - Air-Cooled Condensing Units

Maximum performance from the Mastermetic requires an adequate fresh air circulation through the machine room. Fresh air circulation is provided by use of electric motor driven fans, suitably located as described below.

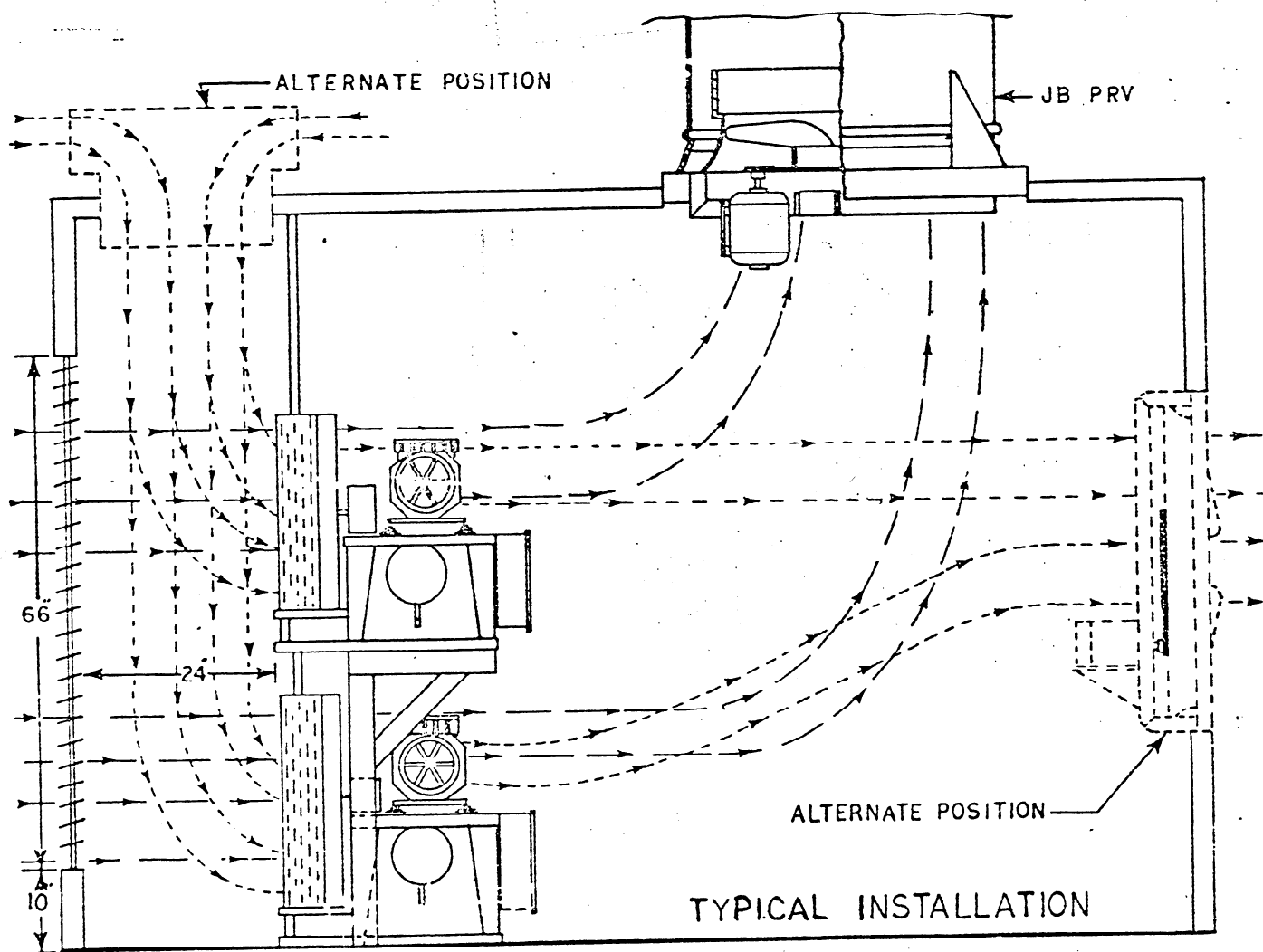


FIGURE 2-1
Typical Ventilating Air Installation

Figure 2-1 presents typical installation combinations of ventilating fans and intake louvers. In all instances, the fans pull air from the room as exhaust fans, while fresh air enters through the louvered panels. The air-circulation path(s) shown in Figure 2-1 show an outside wall mounted louver, preferably opposite the condenser(s). An alternate louver position in the roof is also depicted. The exhaust fans may be either roof or wall mounted. Criteria to determine louver and fan locations are basically:

- eliminate all stagnant air zones within the room
- accommodate the practical requirements of the room location.

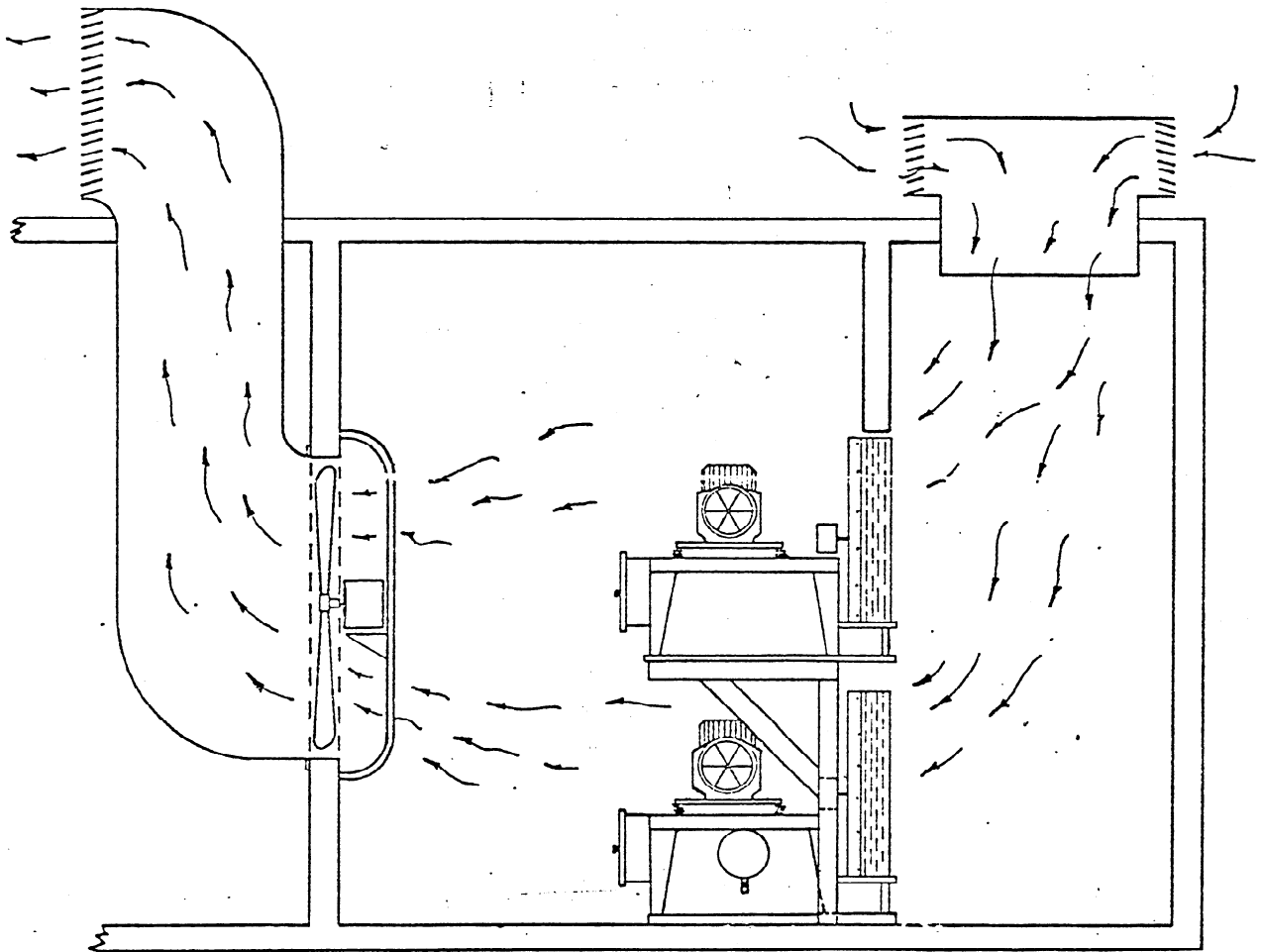
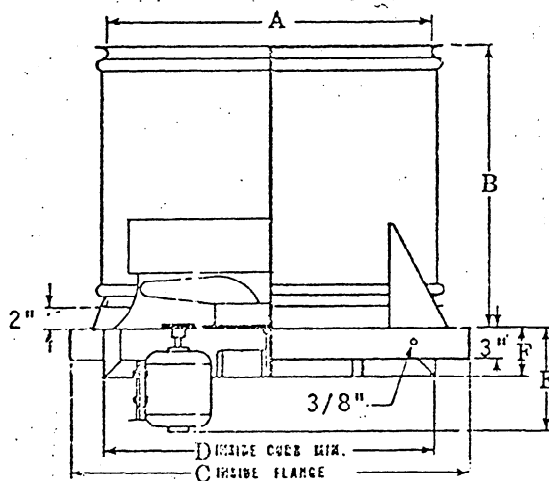


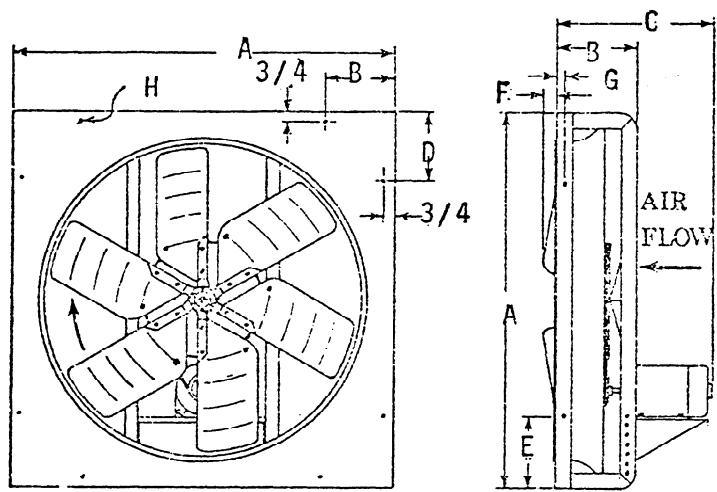
FIGURE 2-2
Roof Ducted Ventilation Air Installation

Figure 2-2 is representative of a machine room that is situated between adjoining rooms. This case usually requires roof mounted entry and exhaust ducting for the ventilating air. Because of the relatively circuitous air path, it is important to assure both minimum ducting pressure loss characteristics as well as to insure an even distribution of the ventilating air flow within the room.

Proper location of fan thermostats is necessary for a uniform response of the exhaust fans. The plan view of Figure 2-3 illustrates correct grouping; on the inside wall, near each other, and centered on the wall. Referring to the plan view, note that the exhaust fans are numbered 1, 2, and 3, with individual thermostats. For ideal conditions the compressor room should maintain approximately 80°F when possible. With this in mind, thermostat 1 should be set to operate the fan at 75°F, thermostat 2 at 80°F and thermostat 3 at 85°F. If the room is above 85°F, all fans should operate. As the room temperature decreases, the fans react in sequence. If motorized louvers are employed, the thermostat operating the lower motor should be set 5°F below the lowest exhaust fan cut-in temperature.



PENTHOUSE FAN AND HOUSING ASSEMBLY				DIMENSIONS IN INCHES				APPROX SHIPPING WT.
FAN MODEL	BLADE DIA.	CFM @ 1/8 S.P.	MOTOR H.P.	A	B	C	D	
JB 3010F	30	10,700	1	38	29	44	35	315
JB 3615M	36	14,750	1-1/2	44	32	50	41	435
JB 4220M	42	19,350	2	50	35	56	47	500
JB 4230M	42	23,750	3	50	35	56	47	510
JB 4830H	48	28,000	3	56	38	62	53	700
JB 48500H	48	33,200	5	56	38	62	53	745
JB 48750H	48	38,650	7-1/2	56	38	62	53	795
JB 54500H	54	38,350	5	62	41	68	59	900
JB 54750H	54	44,200	7-1/2	62	41	68	59	990



FRONT VIEW

SIDE VIEW

BELT DRIVE MODELS				FAN DIMENSIONS IN INCHES							APPROX. SHIPPING WEIGHT	COMPANION SHUTTER MODEL
FAN MODEL	BLADE DIA.	CFM @ 1/8 S.P.	MOTOR H.P.	A	B	C	D	E	F	G		
C 3659Q	36	9,300	1/2	44	9-1/4	15-7/8	7	5	1/2	7/8	105	S-36
C 4275Q	42	13,150	3/4	50	9-1/4	15-7/8	7	5	1/2	7/8	115	S-42
C 4215H	42	17,050	1-1/2	50	9-1/4	20-7/8	7	5	1/2	7/8	214	S-42
C 4230H	42	22,900	3	50	9-1/4	20-7/8	7	5	1/2	7/8	214	S-42
C 4875Q	48	16,100	3/4	56	10-1/2	19-3/4	8	6	1/2	1	154	S-48
C 4810Q	48	19,100	1	56	10-1/2	19-3/4	8	6	1/2	1	154	S-48
C 4815H	48	21,350	1-1/2	56	10-1/2	22-1/4	8	6	1/2	1	259	S-48
C 4820H	48	23,150	2	56	10-1/2	22-1/4	8	6	1/2	1	259	S-48
C 4830H	48	28,400	3	56	10-1/2	22-1/4	8	6	1/2	1	259	S-48
C 4850H	48	33,500	5	56	12-3/4	29-1/2	8	6	1/2	1	383	S-48

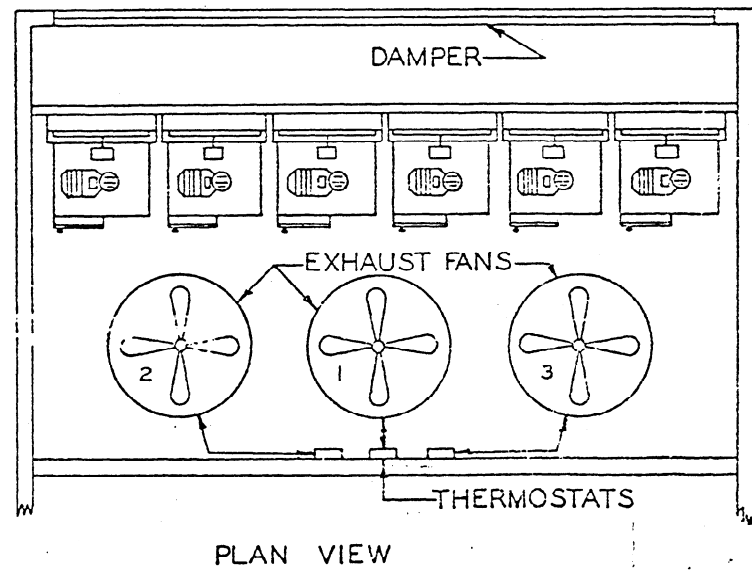
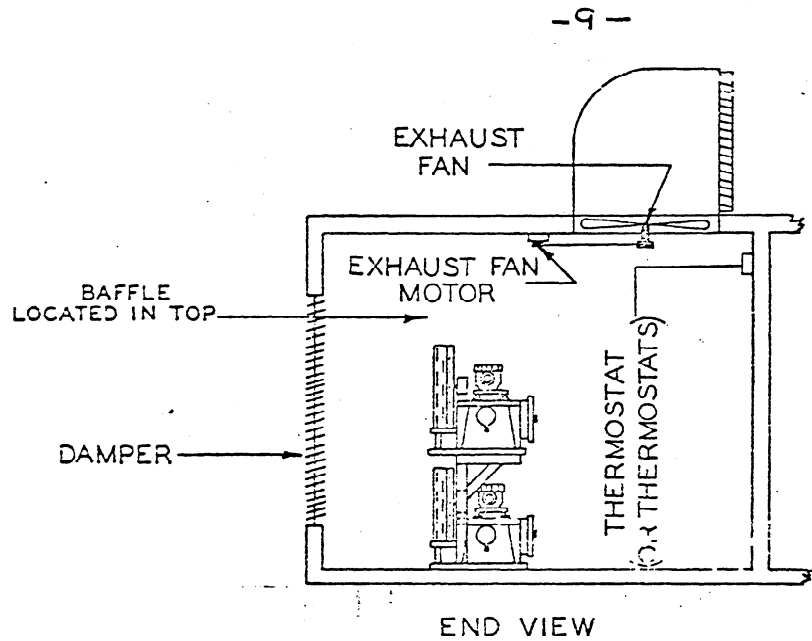
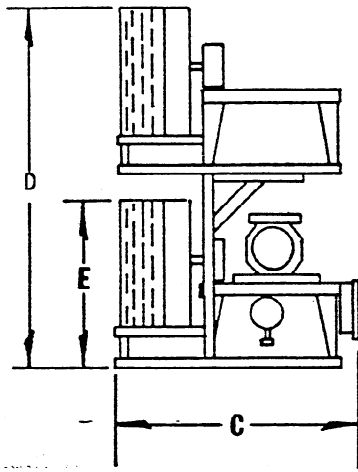


FIG. 2-3

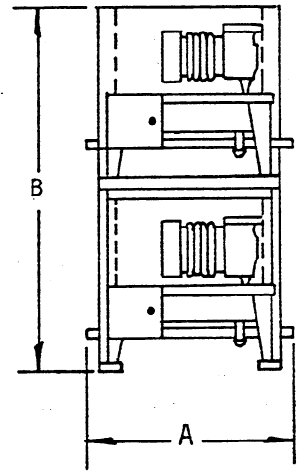
AIR CONTROL OPERATIONS

- AT 70° F THERMOSTAT OPENS LOUVERS 1/3
- AT 75° F THERMOSTAT OPENS LOUVERS 2/3 AND STARTS EXHAUST FAN #1
- AT 80° F THERMOSTAT OPENS LOUVERS FULL AND STARTS EXHAUST FAN #2
- AT 85° F THERMOSTAT STARTS EXHAUST FAN #3

AS THE ROOM TEMPERATURE DECREASES THE FANS AND LOUVERS REACT IN ORDER



SIDE VIEW



FRONT VIEW

DOUBLE CONDENSER
CONDENSING UNITS
WIDTH (DIM. "A") IS AS
LISTED BELOW FOR ALL
TYPES OF UNITS.

SINGLE CONDENSER
CONDENSING UNITS
SINGLE & DOUBLE DECKED

SAH & SAWH DIMENSIONS

UNIT	A	B****	C	D	E***	UNIT	A	B****	C	D	E***
70FH	27-1/8**	B	40**	-	34	550FC	34	B	40**	-	36-1/2
70FC	27-1/8**	B	40**	-	34	560RC	40-1/8	B	46	-	38-1/4
100FH	27-1/8**	B	40**	-	34	560RL	34	B	40**	-	36-1/2
100FC	27-1/8**	B	40**	-	34	750FH	40-1/8	B	46	-	38-1/4
110RL	27-1/8**	B	40**	-	34	750FC	40-1/8	B	46	-	38-1/4
150FH	27-1/8**	B	40**	-	34	760RC	40-1/8	B	46	-	38-1/4
150FC	27-1/8**	B	40**	-	34	760RL	34	B	40**	-	36-1/2
160RL	27-1/8**	B	40**	-	34	780FC	40-1/8	B	46	-	38-1/4
200FH	27-1/8**	B	40**	-	34	790RC	46-1/4	B	50-1/4	-	46-1/4
200FC	27-1/8**	B	40**	-	34	790RL	40-1/8	B	46	-	38-1/4
210RC	27-1/8**	B	40**	-	34	1000FH	46-1/4	B	50-1/4	-	46-1/4
210RL	27-1/8**	B	40**	-	34	1000FC	40-1/8	B	46	-	38-1/4
300FH	34	B	40**	-	36-1/2	1010RC	46-1/4	B	50-1/4	-	46-1/4
300FC	34	B	40**	-	36-1/2	1010RL	40-1/8	B	46	-	38-1/4
310RC	34	B	40**	-	36-1/2	1500FH	40-1/8	-	46	84*	38-1/4
310RL	34	B	40**	-	36-1/2	1500FC	46-1/4	B	50-1/4	-	46-1/4
410RC	34	B	40**	-	36-1/2	1510RC	40-1/8	-	46	84*	38-1/4
500FH	34	B	40**	-	36-1/2	1510RL	46-1/4	B	50-1/4	-	46-1/4
500FC	34	B	40**	-	36-1/2	2000FH	40-1/8	-	46	84*	38-1/4
510RC	34	B	40**	-	36-1/2	2000FC	40-1/8	-	46	84*	38-1/4
510RL	34	B	40**	-	36-1/2	2010RC	40-1/8	-	46	84*	38-1/4
						2010RL	40-1/8	-	46	84*	38-1/4
						2500FC	40-1/8	-	46	84*	38-1/4
						2510RC	40-1/8	-	46	84*	38-1/4
						2510RL	40-1/8	-	46	84*	38-1/4

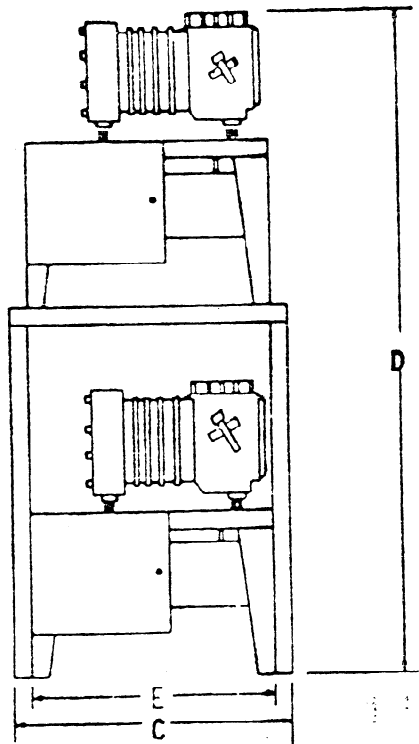
*Denotes Maximum

**If options require Heavy Duty Control Panel HDCP, then dimension "A" will be 31-3/4, and dimension "C" will be 41-1/4.

***Includes 2 x 4 pallet. If heat reclaim valve is used, then add 4-1/4" to dimension "E". Or, if head cooling fan is used, then add 9-1/2" to dimension "E".

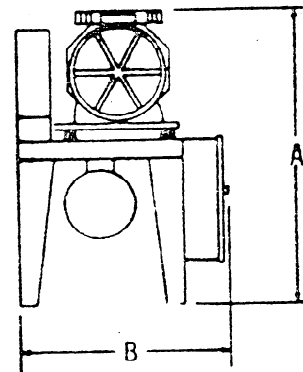
**** If top unit is mounted above 790RC, 1000FH, 1010RC, 1500 FC, or 1510RL, then dimension "B" will be 48" plus dimension "E" of top unit. Otherwise, dimension "B" will be 45" plus dimension "E" of top unit.

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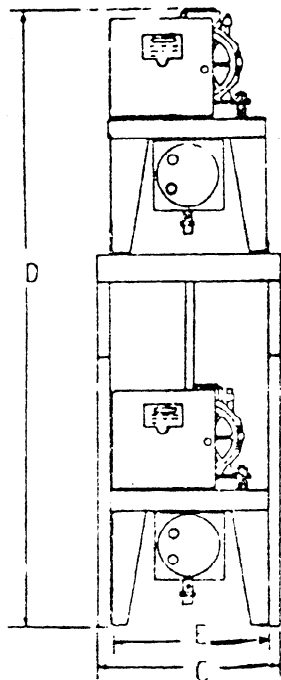
SINGLE UNIT AND
UNITS DOUBLE DECKED
Front View

DIMENSIONS	
RAH	
All Units	
A	37 Max.
B	28-3/4
C	30-1/4
D	82 Max.
E	36-1/2



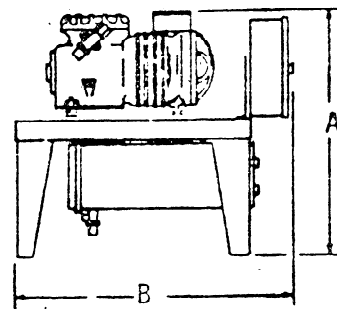
SINGLE UNIT
Side View

MODEL RAH



SINGLE UNIT AND
UNITS DOUBLE DECKED
Front View

DIMENSIONS		
	SWH	SWH
	2 - 15 HP	20 & 25 HP
A	37 Max.	34-1/2 Max
B	35	52-1/2
C	24	24
D	82 Max.	77-1/4 Max
E	21	21



SINGLE UNIT
Side View

MODEL SWH

3. ENGINEERING NOTES

3.1 Refrigerant Selection

Both R-12 and R-502 are offered in commercial temperature applications. For low temperature applications R-502 only is specified; this because for a given compressor displacement its refrigerating capacity is somewhat greater than that of R-12 at the low temperatures. Use of R-502 for commercial temperatures as well as low temperatures has the advantage of using but one refrigerant in a given store. However, this benefit should be weighed carefully since R-502 is approximately twice as expensive as R-12.

3.2 Compressor Selection

The appropriate condensing unit is selected after the type refrigerant has been determined. The individual case compressor size sheets list the electrical requirements for each case, recommended line sizes and BTUH requirements for most common length line ups. For most line ups a compressor selection is included.

Please note that most of the compressor selections are based on 90° ambient which will produce approximately 105° condensing on low temperature units and 110° condensing on commercial temperature units. If ambients over 90° are expected, then the machine's capacity will decrease at the rate of 4% per 5°F increase in ambient.

3.3 Multiplexing

Multiplexing is the term applied when more than one case line up is supplied by one compressor. When multiplexing, care must be taken to size the compressor to accommodate the entire load at the lowest suction temperature requirement for any case in the group. In order to avoid problems associated with dissimilar defrosts, it is preferable to multiplex only the same kinds of cases.

For your particular multiplexing application, please contact the Engineering or Service Department.

3.4 Winter Control

OSAH outdoor units are factory equipped with a condenser flooding valve as standard. When "flooding" a condenser to control winter head pressures, additional refrigerant is required to fill the condenser with liquid to cut down on condensing surface. The following chart lists the amount of refrigerant that should be added after the sight glass indicates a full

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charge based on ambient temperature when charging the system. This chart is based on 105° condensing temperature and the valve is set to maintain 105° condensing. IMPORTANT: IT IS IMPERATIVE THAT THIS CHART BE ADHERED TO FOR PROPER OPERATION IN COLD WEATHER.

CONDENSING UNIT (SAH)	AMBIENT TEMPERATURES WHEN CHARGING					
	10° & BELOW	11° TO 24°	25° TO 39°	40° TO 59°	60° TO 79°	80° UP
1 H.P.	1.0	2.5	3.0	3.5	3.5	4.0
1-1/2 H.P.	1.5	4.0	4.5	5.0	5.5	6.0
2 H.P.	2.5	5.0	6.0	6.5	7.0	7.5
3 H.P.	3.0	7.0	8.0	8.5	9.0	10.0
5 H.P.	3.5	8.5	10.0	10.5	11.0	12.0
7-1/2 H.P.	5.5	13.0	15.0	16.0	17.5	19.0
10 H.P.	7.0	16.0	18.0	20.0	21.0	22.0
15 H.P.	11.0	26.0	30.0	32.5	35.0	37.0
20 H.P.	14.0	32.0	36.0	40.0	42.0	44.0
25 H.P.	14.0	32.0	36.0	40.0	42.0	44.0

For practical purposes R-12 and R-502 charge additions are the same.

The condenser flooding valve is available on RAH and SAH units as an option. Also available for extreme climates are insulated/heated receivers and condenser fan cycling controls.

3.5 Line Sizing

The line sizes indicated on the compressor size sheets mentioned in 1-2 are liberally sized to cover all contingencies. For a particular job where exact line lengths are known, contact the Engineering Department for sizing assistance or ask for the Line Sizing Bulletin, which will usually result in a smaller line size.

3.6 Control Panels and Time Clocks

Following is a list of Control Panels showing the components of each and their functions based on the most effective current applications in the field. Components listed are for "RWCP" (Regular Warren Control Panel). Components for the "HDCP" (Heavy Duty Control Panel) are the same except a NEMA-rated heavy-duty Square-D contactor is used in lieu of the definite purpose type. In addition, the HDCP includes a defrost-

indicating pilot light, an on-off control-circuit toggle switch, and provisions for one common electrical terminal strip for wiring both compressor and electric-defrost circuits. Also the large control-panel box is used for all horsepower sizes.

<u>PANEL</u>	<u>COMPONENTS</u>	<u>APPLICATION & FUNCTION</u>
RWCP-1 HDCP-1	Circuit Breaker Contactor <u>No</u> time clock	For off cycle defrost on produce cases, walk-in produce rooms, meat-cutting rooms, air conditioning, and any system where no defrost is required or where the coils defrost on each "off" cycle.
RWCP-2E HDCP-2E	Circuit Breaker Contactor Time Clock 8047-20B (double-pole) (double-throw) Defrost Relay required for over 40 amps.	For straight time electric defrost on meat, dairy, frozen-food, and ice-cream cases equipped with electric defrost where not over 40 amps 1 phase is required. See Notes (**) for over 40-amp requirements. The RWCP-3P is recommended for this application also. <u>Do not use on multideck low-temps and walk-ins.</u>
RWCP-2E-55-3** HDCP-2E-55-3**	Circuit Breaker Contactor Time Clock 8308-20B (three-pole, double) (throw defrost)	Same as RWCP-2E except for three-phase electric defrost up to 55 amps maximum per leg.
RWCP-2EC HDCP-2EC	Circuit Breaker Contactor Time Clock 8145-20B (Time Initiate-) (Temperature) (Terminate) Defrost Relay required for over 40 amps.	Temperature terminated for walk-in freezers or coolers using electric defrost and multideck frozen-food refrigerators. See Notes (**) for over 40-amp requirements.

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<u>PANEL</u>	<u>COMPONENTS</u>	<u>APPLICATION & FUNCTION</u>
RWCP-2EC-55-3** HDCP-2EC-55-3**	Circuit Breaker Contactor Time Clock 8408-20B (Time Initiate-) (Temperature) (Terminate) (three-pole,) (double-throw) (defrost)	Same as RWCP-2EC except for three-phase electric defrost up to 55 amps maximum per leg.
RWCP-2HG HDCP-2HG	Circuit Breaker Contactor Time Clock 632-20 Time Initiate, Time Terminate has delay for draining.	For walk-in freezers or coolers using 3rd line hot-gas defrost. Clock has built-in fan delay. Also controls hot-gas solenoid. Includes check valve and solenoid installed in discharge line.
RWCP-3P HDCP-3P	Circuit Breaker Contactor Time-Pressure Clock 8247-20B Defrost Relay required for over 40 amps.	Time initiate pressure terminate electric or straight time defrost recommended for all meat, dairy, produce, frozen-food and ice-cream case defrosting (regular or electric). Do not use on open multideck low-temps or electric-defrost walk-ins, or on CSAH Weathermetic condensing units. This panel is preferred over the straight-time panels because it will adjust defrost time to varying amount of ice on coils. See Notes (**) for over 40-amp requirements.
RWCP-3P-55-3 HDCP-3P-55-3	Circuit Breaker Contactor Time-Pressure Clock 8608-20B (three-pole double-throw defrost)	Same as RWCP-3P except for three-phase electric defrost up to 55 amps per leg.

*Liquid-line solenoid is recommended for walk-ins using electric or hot-gas defrost. Not included in panels.

**Defrost-Relay Requirements (For refrigerator line-ups on a single condensing unit.)

MASTERMETIC CONTROL PANEL APPLICATIONS

Maximum lineal feet of display case for relay or clock shown.

CASE(S)	DEFROST WIRED SINGLE PHASE CLOCK OR RELAY RATING		DEFROST WIRED THREE PHASE (208 VOLT) CLOCK OR RELAY RATING	
	R60-1 relay	R75-1 relay	55-3 amp clock	R60-3 relay
XL, IL, WIL, ZCL (G)	28-44'	52-60'	8-80'	8-84'
ZM(SR), HZM, BQD, JQD, JQXD	40-68'	76-88'	8-116'	8-124'
WTL, WTLI	16-24'	24-28'	8-40'	8-40'
7400 FF 7400 IC	Use 3-phase defrost only		8-24' 8-16'	8-24' 8-20'
WHRL(I)	10-16 doors	10-20 doors	0-20 doors	N/A
				N/A
				44-48'
				88-100'
				-
				24-32' 20-24'

NOTES:

1. Where case lengths exceed those listed above, use two relays of proper size, i.e. WTL-60 would use two 60-amp relays, order as R60-3/R60-3.
2. Except for the 7400 all cases are supplied single phase defrost and must be field connected with other cases for three phase defrost.
3. The 55-amp clock may be used for single phase defrost by leaving the third terminal unused. Single phase electric defrost clocks have a 40-amp contact rating.
4. For walk-ins, see page U/R 11 and 12 for amp requirements.

CONTROL PANEL MODEL NUMBER CODE

TYPE PANEL
HDCP - HEAVY-DUTY CONTROL PANEL
RWCP - REGULAR WARREN/SHERER CONTROL PANEL

RWCP-2ECR60-3 B70-3

DEFROST CIRCUIT BREAKER	
SINGLE PHASE	THREE PHASE
B00-1	B00-3
B15-1	B15-3
B20-1	B20-3
B30-1	B30-3
B40-1	B40-3
B70-1	B70-3
	B100-3
	B125-3
	B150-3

See Page 5 for Circuit Breaker Selection Data.

TYPE CLOCK
1
2E
2E55-3
2EC
2EC55-3
2HG
3P
3P55-3

DEFROST RELAYS	
SINGLE PHASE	THREE PHASE
R30-1	R60-3
R60-1	R75-3
R75-1	R90-3
R100-1	
OR COMBINATIONS (DUAL RELAYS):	
R60-60-3	
R60-75-3	
R75-75-3	

See Page 4 of this form for Defrost Relay Selection Data.

CIRCUIT BREAKER CONTROL PANEL ACCESSORY
FOR SINGLE OR 3 PHASE 208-230 VOLT ELECTRIC DEFROST

DEFROST LOAD AMPS 208-230 VOLTS 1 OR 3 PHASE	NOMINAL CONDENSING-UNIT HORSEPOWER						
	3/4 - 1	1 1/2 - 2	3	4 - 5 1/2	7 1/2	10	15 - 20
	STANDARD COMPRESSOR CIRCUIT BREAKER - AMPS						
	15	20	40	50	70	100	125
0-14	B-00	B-00	B-15	B-15	B-15	B-15	B-15
15-19	B-20	B-00	B-00	B-20	B-20	B-20	B-20
20-39	B-40	B-40	B-00	B-00	B-00	B-40	B-40
40-49	B-50	B-50	B-50	B-00	B-00	B-00	B-50
50-69	B-70	B-70	B-70	B-70	B-00	B-00	B-70
70-99	B-100	B-100	B-100	B-100	B-100	B-00	B-00
100-124	B-125	B-125	B-125	B-125	B-125	B-125	B-00
125-150	B-150	B-150	B-150	B-150	B-150	B-150	B-150

B-00 additional breaker not required. Line side of clock or defrost relay is wired to load side of compressor circuit breaker which is of adequate size. Single or three phase. NOTE: if separate defrost circuit breaker is required, use same size breaker as standard compressor circuit breaker.

B - Where a number is shown, an additional circuit breaker, of the indicated size, is wired in parallel with compressor circuit breaker. One common terminal point is provided. See U/R-8 for prices and relays.

TABLE II

EXAMPLE:
Specify as shown in the following example:

RWCP -2E R75-3 B-70-3
Panel, Clock, Relay Circuit Breaker
& Phase & Phase

The following tables contain a pertinent listing of Copeland compressors and related components. This information is useful for sizing and replacement purposes.

condensing unit model	copeland compressor model	1-phase amps 230/60/1		3-phase amps 208-220/60/3		3-phase			AIR COOLED		
		fla	lra	fla	lra	circuit breaker	std contactor	nema contactor	cond size	cond fan amp	aux fan amps rah -swh only
SAH-SAWH-RAH-SWH											
<u>1/2 H.P. **</u>											
50 FH	KAN-0050	3.7	22.5	2.0	13.2	10J14-17, 15 AMP	↑	↑	H.P.	1.8	0.23
50 FC	KAE-0050	3.7	22.5	2.0	13.2				1		
50 FL	KAM-0050	3.7	22.5	2.0	13.2				1		
60 RL	KAN-0050	3.7	22.5	2.0	13.2				1		
<u>3/4 H.P. **</u>											
70 FH	KAM-0075	5.0	30.4	2.7	19.9	10J14-17, 15 AMP	↑	↑	1	1.8	0.23
70 FC	KAG-0075	5.0	30.4	2.7	19.9				1		
70 FL	KAA-0075	5.0	30.4	2.7	19.9				1		
80 RL	KAM-0075	5.0	30.4	2.7	19.9				1		
<u>1 H.P. **</u>											
100 FH	KAJ-0100	5.0	33.5	4.4	21.5	10J14-17, 15 AMP	↑	↑	1	1.8	0.23
100 FC	KAK-0100	5.0	33.5	4.4	21.5				1		
100 FL	KAT-0100	5.0	33.5	4.4	21.5				1		
110 RL	KAJ-0100	5.0	33.5	4.4	21.5				1		
<u>1 - 1-1/2 HP**</u>											
150 FH	KAL-0150	6.1	37.9	5.0	35.5	10J14-18, 20 AMP	↑	↑	1-1/2	1.8	0.23
150 FC	KAT-0150	6.1	37.9	5.0	35.5				1-1/2		
150 FL	EAJ-0150	6.1	36.8	5.0	35.5				1-1/2		
160 RL	EAB-0150	6.1	36.8	5.0	35.5				1-1/2		
<u>2 H.P. **</u>											
200 FH	EAV-0200	8.4	54.0	5.9	46.0	10J14-18, 20 AMP	↑	↑	2	1.8	0.23
200 FC	EAL-0200	8.4	54.0	5.9	46.0				2		
200 FL	3AH-0200	8.4	54.0	5.9	46.0				2		
210 RL	EAV-0200	8.4	54.0	5.9	40.0				2		
210 RC	ERC-0200	8.4	54.0	5.9	46.0				2		
<u>3 H.P. **</u>											
300 FH	LAH-0310	17.2	83.0	13.7	71.0	10J14-20 40 AMP	↑	↑	5	2.4	0.23
300 FC	LAC-0310	17.2	83.0	13.7	71.0				5		
300 FL	NRJ-0310	19.7	89.0	13.7	71.0				3		
310 RL	LAC-0310	17.2	83.0	13.7	71.0				3		
310 RC	3RA-0310	15.0	83.0	12.7	71.0				5		
<u>4 H.P. **</u>											
410 RC	NRB-9400	34.8	131.0	21.9	141.0	10J14-21 50 AMP	8E10-39 SIZE 11 27 AMP	5	2.4	1.2	

condensing unit model	copeland compressor model	3-phase amps 440/60/3		3-phase amps 200-220/60/3		3-phase			AIR COOLED		aux fan amps rah-swh only			
		fla	lra	fla	lra	circuit breaker	std contactor	nema contactor	cond size	cond fan amp				
SAH-SWH-SAWH-RAH														
<u>5 H.P. **</u>														
500 FH	MRB-0500	8.9	47.2	17.8	115.0	10J14-21 50 AMP	8E10-27 30 AMP	8E10-39, SIZE "1" 27 AMP	H.P.					
500 FC	MRB-0500	8.9	51.5	17.8	115.0				7-1/2	2.4	1.2			
500 FL	9RB-0500	8.9	51.5	17.8	115.0				5	2.4	1.2			
510 RL	MRB-0500	8.9	51.5	17.8	115.0				5	2.4	1.2			
510 RC	NRA-0500	11.4	70.5	22.8	141.0				7-1/2	2.4	1.2			
550 FC	9RA-0500	8.9	51.5	17.8	115.0				7-1/2	2.4	1.2			
560 RL	9RA-0500	8.9	51.5	17.8	115.0				5	2.4	1.2			
560 RC	NRM-0500	11.4	70.5	22.8	141.0				10	5.0	1.2			
<u>7-1/2 H.P. **</u>														
720 FL	9RS-0760	15.6	72.5	31.2	164.0				10J14-33 70 AMP	8E10-31 40 AMP	8E10-45, SIZE "2" 45 AMP	7-1/2	2.4	1.2
750 FH	9RB-0760	15.6	72.5	31.2	164.0	10	5.0	1.2						
750 FC	9RB-0760	15.6	72.5	31.2	164.0	10	5.0	1.2						
750 FL	4RA-0750	12.1	86.0	24.2	172.0	7-1/2	2.4	1.2						
760 RL	9RB-0760	15.6	72.5	31.2	164.0	7-1/2	2.4	1.2						
760 RC	MRH-0760	15.6	72.5	31.2	164.0	10	5.0	1.2						
780 FC	9RS-0760	15.6	72.5	31.2	164.0	10	5.0	1.2						
790 RL	9RS-0760	15.6	72.5	31.2	164.0	10	5.0	1.2						
790 RC	9RA-0760	15.6	72.5	31.2	164.0	10-HD	5.0	1.2						
<u>10 H.P. **</u>														
1000 FH	4RA-1000	23.2	114.0	46.4	240.0	10J14-25, 40A 10J14-23, 100A	8E10-40 60 AMP	8E10-46, SIZE "3" 90 AMP	10-HD	5.0	1.2			
1000 FC	4RA-1000	23.2	114.0	46.4	240.0				10	5.0	1.2			
1000 FL	6RA-1000	23.2	114.0	46.4	240.0				10	5.0	1.2			
1010 RL	4RA-1000	23.2	114.0	46.4	240.0				10	5.0	1.2			
1010 RC	9RC-1010	23.8	98.5	47.5	208.0				10-HD	5.0	1.2			
<u>15 H.P. **</u>														
1500 FH	4RH-1500	30.0	139.0	60.0	278.0	10J14-25, 40A 10J14-48, 125A	8E10-37 75 AMP	8E10-46, SIZE "3" 90 AMP	2-10	10.0	1.2			
1500 FC	4RH-1500	30.0	139.0	60.0	278.0				10-HD	5.0	1.2			
1510 RC	9RS-1500	34.5	142.0	69.0	289.0				2-10	10.0	1.2			
1510 RL	4RL-1500	30.0	139.0	60.0	278.0				10-HD	5.0	1.2			
<u>20 H.P. **</u>														
2000 FH	6RA-2000	34.9	160.0	69.7	308.0	10J14-25, 40A 10J14-48, 125A	8E10-44 50 AMP	8E10-46, SIZE "3" 90 AMP	2-10	10.0	1.2			
2000 FC	6RA-2000	34.9	160.0	69.7	308.0				2-10	10.0	1.2			
2010 RL	6RA-2000	34.9	160.0	69.7	308.0				2-10	10.0	1.2			
2010 RC	4RA-2000	34.9	160.0	69.7	308.0				2-10	10.0	1.2			
<u>25 H.P. **</u>														
2500 FC	6RH-2000	41.0	160.0	82.0	308.0	10J14-25, 40A 10J14-49, 150A	(2) 8E10-40 60 AMP	8E10-46, SIZE "3" 90 AMP	2-10	10.0	1.2			
2510 RL	6RL-2500	45.0	225.0	90.0	428.0				2-10	10.0	1.2			
2510 RC	4RH-2500	45.0	225.0	90.0	428.0				2-10	10.0	1.2			

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** RAH and SWH Models require auxiliary fan for cooling compressor body.

3/4 - 3 HP 9A11-14 5W Fan Motor, add 0.23 amps
 9B10-20 0U-7731-5 Fan Blade

5 - 7-1/2 HP 9A12-12 1/20 HP Fan Motor, add 1.2 amps
 9B10-14 P-1227-4 Fan Blade
 (with exception of SAWH, SWH, RAH, SAH
 750 FL)

10 HP and above SAH, RAH, SWH and SAWH as noted:

9R Models 9A10-28 Copeland Vertical Fan Kit
 550-0151-00 230/60 1.2 amps

4R Models and SAH, RAH, SWH, SAWH 750 FL:
 9A12-22 Copeland Vertical Fan Kit
 550-0152-00 230/60 1.2 amps

6R Models 9A12-24 Copeland Vertical Fan Kit
 550-0153-00 230/60 1.2 amps

6RL Models 9A10-26 Copeland Vertical Fan Kit
 550-0175-00 230/60 1.2 amps

CONDENSER FAN MOTOR 230 VOLTS 60 or 50 CYCLE (SEE RIGHT HAND COLUMN)

1 thru 2 H.P. Condenser	9A12-13 Motor	} -	1/10 HP CW 230/60 1050 RPM 1/2" Shaft
	9B10-16 Fan Blade		Resilient Ring <u>1.8</u> amps 16" 4 Blade CW 1/2" 30° Pitch
3 thru 7-1/2 HP Condenser	9A12-17 Motor	} -	1/3 HP CW 208-230/60 1075 RPM 1/2"
	9B10-18 Fan Blade		Shaft BB Resilient Mount <u>2.4</u> amps 22" dia. 23° Pitch 4 blade CW 1/2"
10 H.P. and above Condenser	9A13-10 Motor	} -	1 HP CW 208-230/60 5/8" Shaft w/Key
	9B10-19 Fan Blade		BB Resilient Mount 56 Frame <u>5.0</u> amps 24" dia. 5/6 Blade 29°/33° Pitch CW 5/8"