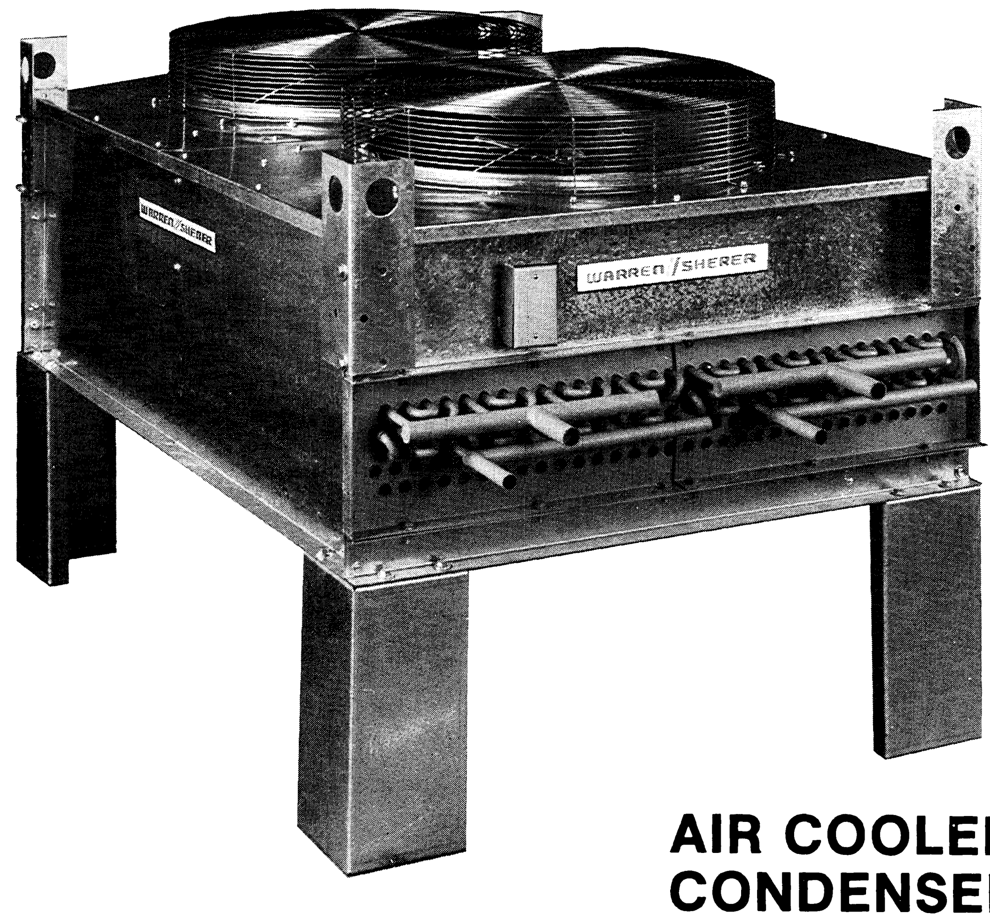
TECHNICAL BULLETIN

WARREN/SHERER



AIR COOLED CONDENSER

WARREN/SHERER DIV. OF KYSOR INDUSTRIAL CORP., 1600 INDUSTRIAL BLVD., CONYERS, GA 30207-0019 TELEPHONE 404-483-5600

Warren/Sherer Air Cooled Condensers

General

Warren/Sherer Air cooled condensers, cover 27 different models from 3/4 thru 108 nominal tons.

Models KD-1-3/4 thru 3, ranging in capacity from 3/4 tons through 3 tons, are direct drive with legs for horizontal or vertical discharge. Fan motors on these units are shaded-pole internally protected, 1050 RPM, mounted on heavy motor supports inside the housing.

Models KD-1-5 thru 12-108 are direct-drive vertical discharge only (vertical & horizontal standard 5-8.5), in capacities from 5 tons through 108 tons. Fan motors are permanent split-capacitor type, ball bearing, permanently lubricated, thermally protected. Motors are 200-230 volt, 60 cycle, single phase (three phase motors are also available). KD-1-5 thru KD-4-37 wired for single phase connection as standard. KD-6-45 thru KD-12-108 wired for three phase connection. Standard KD Models UL-CSA listed.

Features

Coil Surface
Ripple fin staggered tube coil design results in maximum heat rejection capacity. Cores are circuited for optimum refrigerant side pressure drop.

Multiple Fans
Permit use of low-cost fan cycling for control of head pressure at low ambients. Full width divider between fan sections prevents air by-pass.

Mechanical Specifications

Condenser Coil
Manufactured from highest purity copper tube in a staggered tube pattern with fully collared, plate type rippled aluminum fins, mechanically bonded to the tubes.

Housings
The smaller capacity KD-1-3/4 thru 8.5 model casings are constructed from heavy gauge textured aluminum. Models KD-2-9.5 & larger are made from sturdy, heavy gauge, galvanized steel, designed to provide maximum housing rigidity as well as excellent resistance from corrosion.

Fans
All KD fan blades are constructed of heavy gauge aluminum. Fans on all models are operated at low tip speeds and are statically balanced and factory run before shipment.

Motors and Wiring
All motors for KD are equipped with inherent overload protectors rated for group installation. Direct drive motors on Models KD are drip proof, permanent split capacitor type, ball bearing. All units are factory wired. All leads are marked and terminated in a readily acessible junction box.

Optional Features

Fan Cycling Controls
Cycles condenser fan(s) in response to condenser air temperature on all fan units.

Condenser Flooding Control
Single control consisting of 2 pressure sensitive valves. See "Low Ambient Control" section for further details.

Selecting Your Warren/Sherer Air Cooled Condenser

Based on Total Heat Rejection at the Condenser

Simply stated, the total heat rejection at the condenser is the sum of the refrigerating effect and the heat equivalent of the power input to the compressor. In a hermetic compressor, this heat rejection-generally expressed in BTUH - includes the effect of suction gas cooling of the motor. Where heat rejection figures are available from the compressor manufacturer, these figures should be used when selecting your Warren/Sherer Condenser. Where not available, factors for estimating heat rejection for both open and suction-cooled compressors are provided below together with instructions in their use.

Heat Rejection Factors / Compressor Capacity X Factor = Condenser Load

Table 1 Open Compressors

Temp.	Condensing Temperature							
Evap.	90	100	105	110	115	120	125	130
-40	1.45	1.48	1.52	1.56	1.58	1.61	*	*
-35	1.42	1.45	1.47	1.51	1.54	1.57	*	*
-30	1.39	1.41	1.44	1.47	1.50	1.53	*	*
-25	1.37	1.39	1.41	1.44	1.46	1.49	1.52	*
-20	1.34	1.37	1.39	1.41	1.43	1.45	1.48	1.51
-15	1.31	1.34	1.37	1.38	1.40	1.42	1.45	1.47
-10	1.28	1.31	1.33	1.37	1.38	1.40	1.42	1.45
0	1.24	1.28	1.29	1.32	1.33	1.35	1.38	1.41
+10	1.21	1.24	1.26	1.28	1.30	1.31	1.34	1.36
+20	1.18	1.21	1.23	1.24	1.26	1.28	1.30	1.32
+30	1.15	1.18	1.20	1.21	1.23	1.24	1.26	1.28
+40	1.13	1.15	1.17	1.18	1.19	1.20	1.22	1.24
+50	1.11	1.13	1.14	1.15	1.16	1.17	1.18	1.20

Table 2 Suction Cooled Compressors

Temp.	Condensing Temperature							
Evap.	90	100	105	110	115	120	125	130
—40	1.67	1.71	1.75	1.79	1.84	1.90	*	*
—35	1.63	1.67	1.70	1.73	1.78	1.83	*	*
—30	1.58	1.62	1.65	1.68	1.72	1.77	*	*
—25	1.54	1.58	1.60	1.64	1.67	1.71	1.76	*
—20	1.49	1.53	1.56	1.58	1.63	1.66	1.70	1.75
—15	1.46	1.50	1.52	1.54	1.58	1.62	1.65	1.69
+10	1.31	1.34	1.36	1.38	1.40	1.43	1.47	1.49
+15	1.29	1.32	1.33	1.35	1.37	1.40	1.43	1.46
+20	1.26	1.29	1.31	1.33	1.35	1.37	1.40	1.43
+25	1.25	1.27	1.29	1.31	1.33	1.35	1.38	1.40
+30	1.22	1.25	1.26	1.28	1.30	1.32	1.35	1.37
+35	1.20	1.23	1.25	1.26	1.27	1.29	1.32	1.34
+40	1.18	1.21	1.22	1.24	1.26	1.27	1.30	1.32

Total Heat Rejection, MBH — R-12**

Table 3 Models KD Vertical Discharge

TD*	1-¾	1	1-1½	1-2	1-3
10	4.2	5.4	7.8	10.0	14.6
15	6.3	8.1	11.8	15.0	21.9
20	8.4	10.0	15.7	20.0	29.2
25	10.5	13.5	19.6	25.0	36.5
30	12.6	16.2	23.5	30.0	43.8

Table 4 Models KD Vertical Discharge

TD*	1-5	1-6.5	1-7.5	1-8.5	2-9.5	2-13	2-15.5	2-17	3-19	3-23
10	23.0	30.8	36.7	41.0	46.0	61.7	76.2	81.9	92.4	110.4
15	34.5	46.2	55.0	61.9	68.9	92.5	112.5	122.8	138.5	165.5
20	46.0	61.7	73.4	81.9	91.9	123.4	152.4	163.8	184.8	220.8
25	50.5	80.0	91.7	102.3	114.8	154.2	187.5	204.5	230.8	275.7
30	69.0	92.4	110.0	122.8	137.8	185.0	225.0	245.5	277.0	331.0

Table 5 Models KD Vertical Discharge

TD*	3-26	4-31	4-35	4-37	6-45	6-51	6-55	9-62	9-73	9-83	9-90	12-108
10	124.0	152.4	165.0	177.5	217.5	244.5	264.5	295.0	350.5	400.0	426.5	497.0
15	185.0	228.5	247.0	266.0	326.0	366.0	397.0	442.0	526.0	600.0	639.0	745.0
20	248.0	304.7	330.0	355.0	435.0	489.0	529.0	590.0	701.0	800.0	853.0	993.0
25	310.0	380.9	412.0	444.0	544.0	611.0	661.0	737.0	876.0	999.0	1065.0	1242.0
30	370.0	457.0	495.0	533.0	653.0	733.0	794.0	885.0	1052.0	1200.0	1279.0	1490.0

* TD Temperature difference between entering air & condensing temperature
** For R22 or R502 multiply load by .952 then select unit

Selection Example

Example

DESIGN	
Condensing Unit Model	DM2-2000FC
Capacity	140,000
Suction Temperature	+20°F
Refrigerant	R-12
Design Condensing Temperature	115°F
Design Ambient Temperature	100°F
Temperature Difference (TD)	15°F

Solution

1. From Table 2 opposite +20°F Evaporator Temperature and under 115°F condensing, select the heat rejection factor of 1.35.
2. Multiply condensing unit capacity by this factor: 140.000 x 1.35 = 189000 BTUH
3. From Page 2 Table 5, opposite 15°TD select a Warren/Sherer Model KD-4-31.

As a guide to selection of the TD (temperature difference between condensing temperature and ambient temperature) the following are suggested:

Air Conditioning	25° TD
High and Medium Temperature Refrigeration	15° TD
Low Temperature Refrigeration	10° TD

How To Divide W/S Condensers into Multiple Systems

Considerable cost savings can be made in many applications by using one large condenser to satisfy the condensing requirements of several compressors. Warren/Sherer Condensers lend themselves readily and easily to such multi-system requirements, by following these simple steps:

Step 1.
Determine whether the compressors to be used are open or suction cooled; the capacity in BTUH of each at the operating back pressure; the refrigerant, whether R-12, R-22 or R-502; the design ambient air temperature and the condensing temperature desired.

Step 2.
Using a work-sheet form like or similar to that used in the hypothetical "Example" immediately below, detail the capacity of each compressor at the operating back-pressure; the applicable heat rejection factor (Table 1 or 2); and, by multiplying, its heat rejection. Then, by totaling the individual heat-rejection figures, arrive at the total heat rejection capacity required of the condenser.

If different TD's are required for different refrigeration systems, correct compressor heat rejection figures to one common TD.

Step 3.
In the "Example", where all compressors are suction cooled and the specifications call for a vertical discharge condenser, the total condenser heat rejection requirement was found to be 175.147 BTUH. Referring to Table 5 opposite 15° TD, it is readily seen that Model KD-3-26 meets the heat rejection requirements and is the indicated selection.

Step 4.
Determine the portion of the total condenser surface required for each system. This information is required by Warren/Sherer along with the net refrigeration effect and suction temperature to calculate individual circuiting for each system. This information is also useful in establishing refrigerant charge covered in Table 12.

Example / Based on 90° Design Ambient

Compr.	Refrig. Type	Suction Temp.	Cond. Temp.	TD	BTUH Evap. NRE		THR Factor Table 1 or 2		Base Mult. for TD Table7		Refrig. Type Mult. Table 6		Corrected Total Heat Rej.	% of Unit Surface for Each System
1	12	+20°	110°	15°	14000	X	1.33	X	1.0	X	1.0	=	18620	18620 / 175147 X 100 = 10.6
2	12	+20°	110°	14°	10000	X	1.33	X	1.0	X	1.0	=	13300	13300 / 175147 X 100 = 7.6
3	502	-20°	105°	10°	30000	X	1.56	X	1.5	X	.952	=	66830	66830 / 175147 X 100 = 38.2
4	12	+30°	110°	15°	14500	X	1.28	X	1.0	X	1.0	=	18560	18560 / 175147 X 100 = 10.6
5	12	+20°	110°	15°	12500	X	1.33	X	1.0	X	1.0	=	16625	16625 / 175147 X 100 = 9.5
6	502	-20°	105°	10°	18500	X	1.56	X	1.5	X	.952	=	41212	41212 / 175147 X 100 = 23.5
													THR = 175,147	↑ Using this as divisor

Select Model KD-3-26 From Table 5

Table 6 Refrig. Type Multiplier

Base Refrig.	Mult.
R-12	1.0
R-502	.952
R-22	.952

Table 7 Base Multiplier on TD

Design TD	Base TD 10	15	20	25	30
10	1.00	1.5	2.00	2.50	3.00
15	.67	1.0	1.33	1.67	2.00
20	.50	.75	1.00	1.25	1.50
25	.40	.60	.80	1.00	1.20
30	.33	.50	.67	.83	1.00

$$\text{Base Mult.} = \frac{\text{Base TD}}{\text{Design TD}}$$

NRE Net Refrigerating Effect
THR Total Heat Rejection
TD Temperature Difference between Entering Air and Condensing Temperature

Low Ambient Head Pressure Controls

A decrease in ambient air temperature results in a capacity increase in the air cooled condenser. This capacity increase is directly proportional to the temperature difference (TD) between the condensing temperature and the temperature of the ambient air entering the condenser. Since most refrigerating and air conditioning systems are designed for summer operation, it follows that when the same system operates under lower ambients resulting from seasonal changes, there occurs an increase in the condenser capacity with a consequent reduction in the system head pressure. If the head pressure drops below the point where the expansion valve can properly feed the evaporator, inefficient system operation will result.

To maintain adequate head pressure in the condenser under low ambient conditons, Warren/Sherer offers two basic control methods: (1) fan cycling on multiple fan units; (2) flooding the condenser with liquid refrigerant.

Fan Cycling Head Pressure Control* (1)

The optional fan cycling head pressure control is available on all condenser models and offers satisfactory head pressure control for ambient air temperature as low as the minimum temperature listed in Tables 8 and 8A. The control package consists of condenser air temperature sensing thermostats for each fan or group of fans and the necessary contactors mounted in a weatherproof control box.

This arrangement allows all condenser fans to cycle off during low ambient and low load conditions. All components are factory wired for the operation described. Recommended cut-in and cut-out settings are listed in Table 9.

The fan section of each condenser is partitioned to prevent air by-pass through the venturi section where a fan has been cycled.

Table 8
Models KD-2-9.5 thru 2-17 and KD-4-31 thru 4-37

Design TD	Min. Outside Temp. °F	TD @ Min. Outside Temp. & 90° Cond.
30	35	55
25	45	45
20	54	36
15	63	27
10	72	18

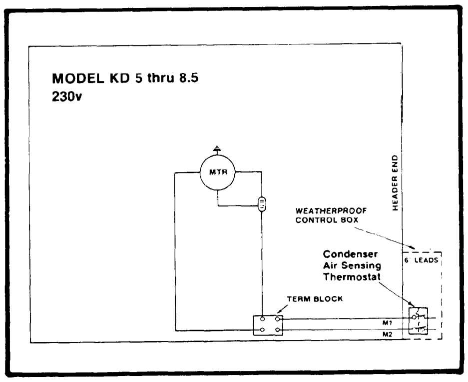
Table 8A
Models KD-3-19 thru 3-26 and KD-6-45 thru 12-108

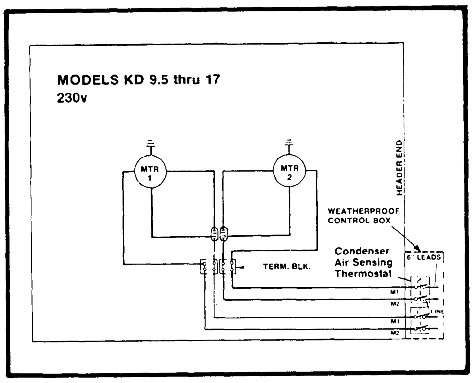
Design TD	Min. Outside Temp. °F	TD @ Min. Outside Temp. & 90° Cond.
30	15	75
25	27	63
20	40	50
15	52	38
10	65	25

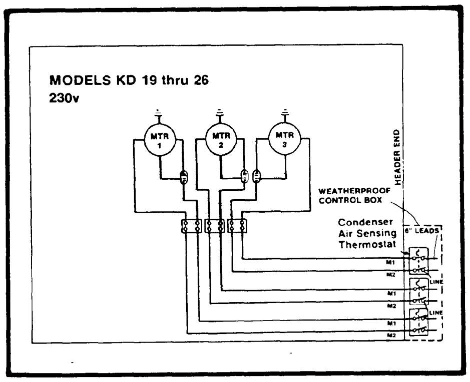
Table 9

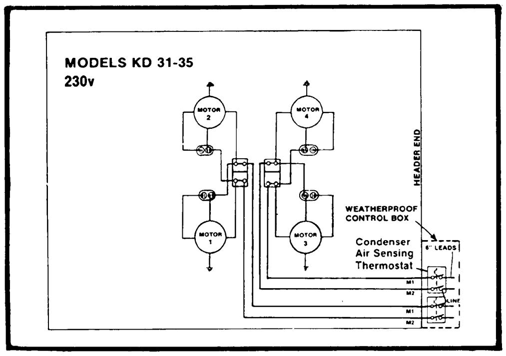
Condenser Model	TD	Thermostat 1		Thermostat 2		Thermostat 3	
All Models KD		C.I.	C.O.	C.I.	C.O.	C.I.	C.O.
1-5, 1-6.5, 1-7.5, 1-8.5	10	60	54				
	15	56	50				
2-9.5, 2-13, 2-15.5, 2-17	10	66	60	50	44		
4-31, 4-35	15	62	56	46	40		
3-19, 3-23, 3-26	10	74	68	66	60	50	44
4-37	15	70	64	62	56	46	40
6-45, 6-51, 6-55							
9-62, 9-73, 9-83, 9-90, 12-108							

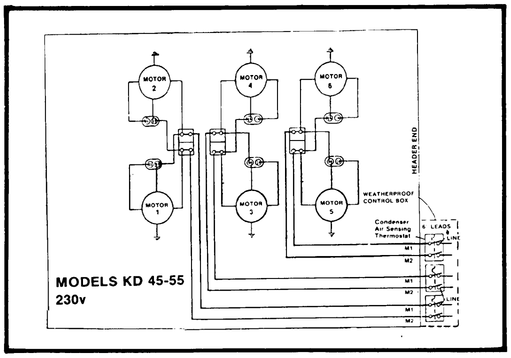
Typical Fan Cycle Wiring Diagrams — Head Pressure Controls

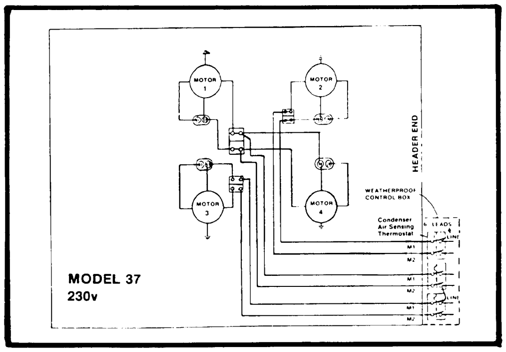


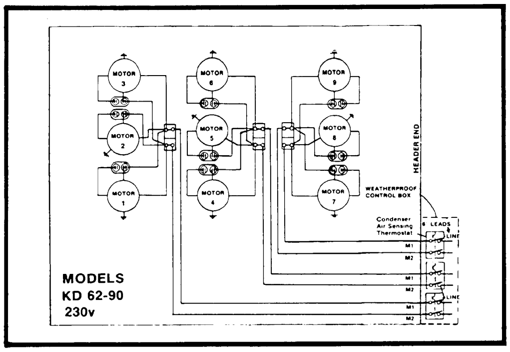


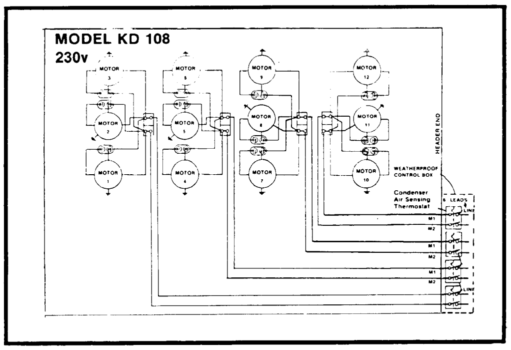


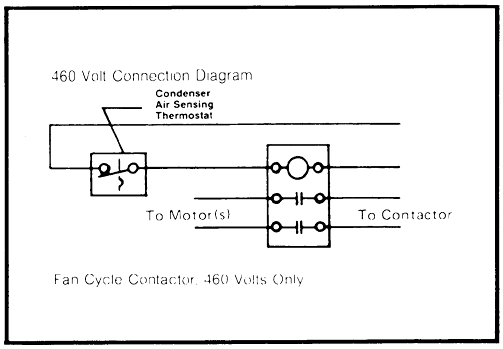






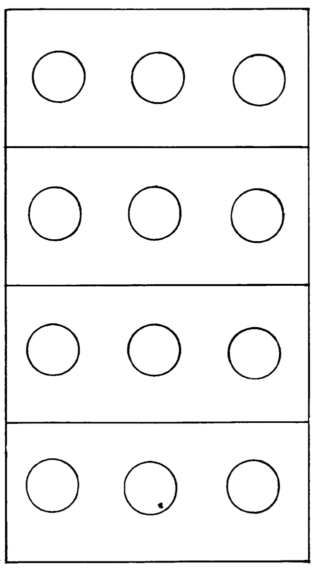




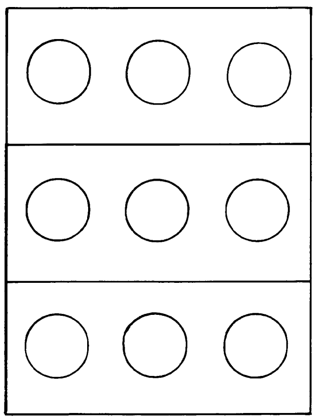


Fan Compartment Sections

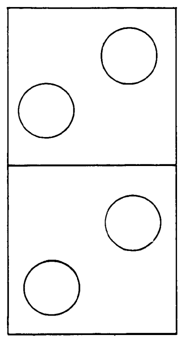
On KD 1-5 thru KD 3-26 (ie: all one, two and three fan units), there is one fan compartment and one fan cycle control per fan!



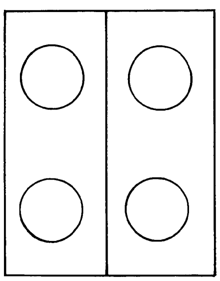
KD 12-108
(4 compartments, 4 fan cycle controls)



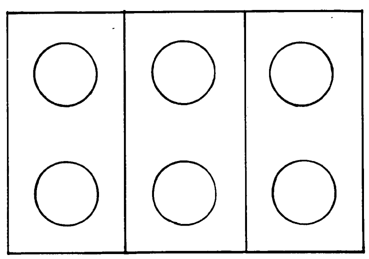
KD 9-62, -73, -83, -90
(3 compartments, 3 fan cycle controls)



KD 4-37
(2 compartments, 2 fan cycle controls)



KD 4-31, -35
(2 compartments, 2 fan cycle controls)



KD 6-45, -51, -55
(3 compartments, 3 fan cycle controls)

Flooded-Type Head Pressure Control (2)

The Warren/Sherer condenser-flooding type of low ambient head pressure control consists of a combination of modulating pressure sensitive valve(s) with three connections; one to the liquid line from the condenser; one to the compressor hot-gas discharge line; and one to the receiver. (See Fig. 1 & Fig. 2)

The controls described above are used primarily on MasterMetic units (MAH, SAH, RAH).
Parallel systems (DM2, DM3) are provided with head pressure controls as an integral part of the system.

How the Valves Work

Under normal summer ambient design conditions the liquid side of the valve remains fully open and the hot-gas side fully closed, thus offering no interference with the design operation of the system. Under conditions of reduced loads and/or cold ambient temperatures, the liquid side valve remains closed on start-up, causing the condenser to flood, thus reducing the effective condenser surface area. Flooding continues until the condenser pressure reaches the pressure of the valve setting. The gas side valve, meanwhile is open, allowing a portion of the hot discharge gas to flow directly into the receiver, maintaining in the receiver the high side pressure required for proper valve operation and prevention of compressor short-cycling. Once the desired pressure is reached in the condenser, the valve(s) modulate to maintain adequate high-side pressure regardless of outside ambient temperature conditions.

Valve Selection

Because different refrigerants have varying pressure-temperature characteristics and require different flow rates to produce given refrigeration tonnages, the valve ratings are based on net refrigerating tons at the evaporator. The Psig settings are based on the type of refrigerant to be used in the system.

Select valves from Table 10 Do not undersize.

Table 10 Condenser Flooding Valve Selection

Warren/Sherer Part Number	Unit Size	Refrigerant Type
8A12-31	3/4 - 7-1/2	FC / FH
8A12-30	10 - 25	FC / FH
8A12-32	3/4 - 7-1/2	RC / RL
8A12-29	10 - 25	RC / RL

Table 11 Valve Settings (PSIG)

Liquid Side		Hot Gas Side
R-12	100	20 PSIG difference between discharge line and receiver
R-22	180	
R-502	180	

Valve Installation

Figure 1 shows a typical installation of the condenser flooding low ambient control valve. Due to the tight seating arrangement of the valve, an auxiliary check valve in the liquid drain line to prevent refrigerant migration from the warm receiver to the cold condenser is not required under normal circumstances. Migration can occur only if the receiver pressure increases above the valve setting—where the receiver is located in an ambient of 90°F. or higher and the condenser in a lower ambient.

When condenser flooding valves are used, careful selection of the receiver is most important. Receiver pump-down capacity must equal or exceed the total refrigerant charge required in the system. Under all low ambient conditions, receivers should be located indoors in a warm area or, if outdoors, insulated and heated to a thermostatically controlled 60° to 65° temperature. Such heater(s) should be wired in parallel with the compressor crankcase heater, so it functions only during compressor off-cycle.

* Including Flooded Condenser see Page 7

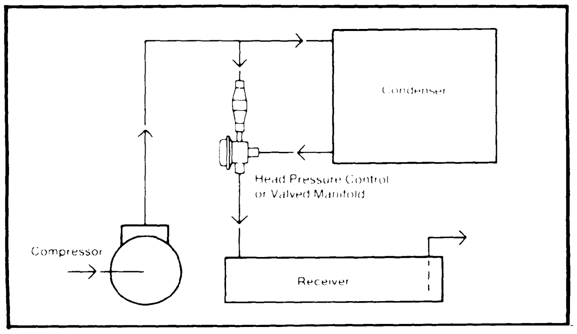


Figure 1

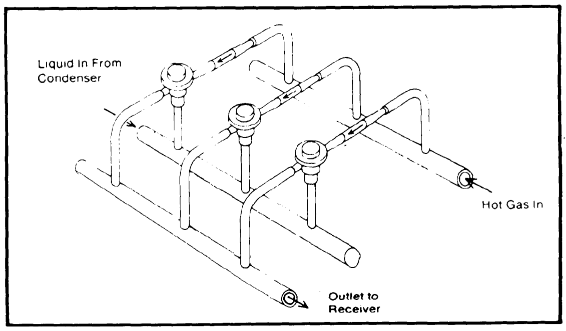


Figure 2

Refrigerant Charge

The summer design refrigerant charge necessary for effective system operation is the sum of operating charge for the evaporator, refrigerant piping (suction, liquid and discharge lines), condenser and receiver. The pump-down capacity of the receiver should be somewhat greater (10% to 15%) than the total refrigerant charge required. When using the Warren/Sherer low-ambient control system, additional refrigerant, over and above the summer design system charge, must be added to the system to allow for condenser flooding. The amount of this added charge is determined by the ambient in which the condenser will operate. Table 12 below lists the total unit charge for all Warren/Sherer single system air-cooled condensers.

The approximate refrigerant charge for each compressor system on multi-system condensers is as follows:

From example page 3 System	% Surface				Unit Chg.		#
1	10.6	÷	100	X	80	=	8.5
2	7.6	÷	100	X	80	=	6.1
3	38.2	÷	100	X	80	=	30.6
4	10.6	÷	100	X	80	=	9.3
5	9.5	÷	100	X	80	=	7.6
6	23.5	÷	100	X	80	=	18.8

Table 12 Operating Charges*/R-12 (Lbs.)**

Condenser Model Number	Ambient Above 60°F Unit Charge	Ambient Between 60°F & 20°F Unit Charge	Ambient Below 20°F Unit Charge
KD-1-¾	0.6	2.0	3.0
KD-1-1	0.8	2.7	4.0
KD-1-1½	1.0	3.5	5.0
KD-1-2	1.7	5.7	8.0
KD-1-3	2.3	8	11
KD-1-5	4.0	13	19
KD-1-6.5	5.0	17	24
KD-1-7.5	6.0	20	28
KD-1-8.5	8.0	27	38
KD-2-9.5	7.0	24	33
KD-2-13	10.0	34	47
KD-2-15.5	14.0	48	65
KD-2-17	17.0	58	80
KD-3-19	16.0	55	76
KD-3-23	20.0	68	95
KD-3-26	25.0	85	120
KD-4-31	28.0	96	130
KD-4-35	34.0	116	160
KD-4-37	43.0	140	240
KD-6-45	44.0	150	208
KD-6-51	54.0	180	256
KD-6-55	64.0	210	304
KD-9-62	51.0	170	242
KD-9-73	66.0	220	314
KD-9-83	80.0	270	380
KD-9-90	94.0	320	445
KD-12-108	110.0	384	534

*Based on 120° condensing for summer operation; 90° maximum condensing for below 60°/ **For R-22, multiply by .90; for R-502 by .93

Refrigerant Line Capacities [Tons]

Line Size-O.D. Type L Copper Tube	Discharge Line* R-12 Sat. Suct. Temp. -40	0	+40	R-22 Sat. Suct. Temp. -40	0	+40	R-502 Sat. Suct. Temp. -40	0	+40	Liquid Line Condenser to Receiver Velocity = 100 FPM R-12	R-22	R-502
½	.46	.56	.69	.88	1.04	1.25	.64	.80	.99	1.16	2.24	1.61
⅝	.85	1.04	1.28	1.66	1.97	2.38	1.21	1.52	1.88	3.12	3.57	2.58
⅞	2.25	2.73	3.36	4.41	5.24	6.32	3.31	4.15	5.12	6.61	7.41	5.35
1⅛	4.65	5.60	6.83	8.82	10.48	12.62	6.74	8.41	10.39	11.20	12.70	9.13
1⅜	7.82	9.50	11.74	15.38	18.28	22.10	11.90	15.92	18.59	17.10	19.20	13.90
1⅝	12.68	15.50	19.03	23.00	27.98	34.50	19.00	23.75	29.20	24.30	27.20	19.68
2⅛	25.84	31.52	38.80	50.87	60.45	72.90	40.42	50.50	62.30	42.30	47.30	34.23
2⅝	45.65	55.50	68.36	88.87	105.51	127.30	72.54	90.72	111.90	65.10	73.20	53.79
3⅛	73.50	89.50	110.23	138.70	164.82	199.00	120.26	150.51	185.90	93.00	104.10	75.35
3⅝	107.55	130.29	161.00	206.98	245.96	297.00	176.12	220.40	272.30	126.00	141.10	101.90
4⅛	151.75	184.94	228.38	297.04	352.00	426.00	258.79	323.68	399.60	163.00	183.00	132.50

*Line sizes based on pressure drop equivalent to 2 degrees per 100′ length

Weight of Refrigerant in Type L Copper Lines (Lbs. per 100 Lineal Feet)

Line Size-O.D.	Liquid Line 110F R-12	R-22	R-502	Suction Line 40F R-12	R-22	-20F R-502	Discharge Line 115F R-12	R-22	R-502
½	7.8	7.0	7.3	.13	.15	.08	.40	.49	.72
⅝	12.6	11.3	11.7	.20	.24	.12	.65	.80	1.16
⅞	26.1	23.4	24.2	.43	.50	.25	1.34	1.68	2.42
1⅛	44.8	40.0	41.5	.74	.86	.43	2.30	2.86	4.15
1⅜	67.6	60.5	62.8	1.02	1.31	.65	3.47	4.34	6.28
1⅝	94.5	85.0	88.0	1.57	1.84	.92	4.90	6.10	8.80
2⅛	166.0	150.0	155.0	2.77	3.25	1.60	8.60	10.70	15.50
2⅝	258.0	232.0	240.0	4.30	5.03	2.46	13.30	16.60	24.50
3⅛	366.0	330.0	340.0	6.10	7.15	3.50	18.90	23.60	34.00
3⅝	495.0	446.0	461.0	8.30	9.65	4.75	25.60	31.90	46.10
4⅛	646.0	584.0	602.0	10.80	12.60	6.18	33.40	41.60	60.20

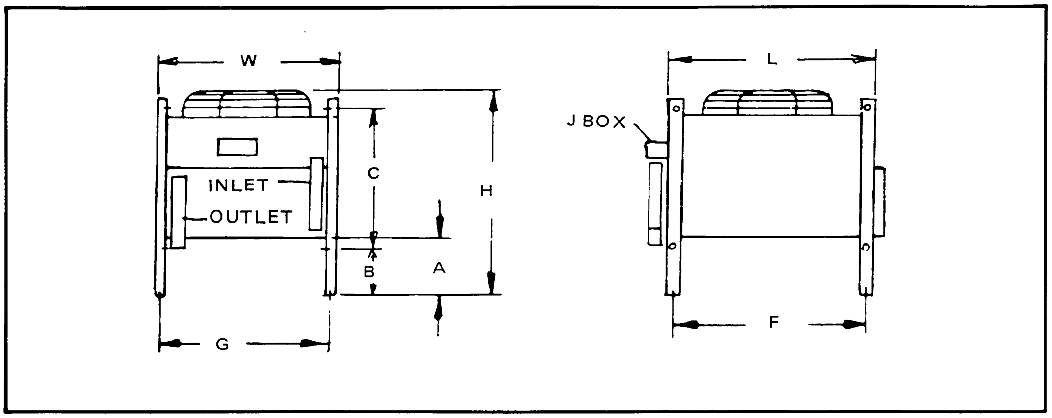
Altitude Correction Factors

Altitude	Sea Level	1000′	2000′	3000′	4000′	5000′	6000′	7000′	8000′	9000′	10000′
Factor	1.0	1.037	1.075	1.116	1.157	1.201	1.248	1.295	1.345	1.400	1.453

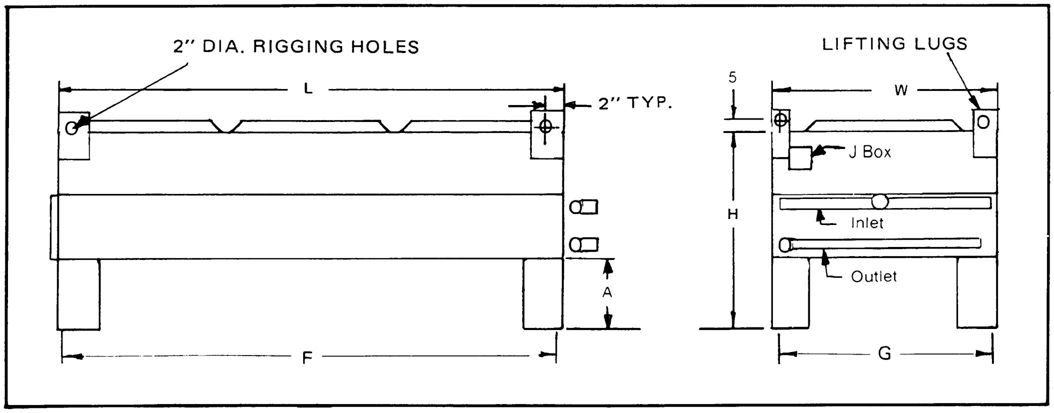
As altitude increases, the capacity of an air cooled condenser decreases because fewer pounds of air are circulated. To compensate for this, the basic calculated total heat rejection must be multiplied by the following factor (density ratio) associated with the altitude where the condenser is to be located. Use this increased total heat rejection figure in making condenser selection.

Dimensional Data

KD-1-¾ thru KD-1-8.5/Horizontal or Vertical Discharge



Models KD-2-9.5 thru 12-108/Direct Drive/Vertical Discharge (Horiz. Discharge Avail. 2-9.5 thru 3-26)



Physical Dimensions in Inches

Models KD/Direct Drive/Horizontal & Vertical Discharge

Model Number	A	B	C	F	G	H	L	W	Connections-O.D. Inlet	Connections-O.D. Outlet	Approx. Shipping Wt.
KD-1-¾	6	4¾	14¾	19⅛	19¼	21	21	20¼	⅝	⅝	58
KD-1-1	6	4¾	14¾	19⅛	19¼	21	21	20¼	⅝	⅝	65
KD-1-1½	6	4¾	14¾	23⅛	25¼	22	25	26¼	⅝	⅝	89
KD-1-2	6	4¾	14¾	23⅛	25¼	22	25	26¼	⅝	⅝	110
KD-1-3	6	4¾	14¾	23⅛	25¼	22	25	26¼	⅞	⅞	145

Models KD/Direct Drive

Model Number	A	B	C	F	G	H	L	W	Connections-O.D. Inlet	Connections-O.D. Outlet	Approx. Shipping Wt.
KD-1-5	10	8¾	19	41½	34⅜	31½	43½	35½	1⅛	1⅛	195
KD-1-6.5	10	8¾	19	41½	34⅜	31½	43½	35½	1⅜	1⅜	220
KD-1-7.5	10	8¾	19	41½	34⅜	31½	43½	35½	1⅜	1⅜	245
KD-1-8.5	10	8¾	19	41½	34⅜	31½	43½	35½	1⅜	1⅜	285
KD-2-9.5	15			58¾	38¾	34	63¼	43½	1⅝	1⅛	434
KD-2-13	15			58¾	38¾	34	63¼	43½	1⅝	1⅛	484
KD-2-15.5	15			58¾	38¾	34	63¼	43½	1⅝	1⅛	534
KD-2-17	15			58¾	38¾	34	63¼	43½	1⅝	1⅛	581
KD-3-19	15			88¾	38¾	34	93¼	43½	2⅛	1⅜	656
KD-3-23	15			88¾	38¾	34	93¼	43½	2⅛	1⅜	731
KD-3-26	15			88¾	38¾	34	93¼	43½	2⅛	1⅜	806
KD-4-31	15			58¾	78¾	35½	63¼	83½	2- 1⅝	2- 1⅛	991
KD-4-35	15			58¾	78¾	35½	63¼	83½	2- 1⅝	2- 1⅛	1081
KD-4-37	18			94½	48¾	45¼	99¼	53½	2- 1⅝	2- 1⅜	1176
KD-6-45	18			103½	68¾	39¾	108¼	73½	2- 2⅛	2- 1⅝	1923
KD-6-51	18			103½	68¾	39¾	108¼	73½	2- 2⅛	2- 1⅝	2078
KD-6-55	18			103½	68¾	39¾	108¼	73½	2- 2⅛	2- 1⅝	2233
KD-9-62	22			118½	88¾	42¾	123¼	93½	2- 2⅛	2- 1⅝	2315
KD-9-73	22			118½	88¾	42¾	123¼	93½	2- 2⅛	2- 1⅝	2520
KD-9-83	22			118½	88¾	42¾	123¼	93½	2- 2⅝	2-2⅛	2735
KD-9-90	22			118½	88¾	42¾	123¼	93½	2- 2⅝	2-2⅛	2960
KD-12-108	22			157	89¼	51¾	161¼	93½	2-2⅝	2-2⅛	3300

Specifications

Models KD/Direct Drive

Model Number	Total CFM	Condenser Fans No.	Dia.	RPM	Fan Motors No.	HP	Total Motor Amps 115V	230V
KD-1-¾	1440	1	16	1050	1	1/12	4.0	2.0
KD-1-1	1200	1	16	1050	1	1/12	4.0	2.0
KD-1-1½	2600	1	20	1050	1	⅙	5.6	2.8
KD-1-2	2500	1	20	1050	1	⅙	5.6	2.8
KD-1-3	2400	1	20	1050	1	⅙	5.6	2.8

Models KD/Direct Drive

Model Number	Total CFM	Condenser Fans No.	Diam.	RPM	Fan Motors* No.	HP	Total Motor Amps 200V-230V**		460V	**	Wiring Arrangement Stand.	Optional
KD-1-5	5750	1	24	1100	1	½	4.2		2.1		1 phase	
KD-1-6.5	5400	1	24	1100	1	½	4.2		2.1		1 phase	
KD-1-7.5	5150	1	24	1100	1	½	4.2		2.1		1 phase	
KD-1-8.5	4900	1	24	1100	1	½	4.2		2.1		1 phase	
KD-2-9.5	11500	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
KD-2-13	10800	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
KD-2-15.5	10300	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
KD-2-17	9800	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
KD-3-19	16200	3	24	1100	3	½	12.6	7.3	6.3	3.6	1 phase	3 phase
KD-3-23	15450	3	24	1100	3	½	12.6	7.3	6.3	3.6	1 phase	3 phase
KD-3-26	14700	3	24	1100	3	½	12.6	7.3	6.3	3.6	1 phase	3 phase
KD-4-31	21000	4	24	1100	4	½	16.8	11.1	8.4	5.6	1 phase	3 phase
KD-4-35	20000	4	24	1100	4	½	16.8	11.1	8.4	5.6	1 phase	3 phase
KD-4-37	19300	4	24	1100	4	½	16.8	11.1	8.4	5.6	1 phase	3 phase
KD-6-45	30200	6	24	1100	6	½	14.5		7.3		3 phase	
KD-6-51	29000	6	24	1100	6	½	14.5		7.3		3 phase	
KD-6-55	28400	6	24	1100	6	½	14.5		7.3		3 phase	
KD-9-62	49000	9	24	1100	9	½	21.8		10.9		3 phase	
KD-9-73	46500	9	24	1100	9	½	21.8		10.9		3 phase	
KD-9-83	44500	9	24	1100	9	½	21.8		10.9		3 phase	
KD-9-90	42000	9	24	1100	9	½	21.8		10.9		3 phase	
KD-12-108	56000	12	24	1100	12	½	29.1		14.5		3 phase	

* All motors are ½ HP, 200-230/1/60 or 460/1/60, 4.2 FLA or 2.1 FLA, Ball Bearing. 3 phase motors are also available.

** For optional 3 phase wiring, units shown 3 phase have 1 phase motors arranged 3 phase delta.

Catalog material is carefully prepared, but Warren/Sherer is not responsible for typographical errors or omissions.