Witt

IOM 620

Installation
Operation and
Maintenance
Information

MODEL KBC BELT-DRIVE
REMOTE AIR COOLED CONDENSER

Table of Contents

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REPLACEMENT PARTS LIST

KBC Belt-Drive Condenser Parts List

Part Number	***Description***
8221157	48" Fan - 48"-32° x 1-3/16", CW
8397048	48" Flat Fan Guard
8216096	Motor - 1 1/2 hp - 208-230/460/3/60 (Marathon)
8216097	Motor - 2 hp - 208-230/460/3/60 (Marathon)
8323263	Sheave, AS26 x 5/8" — (1 1/2 HP)
8323264	Sheave, AK104 x 1-3/16" — (1 1/2 HP)
8325006	Belt, AX85 — (1 1/2 HP)
8323270	Sheave, BK34 x 5/8" — (2 HP)
8323269	Sheave, BK130 x 1-3/16" — (2 HP)
8325008	Belt - BX90 — (2 HP)
8102048	Shaft - 1-3/16" x 19" Long
8216050	Slide Motor Base - 56 Frame Motor
8216052	Slide Motor Base - 145T Frame Motor
8216054	Slide Motor Base - 184T Frame Motor
8323042	1-3/16" Bearing - NP-19
8323137	Southco Receptacle - 12-11050-27
8323136	Southco Retainer - 12-11014-12
8326011	Southco Screw Assembly - 12-11-203-11
8170002	Nylon Tubing - fl" (Grease Line)
8323024	Compression Fitting fl"OD x 1/8" FPT
8323027	1/8" MPT Grease Fitting
8323122	1/8" x fl" Grease Fitting
8323045	Compression Fitting fl"OD x 1/8" MPT
8356795	HP5-100 - Head Pressure Control Valve
8356117	HP8T7A - Head Pressure Control Valve
8356296	HP14T11A - Head Pressure Control Valve
8218829	Interconnect switch - 600V, 40A, 3 Pole
8218830	Interconnect switch - 600V, 80A, 3 Pole
8218821	Interconnect switch - 600V, 100A, 3 Pole
8218822	Interconnect switch shaft
8218820	Interconnect switch handle
8218516	Overload - C316FNA3M/4.5-6.5 Amps
8218308	Overload - C316FNA3N/6.0-8.5 Amps
8218402	Overload Mounting - C360TB1

GENERAL SAFETY INFORMATION

1. Installation and maintenance are to be performed only by qualified personnel who are familiar with this type of equipment.
2. Make sure that all field wiring conforms to the requirements of the equipment and all applicable national and local codes.
3. Avoid contact with sharp edges and coil surfaces. They are a potential injury hazard.
4. Make sure all power sources are disconnected before any service work is done on units.

INSPECTION

Check all items against the bill of lading to make sure all crates or cartons have been received. If there is any damage, report it immediately to the carrier and file a claim. Make sure the voltage on the unit nameplate agrees with the power supply available.

UNIT ASSEMBLY

All units are shipped (unless otherwise specified) with the legs in place and with the unit in its normal operating position. No assembly is required. Oversized legs (longer than 18") must be field installed.

RIGGING

Leave the units in the carton or on the skid until they are as close as possible to the installation location.

All units are provided with lifting eyes located on top of the unit. The actual method of rigging depends on the type of rigging equipment available, the size of the unit and where the unit is to be located. It is up to the judgment of the rigger to decide specifically how each unit will be handled. Figure 1 shows general requirements for rigging vertical airflow units. See Table 1 for unit weights.

UNIT LOCATION

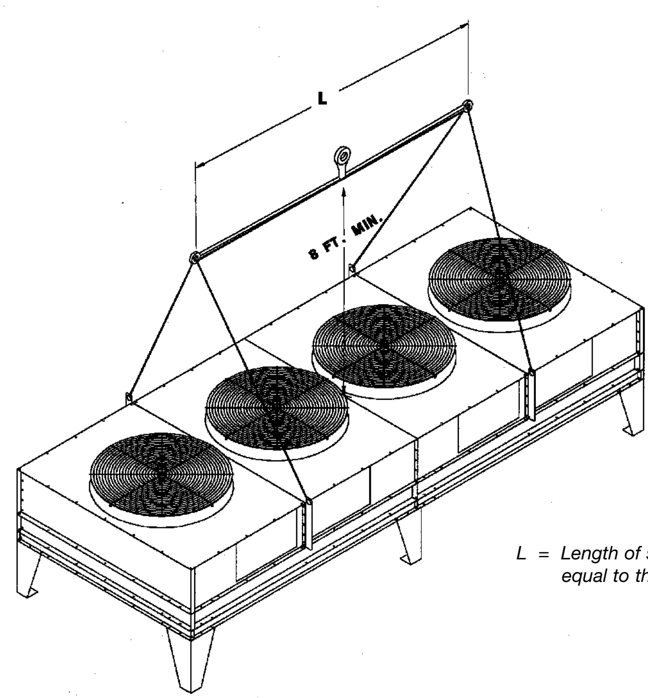
General
KBC units are designed for outdoor applications. If the unit is mounted indoors, provisions must be made to insure that discharge air is not recirculated into the unit. If the unit is ducted, the duct must not add more than 0.1 inch W.G. to the static pressure imposed on the fans.

Units should be located no closer than the width of the unit to an obstruction such as a wall or another unit. Keep the inlet air area around each unit clear to avoid restricting the airflow to the unit.

UNIT INSTALLATION

Make sure all units are installed level to insure 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. See Page 4 for dimensions.

Figure 1



L = Length of spreader bar should be approximately equal to the distance between hoisting eyes.

PHYSICAL DATA

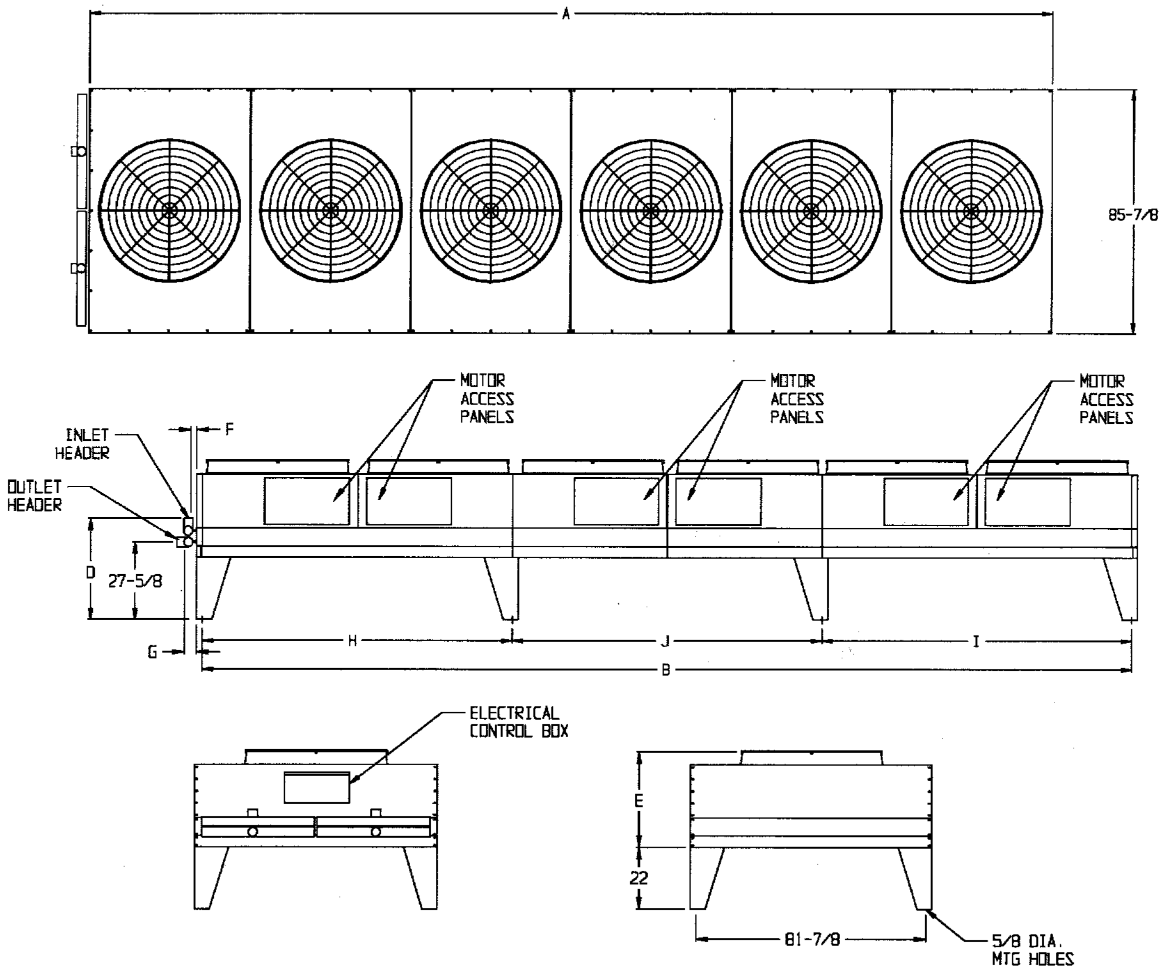


Table 1: Physical Data

Model	*Dimensions in Inches **									*Conn.—ODF*		*Approx.*
KBC	*A*	*B*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*In*	*Out*	*Net Wt. Lbs.*
212	114	110	35 1/4	34 3/4	1 5/8	6 5/8	—	—	—	1 5/8	1 5/8	1190
224	114	110	35 1/4	34 3/4	1 5/8	6 5/8	—	—	—	1 5/8	1 5/8	1250
262	114	110	36 1/2	34 3/4	1 3/4	6 3/4	—	—	—	1 5/8	1 5/8	1375
323	169	165	35 1/4	34 3/4	1 3/4	6 3/4	82	83	—	1 5/8	1 5/8	1835
341	169	165	35 1/4	34 3/4	1 3/4	6 3/4	82	83	—	1 5/8	1 5/8	1925
387	169	165	36 1/2	34 3/4	1 3/4	6 3/4	82	83	—	1 5/8	1 5/8	2020
520	224	220	36 1/2	34 3/4	2	7	109 1/2	110 1/2	—	2 1/8	2 1/8	2795
642	224	220	37 7/8	34 3/4	2	7	109 1/2	110 1/2	—	2 1/8	2 1/8	2995
677	224	220	39 1/8	36	2	7	109 1/2	110 1/2	—	2 1/8	2 1/8	3225
648	279	275	36 1/2	34 3/4	2	7	82 1/2	110 1/2	82 1/2	2 1/8	2 1/8	3585
798	279	275	37 7/8	34 3/4	2 1/4	7 1/4	82 1/2	110 1/2	82 1/2	2 5/8	2 5/8	3840
843	279	275	39 1/8	36	2 1/4	7 1/4	82 1/2	110 1/2	82 1/2	2 5/8	2 5/8	4130
780	334	330	36 1/2	34 3/4	2 1/4	7 1/4	109 1/2	110 1/2	110	2 5/8	2 5/8	4360

** All units have 8 FPI fin spacing*

REFRIGERANT PIPING INFORMATION

Discharge Lines

When designing and sizing discharge lines, please consider the following three factors:

1. Pressure Drop

   Lines should be sized for a reasonable pressure drop. Pressure drop increases the required horsepower per ton of refrigeration and decreases the compressor capacity.

   It is normal practice not to exceed a pressure drop corresponding to a 2° F change in the saturation temperature of the refrigerant. Table 2 shows discharge line capacities for pressure drop equivalent to 2° F per 100 feet of line. It can be converted to capacity based on a 1° F equivalent drop per 100 feet by using the factor given below the table.

2. Oil Trapping

   Lines must be sized and routed so that oil is carried through the system. Normally, sizing according to Table 2 will be satisfactory. However, when the condenser is located at a higher level than the compressor, it may be necessary to take special precautions, especially if the system is designed to operate at reduced compressor capacity.

   A vertical hot gas line sized to transport oil at minimum load conditions may have excessive pressure drop at full load. If this is the case, a double hot gas riser, as shown in Figure 2 should be used. Size riser Number 1 for the minimum load condition. Size riser Number 2 so that the combined cross-sectional area of both risers is equal to the cross-sectional area of a single riser having acceptable pressure drop at full load.

   Install a trap between the two risers, as shown in Figure 2. During partial load, the trap will fill up with oil until riser Number 2 is sealed off. Keep the trap as small as possible to limit its oil holding capacity.

3. Compressor Head Protection

   Discharge lines should be designed to prevent condensed refrigerant and oil from draining back to the compressor during off cycles. Use the following guidelines.

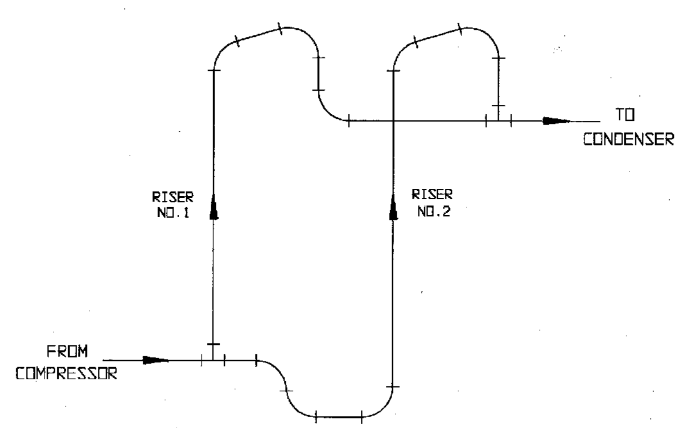
   a. The highest point in the discharge line should be above the highest point in the condenser coil. A purge valve should be located at this point.
   b. The hot gas line should loop to the floor if the condenser is located above the compressor, especially if the hot gas riser is long.
   c. If the condenser 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.
   d. A check valve should be installed in each discharge line of a multiple compressor arrangement to prevent refrigerant from an active compressor from condensing on the heads of an idle compressor.

Table 2: Discharge Line Sizing

Line Size (O.D.) Type L Tubing	*Discharge Line Capacity * (MBH @ Evaporator)*					
	R-22			*R-404A & 507*		
	Suction Temperature					
	-40	*0*	*40*	*-40*	*0*	*40*
1/2	13	14	15	10	11	12
5/8	24	26	28	18	22	23
7/8	65	70	73	48	54	60
1 1/8	132	140	149	97	110	122
1 3/8	230	246	260	169	192	212
1 5/8	364	388	412	268	302	336
2 1/8	752	803	852	552	625	694
2 5/8	1325	1412	1500	972	1103	1220
3 1/8	2112	2252	2393	1544	1753	1942
3 5/8	3134	3343	3551	2293	2602	2881

** Based on pressure drop equivalent to 2° F. per 100 equivalent feet of line. For 1° F. per 100 feet, multiply table value by 0.683.*

Figure 2: Dual Riser Piping



Liquid Lines

Generally receiver-to-expansion valve liquid lines can be sized for pressure drop equivalent to a 1° F to 2° F change in saturation temperature. If there is substantial sub cooling, or the line is short, it can be sized at the high end of this range. If the opposite is true, a more conservative selection should be made.

A receiver, if used in the system, should be located below the condenser and 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.

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 venting of refrigerant vapor in the opposite direction back to the condenser. The receiver will become vapor-locked under these conditions if the re-evaporated gas is not allowed to flow back to the condenser for re-condensation.

All liquid (condensate) lines should be free of any traps or loops.

Table 3 shows liquid line capacity in evaporator MBH. Line sizing is shown for both condenser-to-receiver lines and receiver-to-expansion valve lines. All capacities are for 100 equivalent feet of tubing. The selections based on pressure drop are for an equivalent to a 2° F change in saturation temperature. They can be converted to capacities based on a 1° F equivalent drop by using the factor given below the table.

Table 3: Liquid Line Sizing

Line Size (O.D.) Type L Tubing	*Liquid Line Capacity (MBH @ Evaporator)*			
	Condenser To Receiver Piping †		*Receiver To Exp. Valve Piping **	
	R-22	*R-404A Δ*	*R-22*	*R-404A Δ*
1/2	28	18	64	42
5/8	44	28	118	79
7/8	94	59	319	208
1 1/8	158	100	650	424
1 3/8	242	151	1136	738
1 5/8	342	215	1801	1166
2 1/8	595	373	3742	2424
2 5/8	918	576	-	-
3 1/8	1310	821	-	-
3 5/8	1774	1111	-	-

† Based on 100 FPM refrigerant velocity.
Δ Use R-404A sizing for R-507.
** Based on refrigerant pressure drop equivalent to 2° F. per 100 equivalent feet of line. For 1° F. per 100 feet, multiply table value by 0.683.*

Multiple Condensers

Often two condensers, or two sections of the same condenser, are piped in parallel to the same refrigeration system. It is important that the sections or units have the same, or nearly the same, capacity so that the pressure drop through each is equal. The piping should be arranged so that the lengths of runs and bends to each are equal on both the inlet and outlet of the condensers. A drop leg should be included from each liquid outlet of sufficient height to prevent backup of liquid into one coil. This will overcome any difference in pressure drop that may exist between the two coils.

Routing of Piping

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 inter-connecting lines between two condensers and provide isolation where pipes pass through building walls or floors.

FLOODED CONDENSER CONTROL

The Witt Flooded Condenser Control System maintains adequate condensing pressure during periods of low outdoor ambient temperatures by flooding the condenser with liquid refrigerant. Flooding reduces the amount of coil surface that is available for condensing.It is a completely automatic system which always maintains a minimum preset pressure.

Operation

The system consists of a modulating three-way valve controlled by refrigerant discharge pressure. A fall in ambient temperature causes a corresponding fall in discharge pressure. The valve modulates allowing discharge gas to flow to the receiver, creating a higher pressure at the condenser outlet.

This higher pressure reduces the flow out of the condenser, causing liquid refrigerant to back up in the coil. This flooding of the condenser reduces the available condensing surface and raises the condensing pressure so that adequate high side pressure is maintained.

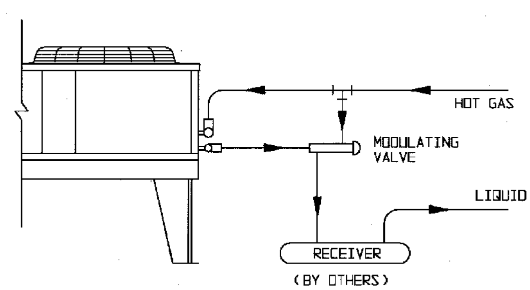


Figure 3: Flooded Condenser Valve Piping
(All piping shown is by others)

Valve Selection

Select valve from Table 4 based on:

a) Refrigerant type
b) Evaporator temperature
c) Net refrigeration effect at the evaporator

Figure 3 (Page 6) shows typical field piping to the valve. If the evaporator capacity requires the use of two valves, they must be piped in parallel.

Application and Refrigerant Charge Requirements

The total system refrigerant charge is the sum of the operating charges of the condenser, evaporator, receiver and the refrigerant lines. Pumpdown capacity (80% of full capacity) of the receiver must be equal to or greater than the total system charge. The standard operating charge for each unit is shown in Table 5. Table 7 shows the weight of refrigerant in liquid, suction and discharge lines.

A larger receiver and additional refrigerant are required for systems with flooded condenser control. The receiver can be conveniently installed directly under the condenser. However, if the system will be operated at ambient temperatures below 55° F, the receiver should be heated or located in a warm area. In this situation, a check valve must be installed in the line between the receiver and the valve. This prevents refrigerant migration from the receiver to the condenser.

The amount of additional refrigerant charge is based on the lowest expected winter operating temperature and the design TD. To determine the total required condenser charge, multiply the standard unit operating charge from Table 5, by the appropriate factor from Table 6. In addition to the condenser charge, the operating charges of the evaporator, receiver and refrigerant lines must be added to determine the total system refrigerant charge. The pump-down capacity (80% of full capacity) of the receiver must be at least equal to the total system charge.

If Flooded Condenser Control is used on a system with a compressor having capacity reduction, the amount of reduction must be taken into account when determining the refrigerant charge. The capacity reduction lowers the design TD, so the system requires more charge to maintain adequate condensing pressure.

Before obtaining a factor from Table 6, the design TD must be corrected by multiplying it by the percentage that reduced capacity is of full capacity. For Example, if the reduced capacity is 50% of the full capacity, a design TD of 20° would be reduced to 10°. The correction factor from Table 6 would have to be based on 10°TD.

Table 4: Head Pressure Control Valve Capacity

Control Valve			*Valve Capacity*				
WITT Part No.	*Qty*	*Conn Size ODF*	*R-22 Evaporator Temperature*				
			40	*20*	*0*	*-20*	*-40*
8356118	1	7/8	162	159	154	150	144
8356121	1	1 3/8	406	397	386	375	361
8356121	2	1 3/8	812	794	772	750	722

Control Valve			*Valve Capacity*				
WITT Part No.	*Qty*	*Conn Size ODF*	*R-404A, 507 Evaporator Temperature*				
			40	*20*	*0*	*-20*	*-40*
8356118	1	7/8	104	100	94	88	82
8356121	1	1 3/8	276	264	248	233	218
8356121	2	1 3/8	552	528	496	466	436

Refrigerant Charge—Single Section Unit

Given:
A KBC-262 condenser with a standard R-404A charge of 43.6 lbs. (see Table 5). The unit has a design TD of 10° F. and will operate at minimum ambient of 0° F.

Solution:
The standard charge must be multiplied by a correction factor of 4.6 as shown in Table 6. Therefore, the required charge is 43.6 x 4.6 = 200.6 lbs. If the compressor used on the system had 50% capacity reduction, the correction factor from Table 6 would have to be for 5° TD or 4.8.

Refrigerant Charge—Multi-Section Unit

Given:
A KBC-224 condenser split into 2 sections. One section has 36 face tubes of R-404A at a 10° TD and the other section has 18 face tubes of R-22 at a 15° TD. The unit will operate at a minimum ambient of 10° F.

Solution:
To calculate the winter charge for each section, multiply the number of face tubes by the charge per face tube from Table 5 and the correction factor from Table 6.

R-404A section:
36 face tubes x 0.60 lb./face tube x 4.5 = 97.2 lb.

R-22 section:
18 face tubes x 0.59 lb./face tubes x 4.3 = 45.7 lb.

If the compressors have capacity reduction, this must be taken into consideration, as shown in the example for a Single Section Condenser.

Refrigerant Charge—With Fan Cycling

Use the following procedure to calculate the refrigerant charge correction factor when Fan Cycling and Flooded Condenser Controls work together. This factor will be used (instead of the factor from Table 6) when calculating refrigerant charge as shown above.

Given:

Model KBC-323 Condenser
20° F. Design TD
-10° F. Minimum Ambient
100% Compressor Capacity

Solution:

1. Find the TD that would occur when operating at the minimum ambient for fan cycling. Table 10 states that 40° minimum ambient will produce 90° condensing temperature under the given conditions for fan cycling alone.
   90° - 40° = 50° TD

2. Find the TD that would produce a 90° condensing temperature when operating at -10° ambient.
   90° - (-10°) = 100° TD

3. The TD correction factor is the TD at design ambient (-10°) divided by the TD at the minimum ambient for fan cycling alone.
   Correction Factor = 100° TD ÷ 50° TD = 2.0

4. Refer to the Fan Cycling Charge Factor table below to find a Charge Correction Factor equal to 3.0.

Fan Cycling Charge Factors

Correction Factors		Correction Factors	
T.D.	*Charge*	*T.D.*	*Charge*
1.0	1.0	4.0	4.0
1.5	2.4	4.5	4.1
2.0	3.0	5.0	4.2
2.5	3.3	5.5	4.3
3.0	3.6	6.0	4.4
3.5	3.8	6.5	4.5

Apply this factor to the procedures above to calculate the refrigerant charge for a condenser equipped with both Flooded and Fan Cycling Controls.

Table 5: Standard Refrigerant Charge—Pounds

Model KBC	*Number Face Tubes Avail-able*	*R-22 †*		*R-404A & 507*	
		Charge Per Face Tube	*Total Unit Charge*	*Charge Per Face Tube*	*Total Unit Charge*
212	54	0.59	32.0	0.60	32.6
224		0.59	32.0	0.60	32.6
262		0.79	42.8	0.81	43.6
323		0.89	48.1	0.91	49.0
341		0.89	48.1	0.91	49.0
387		1.18	63.5	1.20	64.7
520		1.56	84.5	1.59	86.1
642		1.95	105.1	1.98	107.0
677		2.33	125.9	2.37	128.2
648		1.96	105.6	1.99	107.6
798		2.44	132.0	2.49	134.4
843		2.93	158.4	2.99	161.3
780		2.35	126.7	2.39	129.0

† R-502: Multiply R-22 charge by 1.04
R-134A: Multiply R-22 charge by 1.01

Table 6: Refrigerant Charge Correction Factor
Low Ambient Flooded Condenser

Minimum Ambient Temp. ° F.	*Design T.D.*					
	30	*25*	*20*	*15*	*10*	*5*
60	1.0	1.6	2.3	3.0	3.7	4.3
50	2.0	2.5	3.0	3.5	4.0	4.5
40	2.6	3.0	3.4	3.8	4.2	4.6
30	3.0	3.3	3.7	4.0	4.3	4.7
20	3.3	3.6	3.9	4.1	4.4	4.7
10	3.5	3.8	4.0	4.3	4.5	4.8
0	3.7	3.9	4.1	4.3	4.6	4.8
-10	3.8	4.0	4.2	4.4	4.6	4.8
-20	3.9	4.1	4.3	4.5	4.6	4.8

** Based on 90° F. Condensing Temperature*

Table 7: Weight of Refrigerant *

Line Size O.D.	*Liquid Line 110° F.*		*Suction Line 40° F.*	*Suction Line -20° F.*	*Discharge Line 115° F.*	
	R-22	*R-404A R-507*	*R-22*	*R-404A R-507*	*R-22*	*R-404A R-507*
5/8	11.3	9.7	0.3	0.2	0.8	0.7
7/8	23.4	24.2	0.5	0.4	1.7	1.4
1 1/8	40.0	41.5	0.9	0.7	2.9	2.5
1 3/8	60.5	62.8	1.3	1.1	4.3	3.7
1 5/8	85.0	83.0	1.8	1.6	6.1	5.2
2 1/8	150.0	155.0	3.3	2.8	10.7	9.2
2 5/8	232.0	240.0	5.0	4.3	16.6	14.3
3 1/8	330.0	340.0	7.2	6.1	23.6	20.3
3 5/8	446.0	461.0	9.7	8.3	31.9	27.4

** Pounds per 100 Ft. of Type L tubing*
R-502:Multiply R-22 charge by 1.04
R-134!: Multiply R-22 charge by 1.01

Table 8: Fan and Motor Data

	Fan Data				Motor Data †				
						Full Load Amps		Min. Circ Ampacity	
Model KBC	Qty	Dia (In)	RPM	CFM	HP	208-230 3 ø	460 3 ø	208-230 3 ø	460 3 ø
212	2	48	415	36500	1 1/2	9.6	4.8	10.8	5.4
224	2		470	38380	2	12.4	6.2	14.0	7.0
262	2		470	35730	2	12.4	6.2	14.0	7.0
323	3		415	54750	1 1/2	14.4	7.2	15.6	7.8
341	3		470	57570	2	18.6	9.3	20.2	10.1
387	3		470	54150	2	18.6	9.3	20.2	10.1
520	4		470	74960	2	24.8	12.4	26.4	13.2
642	4		470	68100	2	24.8	12.4	26.4	13.2
677	4		470	64065	2	24.8	12.4	26.4	13.2
648	5		470	89875	2	31.0	15.5	32.6	16.3
798	5		470	85125	2	31.0	15.5	32.6	16.3
843	5		470	80325	2	31.0	15.5	32.6	16.3
780	6		470	107250	2	37.2	18.6	38.8	19.4

† Refer to Page 17 for individual fan motor amp ratings.

FAN CYCLING CONTROL

The Witt Fan Cycling Control system allows fans to be cycled off in sequence.

The cycling of condenser fans provides an automatic means of maintaining condensing pressure control at low ambient air temperature conditions. It also results in substantial fan motor power savings in lower ambients. Either ambient sensing thermostats or pressure controls can be employed.

Fan cycling control—with ambient temperature thermostat— can also be used in conjunction with the Flooded Condenser Head Pressure Control Option to greatly reduce the required operating charge typical of flooded condenser operation. See Pages 7 and 8 for refrigerant charge calculations.

Table 9 shows how the fans are cycled. Use the set points in Table 12A or B to avoid fan short-cycling when pressure fan cycling is employed—fans should not cycle more than 10 times per hour.

The fans(s) nearest the header end of the unit must run continuously when compressors run. Fan speed control can be employed on these fans to enhance head pressure control.

Multi-Fan Units

The fan cycling control package consists of a weather-proof enclosure, fan contactors and either ambient thermostat(s) or pressure control(s). The enclosure is factory mounted and completely factory wired. Power must be supplied from a fused disconnect switch to the power circuit
terminal block; control circuit power must be supplied to the control terminal block. See Figure 4 for wiring diagrams.

Table 10 shows the minimum ambient temperature for units equipped with fan cycling controls based on design TD and percent compressor capacity.

Fan cycling thermostat and pressure control setpoints are shown in Tables 11 and 12. These setpoints are only general guidelines and may have to be varied for individual installations.

Table 9: Fan Cycling Arrangement

Total Fans	Number of Fans Cycled Per Control
2	1
3	1, 1
4	1, 1, 1
5	2, 1, 1
6	2, 2, 1

Note: Header-end fans do not cycle

Table 10: Minimum Ambient Temperature With Fan Cycling Control

Model KBC	TD	Minimum Amb. Temp. - ° F. At Percent Compressor Capacity Shown							
		Less Fan Speed Control				With Fan Speed Control			
		100%	75%	50%	25%	100%	75%	50%	25%
212 - 262	30	35	39	42	56	12	22	31	50
	25	45	46	47	58	25	31	38	54
	20	54	53	52	61	38	41	44	57
	15	63	60	56	63	51	51	51	60
	10	72	66	61	65	64	61	57	64
323 - 387	30	15	24	32	51	-15	1	18	44
	25	27	33	38	54	3	14	26	48
	20	40	42	45	57	20	28	35	53
	15	52	51	51	60	38	41	44	57
	10	65	61	57	64	55	54	53	61
520 - 677	30	-2	11	24	47	-25	-15	7	39
	25	13	22	31	51	-15	1	18	44
	20	28	33	39	54	6	17	28	49
	15	44	45	47	58	27	33	39	54
	10	59	57	54	62	48	49	50	60
648 - 843	30	-17	0	16	43	-25	-25	- 2	34
	25	1	13	25	48	-25	-10	10	40
	20	19	26	34	52	- 6	8	22	46
	15	36	40	43	57	18	26	34	52
	10	54	53	52	61	42	44	46	58
780	30	-20	-10	10	40	-25	-25	- 8	31
	25	-10	5	20	45	-25	-18	5	38
	20	10	20	30	50	-14	2	18	44
	15	30	35	40	55	12	22	31	51
	10	50	50	50	60	38	41	44	57

Based on approximately 90° F. condensing temperature at 100% capacity; 80° F. condensing temperature at 75% capacity; 70° F. condensing temperature at 50% and 25% capacity.

Table 11A: Fan Cycling Thermostat Settings

Model KBC	Design TD	Thermostat Setpoint—°F		
		Fan 2	Fan 3	Fan 4
212 - 262	30	60	-	-
	25	65	-	-
	20	70	-	-
	15	75	-	-
	10	80	-	-
323 - 387	30	47	60	-
	25	54	65	-
	20	61	70	-
	15	69	75	-
	10	76	80	-
520 - 677	30	35	51	60
	25	45	58	65
	20	54	64	70
	15	63	71	75
	10	72	77	80

Table 11B: Fan cycling Thermostat Settings

Model KBC	Design TD	Thermostat Setpoint—°F		
		Fan 2	Fan 3 10-Fan Unit OR 3 & 4 12-Fan Unit	Fans 4 & 5 10-Fan Unit 0R 5 & 6 12-Fan Unit
648 - 843	30	25	43	60
	25	36	51	65
	20	45	59	70
	15	57	67	75
	10	68	74	80
780	30	15	47	60
	25	27	54	65
	20	40	61	70
	15	52	69	75
	10	65	76	80

NOTES:
Thermostat set point is the temperature at which the fan(s) will shut off on a fall in ambient temperature. Fan(s) will restart when the ambient rises approximately 3° to 4°F. above the setpoint.

Setpoints shown will maintain a minimum of approximately 90°F. condensing temperature based on 100% compressor capacity.

Table 12A: Fan Cycling Pressure Control Settings

Model KBC	*Design TD*	*Refrg. Type*	*Pressure Control Settings—PSIG*					
			Fan 2		*Fan 3*		*Fan 4*	
			Cut-Out	*Cut-In*	*Cut-Out*	*Cut-In*	*Cut-Out*	*Cut-In*
212 - 262	30	22	170	250	—	—	—	—
		404A*	190	275				
	25	22	170	235	—	—	—	—
		404A*	190	260				
	20	22	170	225	—	—	—	—
		404A*	190	240				
	15	22	170	210	—	—	—	—
		404A*	190	230				
	10	22	170	200	—	—	—	—
		404A*	190	220				
323 - 387	30	22	170	275	180	285	—	—
		404A*	190	295	200	305		
	25	22	170	255	180	265	—	—
		404A*	190	275	200	285		
	20	22	170	235	180	245	—	—
		404A*	190	255	200	265		
	15	22	170	215	180	225	—	—
		404A*	190	235	200	245		
	10	22	170	205	180	215	—	—
		404A*	190	225	200	235		
520 - 677	30	22	160	290	170	300	180	310
		404A*	180	285	190	305	200	315
	25	22	160	270	170	280	180	290
		404A*	180	290	190	300	200	310
	20	22	160	250	170	260	180	270
		404A*	180	270	190	280	200	290
	15	22	160	225	170	235	180	245
		404A*	190	245	190	255	200	265
	10	22	160	205	170	215	180	225
		404A*	190	225	190	235	200	245

Table 12B: Fan Cycling Pressure Control Settings

Model KBC	*Design TD*	*Refrg. Type*	*Pressure Control Settings—PSIG*					
			Fan 2		*Fan 3 (5-Fan units), or 3 &4 (6-Fan units)*		*Fans 4 &5 (5-Fan units) 5 &6 (6-Fan units)*	
			Cut-Out	*Cut-In*	*Cut-Out*	*Cut-In*	*Cut-Out*	*Cut-In*
648 - 843	30	22	160	305	170	315	180	325
		404A*	180	330	190	340	200	350
	25	22	160	270	170	280	180	290
		404A*	180	305	190	315	200	325
	20	22	160	255	170	265	180	275
		404A*	180	280	190	290	200	300
	15	22	160	125	170	135	180	145
		404A*	180	230	190	240	200	250
	10	22	160	215	170	225	180	235
		404A*	180	230	190	240	200	250
780	30	22	160	320	170	330	180	340
		404A*	-	-	190	295	200	305
	25	22	160	285	170	295	180	305
		404A*	180	310	190	320	200	330
	20	22	160	260	170	270	180	280
		404A*	180	285	190	295	200	305
	15	22	160	235	170	245	180	255
		404A*	190	255	190	265	200	275
	10	22	160	215	170	225	180	235
		404A*	190	235	190	245	200	255

NOTE: Setpoints shown will maintain a minimum of approximately 90° F. condensing temperature.
** Same settings for R-507*

FIELD WIRING

IMPORTANT: All wiring must be done in accordance with applicable codes and local ordinances.

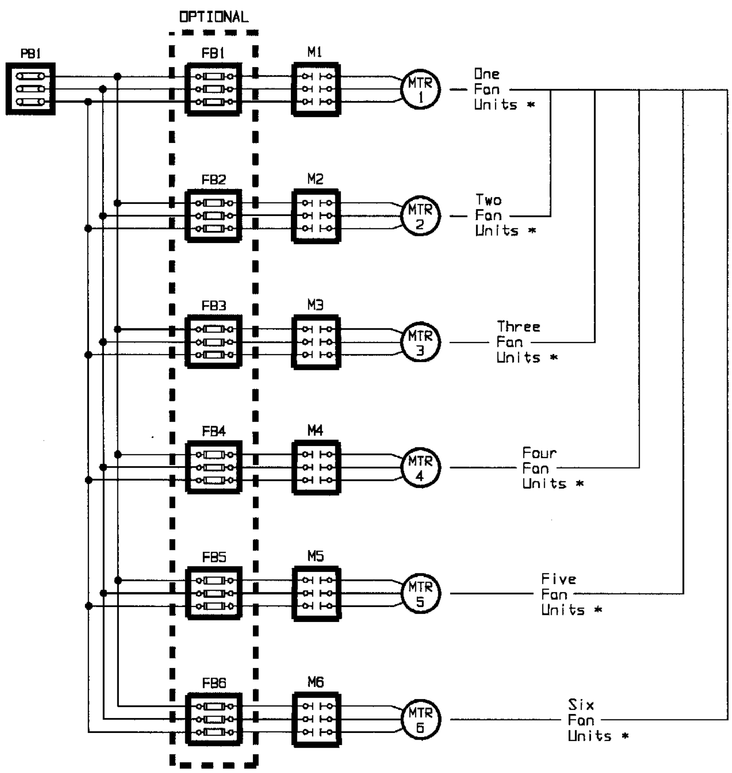
Standard units are furnished with the motor leads terminated in a single weatherproof enclosure located opposite the header end on the unit. A terminal block is provided on all units.

Wiring Options

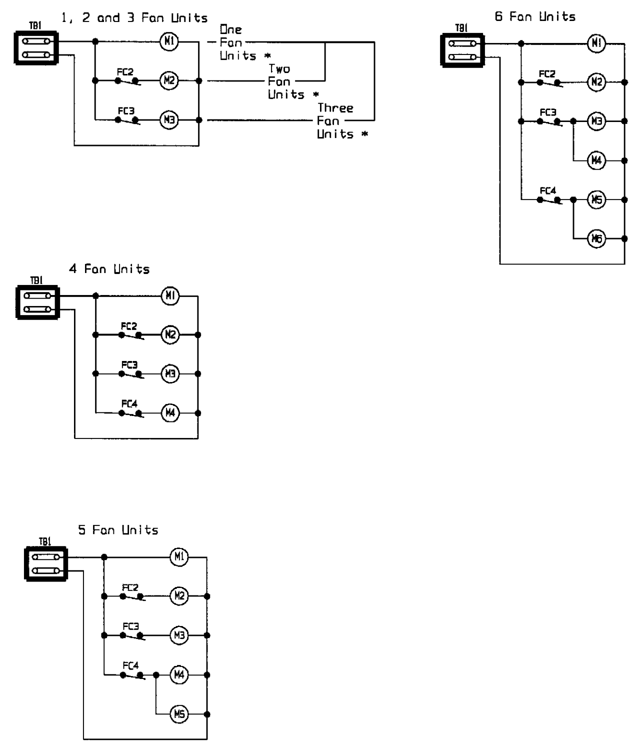
When the fan cycling control option is ordered, the units are furnished with contactors, power circuit terminal block (except on single fan units), fan cycling controls, a control terminal block and motor fusing, if specified. The components are installed in a weatherproof enclosure that is factory mounted and completely wired. See Figure 4 for wiring details.

Figure 4 — Single Fan-Width Units

Power Wiring



Control Wiring



Legend

FB1 - FB6 . . . . .Fuse Blocks
FC2 - FC4 . . . . .Fan Cycling Controls
M1 - M6 . . . . .Fan Motor Contactors
MTR1 - MTR6 . . . . .Fan Motors
TB1 . . . . .Control Terminal Block
PB1 . . . . .Power Terminal Block

Notes

1. Motor 1 is always located at the header end of the unit.
2. Field control wiring connections are made to terminal block TB1.
3. Contactor holding coils can be furnished in most voltages, including 24, 115, 208-230 or 460 volts.
4. Fan cycling controls FC2 through FC4 can be furnished either as ambient temperature controls or pressure controls.

UNIT START-UP

Before starting the refrigeration system, check the following items.

1. Make sure the condenser is wired as shown in the Field Wiring section of this bulletin and in accordance with applicable codes and local ordinances.
2. Make sure all electrical connections are tight.
3. Make sure the piping to the condenser is in accordance with the Refrigerant Piping information section of this bulletin and good piping practice.
4. Make sure all motors and bearings are mounted securely and all fan setscrews are tight.
5. Make sure all fans rotate freely.
6. Make sure the unit is located so that it has free access for proper air flow, see the Unit Location section of this bulletin.
7. After start-up, make sure all fans are rotating in the proper direction. Fans should draw air through the coil.

MAINTENANCE

General

Regular maintenance should include cleaning the surface of the coil; checking to make sure that all electrical connections are tight; and checking belts for proper tensioning and excessive wear.

Lubrication

Extended lube lines are brought from the pillow-block fan-shaft bearings to the unit casing adjacent to each fan motor access panel. Lubricate every 1 to 2 months with a high-quality lithium-base grease conforming to NLGI grade #2. Best results are achieved if the lubrication is done while the unit is operating.

1. Disconnect power to the unit
2. Remove each access panel, and wipe excess grease from the bearing seals.
3. Reconnect power to the unit.
4. Keeping well clear of all internal moving parts, slowly pump a small amount of grease into each bearing until a small bead of grease has formed around the bearing seal.
5. Replace all access panels.

All motors have permanently lubricated and sealed ball bearings—no maintenance is required.

SERVICE RECORD

DATE	*MAINTENANCE PERFORMED*	*COMPONENTS REQUIRED*