

# *Remote Air-Cooled Condenser*

Catalog 610.1



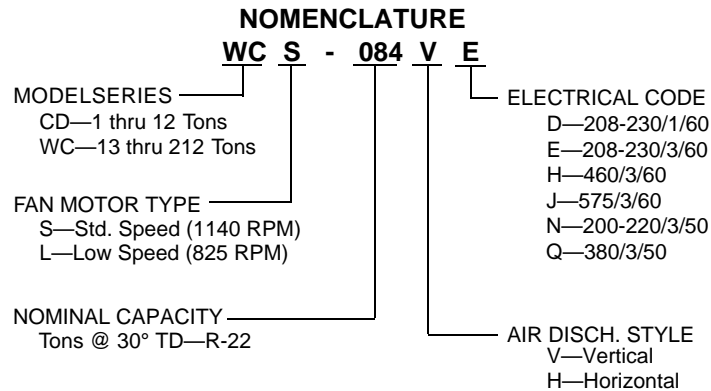
## ***Versatile Condensers for ...***

- *Applications from 1 thru 212 Tons*
- *Supermarkets*
- *Air Conditioning*
- *Refrigerated Warehousing*
- *Process Refrigeration*



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Standard and Optional Features

DESCRIPTION	Notes	UNIT MODEL	
		CDS/CDL 1 to 12 Ton	WCS/WCL 13 to 212 Tons
<b>General Construction and Configuration</b>			
Vertical Air Discharge Configuration		Std	Std
Horizontal Air Discharge Configuration		Opt	Opt
Galvanized Steel Frame and Casing		Std	Std
Heavy Gauge Galvanized Steel Legs (Vert. Disch):	Leg Length	15" (Std)	18" (Std)
	30" or Custom Leg Length	N/A	Opt
	B		
<b>Condenser Coil</b>			
16 Gauge Galvanized Steel Casing and Heavy Gauge Aluminum Tube Sheets		Std	Std
Aluminum Fins Mechanically Expanded into Copper Tubes		Std	Std
Special Fin Materials: Up to .010" Thick Aluminum		Opt	Opt
Copper Fin Stock		Opt	Opt
Polyester-Coated Fin Stock		Opt	Opt
AST ElectroFin™, Heresite or Technicoat Dipped Coils		Opt	Opt
Multi-Circuiting (No extra charge)	C	Opt	Opt
Sub-Cooling Circuits (No extra charge)		Opt	Opt
<b>Fan Section</b>			
6-Pole (1140 RPM), 1-Phase (CD only) or 3-Phase Fan Motors:	Open Type	Std	Std
	Totally Enclosed	Opt	Opt
8-Pole (825 RPM), 1-Phase (CD only) or 3-Phase Fan Motors:	Open Type	Opt	Opt
Variable-Speed Fan Motors on Header End - See Control Panel Options	D, E	Opt	Opt
Fan Motor Mounting: Models CD—Steel Mounting Rail(s)		Std	N/A
Models WC—Welded heavy gauge rod mounting frames		N/A	Std
Fan Blades - Heavy Gauge Aluminum Blades, Painted Steel Hubs		Std	Std
Fully Baffled Fan Modules		Std	Std
'Flip Top' Hinged Fan Panels - Easy Access for Coil Cleaning and Fan/Motor Service		N/A	Opt
Gravity Dampers		Opt	Opt
<b>Control Panel</b>			
Weather-Tight Galvanized Steel Enclosure with All Motor Leads Pulled	F	Std	Std
Mounting Location: Opposite Header End		Std	Std
Left or Right Side (No extra charge)		Opt	Opt
Temp. or Press. Fan Cycling - Individual or Paired-Fan Contactors (Must specify)		Opt	Opt
Custom Fan Cycling Wiring and Logic		Opt	Opt
Variable Speed Control: Penn P-66 Pressure Controlled	D, E	Opt	Opt
Hoffman Temperature Controlled	D, E	Opt	Opt
Output Relay Boards for Computerized Fan Cycling (Computer control by others)	G	Opt	Opt
Motor Fusing - Individually or in Pairs		Opt	Opt
Circuit Breakers	D	Opt	Opt
Fan Control Circuit Toggle Switches		Opt	Opt
Control Transformer	D	Opt	Opt
Fused or Non-Fused Disconnect Switch (Mounted)	D	Opt	Opt
<b>Refrigerant Specialties</b>			
Flooded-Condenser Control Valve System (Furnished loose)		Opt	Opt
Field Manifold Kit	C	Opt	Opt
<b>Shipping</b>			
Vertical Discharge Models			
CD—See Note H	H	See note H	N/A
WC—Legs are collapsed for shipping and must be re-extended during installation.		N/A	Std
Horizontal Discharge Models			
Legs Disassembled - Unit is Cartoned or Crated	H	See note H	Std

Notes:

- A. CD Only
- B. Contact factory.
- C. All double fan-width units are two-section as standard. Requires field manifold kit for single-section operation.
- D. Not UL Listed
- E. Header-End (lead fans) only with 26" blades. Deduct 3% from capacities on pages 4, 5, 6, 7 & 11  
Do not cycle header end (lead) fans unless system is shut down.
- F. Model WC Units are furnished with motor leads wired to 3-Phase terminal blocks.
- G. EMC Output relay board is UL Listed; all others not UL Listed
- H. Legs disassembled; units shipped in carton or crate. Models up thru CDS-012 (CDL-009) can be either horizontal or vertical depending on method of leg assembly.



**Table 1: Performance Data at Standard Fin Spacing**  
Standard Speed (1140 RPM) Fan Motors

Unit Size	Refrigerant 22						Refrigerants 404A & 507					
	TD						TD					
	1	10	15	20	25	30	1	10	15	20	25	30

**SINGLE FAN-WIDTH MODELS**

*Model CDS*

001	0.7	6.7	10.1	13.5	16.8	20.2	0.7	6.6	9.9	13.2	16.5	19.8
002	1.1	11.4	17.1	22.8	28.6	34.3	1.1	11.2	16.8	22.4	28.0	33.6
004	1.8	18.5	27.7	36.9	46.2	55.4	1.8	18.1	27.2	36.2	45.3	54.3
005	2.4	24.7	36.3	48.3	60.5	72.5	2.4	23.7	35.6	47.4	59.3	71.1
008	3.7	36.8	55.3	73.6	92.1	110.5	3.6	36.1	54.2	72.2	90.3	108.3
010	4.8	48.3	72.5	96.7	120.9	145.0	4.7	47.4	71.1	94.8	118.5	142.2
012	5.5	55.4	83.1	110.8	138.5	166.2	5.4	54.3	81.5	108.6	135.8	162.9

*Model WCS*

015	7.2	72.5	108.7	144.8	181.0	217.3	7.1	71.0	106.6	142.0	177.6	213.0
016	8.1	80.9	121.4	161.8	202.2	242.7	7.9	79.3	119.0	158.6	198.3	237.9
020	9.7	96.7	145.0	193.4	241.7	290.0	9.5	94.8	142.1	189.6	237.0	284.3
022	10.6	105.9	158.8	211.8	264.7	317.6	10.4	103.8	155.7	207.6	259.5	311.4
025	11.8	117.9	176.8	235.7	294.7	353.6	11.6	115.5	173.3	231.0	288.8	346.5
028	13.4	134.1	201.2	268.2	335.3	402.3	13.1	131.4	197.1	262.8	328.5	394.3
031	15.1	151.1	226.7	302.3	377.8	453.4	14.8	148.1	222.2	296.2	370.3	444.3
036	17.3	172.9	259.4	345.8	432.3	518.7	16.9	169.4	254.2	338.9	423.6	508.3
041	20.1	201.1	301.7	402.2	502.8	603.3	19.7	197.1	295.6	394.2	492.7	591.2
046	22.7	227.0	340.5	454.0	567.5	681.0	22.2	222.5	333.7	444.9	556.2	667.4
050	24.7	247.0	370.5	493.9	617.4	740.9	24.2	242.0	363.0	484.1	605.1	726.1
053	26.8	268.0	402.0	536.0	670.0	804.0	26.3	262.6	394.0	525.3	656.6	787.9
059	30.2	302.0	453.1	604.1	755.1	906.1	29.6	296.0	444.0	592.0	740.0	888.0
065	32.9	329.0	493.4	657.9	822.4	986.9	32.2	322.4	483.6	644.7	805.9	967.1
069	34.6	346.0	519.0	692.0	865.0	1038.0	33.9	339.1	508.6	678.2	847.7	1017.2
077	38.6	385.5	578.3	771.0	963.8	1156.6	37.8	377.8	566.7	755.6	944.5	1133.4
081	40.4	404.1	606.1	808.1	1010.2	1212.2	39.6	396.0	594.0	792.0	990.0	1188.0
084	42.2	422.5	633.7	845.0	1056.2	1267.5	41.4	414.0	621.1	828.1	1035.1	1242.1
088	44.2	442.0	663.0	884.0	1105.0	1326.0	43.3	433.2	649.7	866.3	1082.9	1299.5
096	48.3	483.1	724.7	966.2	1207.8	1449.4	47.3	473.5	710.2	946.9	1183.6	1420.4
098	49.5	495.0	742.6	990.1	1237.6	1485.1	48.5	485.1	727.7	970.3	1212.8	1455.4
105	52.8	527.9	791.9	1055.9	1319.8	1583.8	51.7	517.4	776.1	1034.7	1293.4	1552.1

**DOUBLE FAN-WIDTH MODELS**

*Model WCS*

047	23.6	235.9	353.9	471.9	589.8	707.8	23.1	231.2	346.8	462.4	578.0	693.6
054	26.8	268.1	402.2	536.3	670.3	804.4	26.3	262.8	394.2	525.5	656.9	788.3
060	30.2	302.0	453.0	604.0	755.0	906.0	29.6	296.0	443.9	591.9	739.9	887.9
066	32.9	328.9	493.4	657.8	822.3	986.7	32.2	322.3	483.5	644.6	805.8	967.0
070	34.6	345.9	518.8	691.7	864.7	1037.6	33.9	338.9	508.4	677.9	847.4	1016.8
075	37.5	375.0	562.6	750.1	937.6	1125.1	36.8	367.5	551.3	735.1	918.8	1102.6
080	40.2	402.1	603.1	804.1	1005.2	1206.2	39.4	394.0	591.0	788.1	985.1	1182.1
085	42.7	427.0	640.5	853.9	1067.4	1280.9	41.8	418.4	627.6	836.9	1046.1	1255.3
090	45.4	453.9	680.9	907.9	1134.8	1361.8	44.5	444.9	667.3	889.7	1112.1	1334.6
099	49.5	495.2	742.8	990.3	1237.9	1485.5	48.5	485.3	727.9	970.5	1213.2	1455.8
106	52.8	527.8	791.8	1055.7	1319.6	1583.5	51.7	517.3	775.9	1034.6	1293.2	1551.8
108	53.6	536.0	804.0	1072.0	1340.0	1608.0	52.5	525.3	787.9	1050.6	1313.2	1575.8
121	60.4	604.1	906.1	1208.1	1510.2	1812.2	59.2	592.0	888.0	1184.0	1480.0	1776.0
132	65.8	657.9	986.9	1315.8	1644.8	1973.7	64.5	644.7	967.1	1289.5	1611.9	1934.2
140	69.2	692.0	1038.0	1384.0	1730.0	2076.0	67.8	678.2	1017.2	1356.3	1695.4	2034.5
154	77.1	771.0	1156.6	1542.1	1927.6	2313.1	75.6	755.6	1133.4	1511.2	1889.0	2266.8
162	80.8	808.1	1212.2	1616.3	2020.3	2424.4	79.2	792.0	1188.0	1583.9	1979.9	2375.9
170	84.5	845.0	1267.5	1689.9	2112.4	2534.9	82.8	828.1	1242.1	1656.1	2070.2	2484.2
177	88.4	884.0	1326.0	1768.0	2210.0	2652.0	86.6	866.3	1299.5	1732.6	2165.8	2599.0
193	96.6	966.2	1449.4	1932.5	2415.6	2898.7	94.7	946.9	1420.4	1893.8	2367.3	2840.7
200	99.0	990.1	1485.1	1980.1	2475.2	2970.2	97.0	970.3	1455.4	1940.5	2425.7	2910.8
212	105.6	1055.9	1583.8	2111.7	2639.7	3167.6	103.5	1034.7	1552.1	2069.5	2586.9	3104.2

R-134a Selections: Divide the Required Capacity by 0.95, then select the proper unit from the R-22 table using the corrected capacity.

**Table 2: Performance Data at Standard Fin Spacing**  
Low Speed (825 RPM) Fan Motors

Unit Size	Refrigerant 22						Refrigerants 404A & 507					
	TD						TD					
	1	10	15	20	25	30	1	10	15	20	25	30
<b>SINGLE FAN-WIDTH MODELS</b>												
<i>Model CDL</i>												
001	0.6	6.4	9.6	12.7	15.9	19.1	0.6	6.2	9.4	12.5	15.6	18.7
002	1.0	10.0	15.0	20.0	25.0	30.0	1.0	9.8	14.7	19.6	24.5	29.4
003	1.6	15.7	23.5	31.3	39.2	47.0	1.5	15.4	23.0	30.7	38.4	46.1
004	2.0	20.2	30.3	40.3	50.4	60.5	2.0	19.8	29.6	39.5	49.4	59.3
006	3.1	31.2	46.9	62.5	78.1	93.7	3.1	30.6	45.9	61.2	76.5	91.8
008	4.0	40.4	60.6	80.7	100.9	121.1	4.0	39.6	59.3	79.1	98.9	118.7
009	4.4	44.4	66.7	88.9	111.1	133.3	4.4	43.5	65.3	87.1	108.9	130.6
<i>Model WCL</i>												
013	6.3	63.3	95.0	126.6	158.3	189.9	6.2	62.0	93.1	124.1	155.1	186.1
014	6.9	68.6	102.9	137.2	171.5	205.8	6.7	67.2	100.8	134.5	168.1	201.7
017	8.2	82.1	123.1	164.1	205.2	246.2	8.0	80.4	120.6	160.9	201.1	241.3
018	8.8	88.4	132.6	176.8	221.0	265.2	8.7	86.6	129.9	173.3	216.6	259.9
023	11.1	110.9	166.4	221.9	277.3	332.8	10.9	108.7	163.1	217.4	271.8	326.1
027	12.8	128.1	192.2	256.3	320.3	384.4	12.6	125.6	188.4	251.1	313.9	376.7
030	13.8	138.1	207.2	276.2	345.3	414.3	13.5	135.3	203.0	270.7	338.3	406.0
031	15.0	149.9	224.9	299.8	374.8	449.7	14.7	146.9	220.4	293.8	367.3	440.7
034	16.0	159.9	239.8	319.7	399.7	479.6	15.7	156.7	235.0	313.3	391.7	470.0
039	19.3	193.0	289.5	385.9	482.4	578.9	18.9	189.1	283.7	378.2	472.8	567.3
041	21.1	211.0	316.5	422.0	527.5	633.0	20.7	206.8	310.2	413.6	517.0	620.3
049	23.0	230.1	345.2	460.3	575.3	690.4	22.6	225.5	338.3	451.1	563.8	676.6
051	25.6	256.5	384.7	512.9	641.1	769.4	25.1	251.3	377.0	502.6	628.3	754.0
055	27.6	275.5	413.3	551.0	688.8	826.5	27.0	270.0	405.0	540.0	675.0	810.0
058	29.5	295.1	442.6	590.1	737.6	885.2	28.9	289.1	433.7	578.3	722.9	867.4
063	31.9	319.1	478.6	638.1	797.7	957.2	31.3	312.7	469.0	625.4	781.7	938.1
069	34.7	347.0	520.5	694.0	867.5	1041.0	34.0	340.0	510.1	680.1	850.1	1020.1
077	38.2	381.5	572.3	763.1	953.8	1144.6	37.4	373.9	560.9	747.8	934.8	1121.7
082	40.7	407.5	611.2	814.9	1018.7	1222.4	39.9	399.3	599.0	798.6	998.3	1198.0
092	45.8	457.6	686.4	915.2	1144.0	1372.8	44.8	448.4	672.6	896.9	1121.1	1345.3
095	47.8	478.1	717.1	956.1	1195.1	1434.2	46.8	468.5	702.7	937.0	1171.2	1405.5
099	48.9	489.0	733.5	978.0	1222.5	1467.0	47.9	479.2	718.8	958.4	1198.1	1437.7
<b>DOUBLE FAN-WIDTH MODELS</b>												
<i>Model WCL</i>												
043	21.6	216.1	324.1	432.1	540.2	648.2	21.2	211.7	317.6	423.5	529.4	635.2
052	25.6	255.8	383.8	511.7	639.6	767.5	25.1	250.7	376.1	501.4	626.8	752.2
056	27.4	274.0	411.1	548.1	685.1	822.1	26.9	268.6	402.8	537.1	671.4	805.7
059	29.4	294.1	441.1	588.1	735.2	882.2	28.8	288.2	432.3	576.4	720.5	864.6
064	31.7	316.9	475.4	633.9	792.3	950.8	31.1	310.6	465.9	621.2	776.5	931.8
068	33.9	339.1	508.7	678.3	847.8	1017.4	33.2	332.4	498.5	664.7	830.9	997.1
076	38.0	380.0	570.1	760.1	950.1	1140.1	37.2	372.4	558.6	744.9	931.1	1117.3
086	42.6	425.9	638.8	851.7	1064.7	1277.6	41.7	417.3	626.0	834.7	1043.4	1252.0
091	45.5	454.9	682.4	909.9	1137.3	1364.8	44.6	445.8	668.8	891.7	1114.6	1337.5
098	48.7	487.1	730.6	974.1	1217.7	1461.2	47.7	477.3	716.0	954.7	1193.3	1432.0
103	51.3	512.9	769.4	1025.8	1282.3	1538.7	50.3	502.6	754.0	1005.3	1256.6	1507.9
111	55.1	551.0	826.5	1102.0	1377.5	1653.0	54.0	540.0	810.0	1080.0	1350.0	1619.9
118	59.0	590.1	885.2	1180.2	1475.3	1770.3	57.8	578.3	867.4	1156.6	1445.7	1734.9
127	63.8	638.1	957.2	1276.3	1595.3	1914.4	62.5	625.4	938.1	1250.7	1563.4	1876.1
138	69.4	694.0	1041.0	1387.9	1734.9	2081.9	68.0	680.1	1020.1	1360.2	1700.2	2040.3
155	76.3	763.1	1144.6	1526.1	1907.7	2289.2	74.8	747.8	1121.7	1495.6	1869.5	2243.4
164	81.5	814.9	1222.4	1629.9	2037.3	2444.8	79.9	798.6	1198.0	1597.3	1996.6	2395.9
183	91.5	915.2	1372.8	1830.3	2287.9	2745.5	89.7	896.9	1345.3	1793.7	2242.2	2690.6
190	95.6	956.1	1434.2	1912.2	2390.3	2868.3	93.7	937.0	1405.5	1874.0	2342.4	2810.9
196	97.8	978.0	1467.0	1956.0	2445.0	2934.0	95.8	958.4	1437.7	1916.9	2396.1	2875.3

R-134a Selections: Divide the Required Capacity by 0.95, then select the proper unit from the R-22 table using the corrected capacity.

Refer to Selection Procedures starting on Page 8



**Table 3: Performance Data at Alternate Fin Spacing**  
Standard Speed (1140 RPM) Fan Motors

Model Size	R-22 Performance Data—MBH/°F. TD				R-404A/507 Performance Data—MBH/°F. TD			
	Fins Per Inch				Fins Per Inch			
	8	10	12	14	8	10	12	14
<b>SINGLE FAN-WIDTH MODELS</b>								
<i>MODEL CDS</i>								
001	<b>.67</b>	—	—	—	<b>.66</b>	—	—	—
002	<b>1.14</b>	—	—	—	<b>1.12</b>	—	—	—
004	—	<b>1.85</b>	—	—	—	<b>1.81</b>	—	—
005	—	<b>2.47</b>	—	—	—	<b>2.37</b>	—	—
008	—	<b>3.68</b>	—	—	—	<b>3.61</b>	—	—
010	—	<b>4.83</b>	—	—	—	<b>4.73</b>	—	—
012	—	<b>5.54</b>	—	—	—	<b>5.43</b>	—	—
<i>MODEL WCS</i>								
015	<b>7.25</b>	See 016	—	—	<b>7.11</b>	See 016	—	—
016	See 015	<b>8.09</b>	—	—	See 015	<b>7.93</b>	—	—
020	<b>9.67</b>	See 022	—	—	<b>9.48</b>	See 022	—	—
022	See 020	<b>10.59</b>	—	—	See 020	<b>10.38</b>	—	—
025	8.84	10.02	10.98	<b>11.79</b>	8.66	9.82	10.76	<b>11.55</b>
028	12.11	<b>13.41</b>	See 031	See 031	11.87	<b>13.14</b>	See 031	See 031
031	See 028	See 028	14.40	<b>15.11</b>	See 028	See 028	14.11	<b>14.81</b>
036	14.70	15.94	16.77	<b>17.29</b>	14.41	15.62	16.43	<b>16.94</b>
041	18.16	<b>20.11</b>	See 046	See 046	17.80	<b>19.71</b>	See 046	See 046
046	See 041	See 041	21.60	<b>22.70</b>	See 041	See 041	21.17	<b>22.25</b>
050	21.66	23.51	<b>24.70</b>	—	21.23	23.04	<b>24.21</b>	—
053	24.17	<b>26.80</b>	See 059	See 059	23.68	<b>26.26</b>	See 059	See 059
059	See 053	See 053	28.76	<b>30.21</b>	See 053	See 053	28.18	<b>29.60</b>
065	28.51	31.13	<b>32.90</b>	See 069	27.94	30.50	<b>32.24</b>	See 069
069	See 065	See 065	See 065	<b>34.60</b>	See 065	See 065	See 065	<b>33.91</b>
077	31.50	34.58	36.89	<b>38.55</b>	30.87	33.89	36.15	<b>37.78</b>
081	37.58	<b>40.41</b>	See 084	See 088	36.82	<b>39.60</b>	See 084	See 088
084	See 081	See 081	<b>42.25</b>	See 088	See 081	See 081	<b>41.41</b>	See 088
088	See 081	See 081	See 084	<b>44.20</b>	See 081	See 081	See 084	<b>43.32</b>
096	44.93	<b>48.31</b>	See 098	See 105	44.03	<b>47.34</b>	See 098	See 105
098	See 096	See 096	<b>49.51</b>	See 105	See 096	See 096	<b>48.51</b>	See 105
105	See 096	See 096	See 098	<b>52.80</b>	See 096	See 096	See 098	<b>51.74</b>
<b>DOUBLE FAN-WIDTH MODELS</b>								
<i>MODEL WCS</i>								
047	17.69	20.05	21.96	<b>23.59</b>	17.34	19.65	21.52	<b>23.12</b>
054	24.16	<b>26.81</b>	See 060	See 060	23.68	<b>26.27</b>	See 060	See 060
060	See 054	See 054	28.75	<b>30.20</b>	See 054	See 054	28.18	<b>29.60</b>
066	28.84	31.31	<b>32.89</b>	See 070	28.26	30.68	<b>32.23</b>	See 070
070	See 066	See 066	See 066	<b>34.59</b>	See 066	See 066	See 066	<b>33.90</b>
075	28.13	31.88	34.91	<b>37.50</b>	27.57	31.24	34.21	<b>36.75</b>
080	35.95	<b>40.21</b>	See 085	See 090	35.23	<b>39.41</b>	See 085	See 090
085	See 080	See 080	<b>42.70</b>	See 090	See 080	See 080	<b>41.85</b>	See 090
090	See 080	See 080	See 085	<b>45.39</b>	See 080	See 080	See 085	<b>44.48</b>
099	43.43	47.14	<b>49.52</b>	See 106	42.56	46.20	<b>48.53</b>	See 106
106	See 099	See 099	See 099	<b>52.78</b>	See 099	See 099	See 099	<b>51.72</b>
108	48.33	<b>53.60</b>	See 121	See 121	47.36	<b>52.53</b>	See 121	See 121
121	See 108	See 108	57.51	<b>60.41</b>	See 108	See 108	56.36	<b>59.20</b>
132	57.02	62.25	<b>65.79</b>	See 140	55.88	61.01	<b>64.47</b>	See 140
140	See 132	See 132	See 132	<b>69.20</b>	See 132	See 132	See 132	<b>67.82</b>
154	62.99	69.16	73.78	<b>77.10</b>	61.73	67.78	72.30	<b>75.56</b>
162	75.15	<b>80.81</b>	See 170	See 177	73.65	<b>79.19</b>	See 170	See 177
170	See 162	See 162	<b>84.50</b>	See 177	See 162	See 162	<b>82.81</b>	See 177
177	See 162	See 162	See 170	<b>88.40</b>	See 162	See 162	See 170	<b>86.63</b>
193	89.86	<b>96.62</b>	See 200	See 212	88.06	<b>94.69</b>	See 200	See 212
200	See 193	See 193	<b>99.01</b>	See 212	See 193	See 193	<b>97.03</b>	See 212
212	See 193	See 193	See 200	<b>105.59</b>	See 193	See 193	See 200	<b>103.48</b>

- Performance in **Bold Type Face** indicates standard fins per inch—Regular Type Face indicates alternate fins per inch.
- A fin spacing (FPI) for a given model is available if the capacity is shown. Otherwise, refer to the model size indicated in table.
- Divide the MBH required by the desired operating TD to get MBH per °F TD. Scan down the appropriate FPI column to find the capacity which meets or exceeds the MBH/°F TD.
- R-134a Selections: Divide the Required Capacity by 0.95, then select the proper unit from the R-22 table using the corrected capacity.

**Table 4: Performance Data at Alternate Fin Spacing**  
Low Speed (825 RPM) Fan Motors

Model Size	R-22 Performance Data—MBH/°F. TD				R-404A/507 Performance Data—MBH/°F. TD			
	Fins Per Inch				Fins Per Inch			
	8	10	12	14	8	10	12	14

**SINGLE FAN-WIDTH MODELS**

**MODEL CDL**

001	<b>.64</b>	—	—	—	<b>.63</b>	—	—	—
002	<b>1.00</b>	—	—	—	<b>.98</b>	—	—	—
003	—	<b>1.57</b>	—	—	—	<b>1.54</b>	—	—
004	—	<b>2.02</b>	—	—	—	<b>1.98</b>	—	—
006	—	<b>3.12</b>	—	—	—	<b>3.06</b>	—	—
008	—	<b>4.04</b>	—	—	—	<b>3.96</b>	—	—
009	—	<b>4.44</b>	—	—	—	<b>4.35</b>	—	—

**MODEL WCL**

013	<b>6.33</b>	See 014	—	—	<b>6.20</b>	See 014	—	—
014	See 013	<b>6.86</b>	—	—	See 013	<b>6.72</b>	—	—
017	<b>8.21</b>	See 018	—	—	<b>8.05</b>	See 018	—	—
018	See 017	<b>8.84</b>	—	—	See 017	<b>8.66</b>	—	—
023	8.32	9.43	10.32	<b>11.09</b>	8.15	9.24	10.12	<b>10.87</b>
027	11.57	<b>12.81</b>	See 030	See 030	11.34	<b>12.55</b>	See 030	See 030
030	See 027	See 027	13.16	<b>13.81</b>	See 027	See 027	12.90	<b>13.53</b>
031	13.15	14.27	<b>14.99</b>	See 034	12.88	13.99	<b>14.69</b>	See 034
034	See 031	See 031	See 031	<b>15.99</b>	See 031	See 031	See 031	<b>15.67</b>
039	17.43	<b>19.30</b>	See 041	See 041	17.08	<b>18.91</b>	See 041	See 041
041	See 039	See 039	20.25	<b>21.10</b>	See 039	See 039	19.85	<b>20.68</b>
049	20.18	21.91	<b>23.01</b>	—	19.78	21.47	22.55	<b>22.55</b>
051	23.08	<b>25.65</b>	See 055	See 055	22.62	<b>25.13</b>	See 055	See 055
055	See 051	See 051	26.67	<b>27.55</b>	See 051	See 051	26.14	<b>27.00</b>
058	26.60	28.88	<b>29.51</b>	See 063	26.06	28.30	<b>28.91</b>	See 063
063	See 058	See 058	See 058	<b>31.91</b>	See 058	See 058	See 058	<b>31.27</b>
069	28.88	31.67	33.34	<b>34.70</b>	28.30	31.03	32.67	<b>34.01</b>
077	35.49	<b>38.16</b>	See 082	See 082	34.78	<b>37.39</b>	See 082	See 082
082	See 077	See 077	39.73	<b>40.75</b>	See 077	See 077	38.93	<b>39.93</b>
092	42.59	<b>45.76</b>	See 095	See 099	41.74	<b>44.84</b>	See 095	See 099
095	See 092	See 092	<b>47.81</b>	See 099	See 092	See 092	<b>46.85</b>	See 099
099	See 092	See 092	See 095	<b>48.90</b>	See 092	See 092	See 095	<b>47.92</b>

**DOUBLE FAN-WIDTH MODELS**

**MODEL WCL**

043	16.21	18.37	20.12	<b>21.61</b>	15.88	18.00	19.72	<b>21.18</b>
052	23.10	<b>25.58</b>	See 056	See 056	22.64	<b>25.07</b>	See 056	See 056
056	See 052	See 052	26.67	<b>27.40</b>	See 052	See 052	26.14	<b>26.85</b>
059	26.61	28.00	<b>29.41</b>	See 064	26.08	27.44	<b>28.82</b>	See 064
064	See 059	See 059	See 059	<b>31.69</b>	See 059	See 059	See 059	<b>31.06</b>
068	25.43	28.82	31.57	<b>33.91</b>	24.92	28.25	30.94	<b>33.23</b>
076	34.65	<b>38.00</b>	See 086	See 086	33.96	<b>37.24</b>	See 086	See 086
086	See 076	See 076	40.01	<b>42.59</b>	See 076	See 076	39.21	<b>41.74</b>
091	39.89	43.31	<b>45.49</b>	See 098	39.10	42.44	<b>44.58</b>	See 098
098	See 091	See 091	See 091	<b>48.71</b>	See 091	See 091	See 091	<b>47.74</b>
103	46.16	<b>51.29</b>	See 111	See 111	45.24	<b>50.26</b>	See 111	See 111
111	See 103	See 103	53.34	<b>55.10</b>	See 103	See 103	52.27	<b>54.00</b>
118	53.19	57.75	<b>59.01</b>	See 127	52.13	56.60	<b>57.83</b>	See 127
127	See 118	See 118	See 118	<b>63.81</b>	See 118	See 118	See 118	<b>62.53</b>
138	57.75	63.33	66.67	<b>69.40</b>	56.60	62.06	65.34	<b>68.01</b>
155	70.97	<b>76.31</b>	See 164	See 164	69.55	<b>74.78</b>	See 164	See 164
164	See 155	See 155	79.45	<b>81.49</b>	See 155	See 155	77.86	<b>79.86</b>
183	85.19	<b>91.52</b>	See 190	See 196	83.48	<b>89.69</b>	See 190	See 196
190	See 183	See 183	<b>95.61</b>	See 196	See 183	See 183	<b>93.70</b>	See 196
196	See 183	See 183	See 190	<b>97.80</b>	See 183	See 183	See 190	<b>95.84</b>

- Performance in **Bold Type Face** indicates standard fins per inch—Regular Type Face indicates alternate fins per inch.
- A fin spacing (FPI) for a given model is available if the capacity is shown. Otherwise, refer to the model size indicated in table.
- Divide the MBH required by the desired operating TD to get MBH per °F TD. Scan down the appropriate FPI column to find the capacity which meets or exceeds the MBH/°F TD.
- R-134a Selections: Divide the Required Capacity by 0.95, then select the proper unit from the R-22 table using the corrected capacity.



**Table 5: Fan and Motor Data**

Unit Size	Qty	Dia (In)	Fan Data				Motor Data †					
			Total CFM		Sound Levels*		Nom. HP		Minimum Circuit Ampacity			
			1140 RPM	825 RPM	1140 RPM	825 RPM	1140 RPM	825 RPM	208-230 1 ø	208-230 3 ø	460 3 ø	575 3 ø
<b>SINGLE FAN-WIDTH MODELS</b>												
CDS	CDL											
001	001	1	18	3100	2540							
002	002	1	18	2750	2040			1/2	1/4	15.0	15.0	15.0
004	003	1	22	3850	2850							
005	004	1	22	3700	2740							
008	006	2	22	7700	5700			1/2	1/4	15.0	15.0	15.0
010	008	2	22	7400	5480							
012	009	2	22	7000	5110							
WCS	WCL											
015	013	2		15700	11600							
016	014	2	26	15600	11400			1	1/2	15.0	15.0	15.0
020	017	2		15400	11500							
022	018	2		15300	11300							
025	023	2		23000	20600	66.0	61.0			15.0	15.0	
028	027	2		22450	20600	66.0	61.0			15.0	15.0	
031	030	2		21900	19800	66.0	61.0			15.0	15.0	
—	031	2		—	19100	—	61.0			15.0	15.0	
036	034	2		20700	18100	66.0	61.0			15.0	15.0	
041	039	3		33675	30900	67.0	62.5			21.1	15.0	
046	041	3		32850	29700	67.0	62.5			21.1	15.0	
050	049	3		32050	28650	67.0	62.5			21.1	15.0	
053	051	4		44900	41200	68.0	63.0			27.6	15.0	
059	055	4	30	43800	39600	68.0	63.0	1 1/2	1 1/2	NA	27.6	15.0
065	058	4		42400	38200	68.0	63.0			27.6	15.0	15.0
069	063	4		41400	36200	68.0	63.0			27.6	15.0	
077	069	5		54750	49500	68.5	63.5			34.1	17.3	
081	077	5		54350	49125	68.5	63.5			34.1	17.3	
084	—	5		53000	—	68.5	—			34.1	17.3	
088	082	5		51750	45250	68.5	63.5			34.1	17.3	
096	092	6		66350	58950	69.0	64.0			40.6	20.6	
098	095	6		64100	57300	69.0	64.0			40.6	20.6	
105	099	6		62100	54300	69.0	64.0			40.6	20.6	
<b>DOUBLE FAN-WIDTH MODELS</b>												
WCS	WCL											
047	043	4		46000	41200	68.0	63.0			27.6	15.0	15.0
054	052	4		44900	41200	68.0	63.0			27.6	15.0	15.0
060	056	4		43800	39600	68.0	63.0			27.6	15.0	15.0
066	059	4		42400	38200	68.0	63.0			27.6	15.0	15.0
070	064	4		41400	36200	68.0	63.0			27.6	15.0	15.0
075	068	6		69000	61800	69.0	64.0			40.6	20.6	15.0
080	076	6		67350	61800	69.0	64.0			40.6	20.6	15.0
085	—	6		67000	—	69.0	—			40.6	20.6	15.0
090	086	6		65700	59400	69.0	64.0			40.6	20.6	15.0
099	091	6	30	64100	57300	69.0	64.0	1 1/2	1 1/2	N/A	40.6	20.6
106	098	6		62100	54300	69.0	64.0			40.6	20.6	15.0
108	103	8		89800	82400	70.0	64.5			53.6	27.2	19.8
121	111	8		87600	79200	70.0	64.5			53.6	27.2	19.8
132	118	8		84800	76400	70.0	64.5			53.6	27.2	19.8
140	127	8		82800	72400	70.0	64.5			53.6	27.2	19.8
154	138	10		109500	99000	71.0	66.0			66.6	33.8	24.6
162	155	10		108700	98250	71.0	66.0			66.6	33.8	24.6
170	—	10		106000	—	71.0	—			66.6	33.8	24.6
177	164	10		103500	90500	71.0	66.0			66.6	33.8	24.6
193	183	12		132700	117900	71.5	67.0			79.6	40.4	29.4
200	190	12		128200	114600	71.5	67.0			79.6	40.4	29.4
212	196	12		124200	108600	71.5	67.0			79.6	40.4	29.4

**CONDENSER SELECTION**

We offer a complete line of direct drive condensers ranging in size from 1 thru 212 nominal tons in 101 different models (see Tables 1 & 2).

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

The heat of compression varies with the compressor design, so the compressor manufacturer's information should be used whenever possible. If the compressor manufacturer's heat of compression information is not available, Tables 6 and 7 (page 9) may be used to determine the heat of compression.

The following formulas may be used to calculate the total heat rejection (THR) for systems that fall outside the normal limits of single stage compressor applications, such as compound or cascade systems.

Suction cooled hermetic compressors  
 $THR = \text{Compressor Capacity (BTUH)} + (3413 \times KW)$

Open Compressors  
 $THR = \text{Compressor Capacity (BTUH)} + (2545 \times BHP)$

**ELEVATION CORRECTION**

Elevation above sea level has an effect on the performance of air cooled condensers.

Divide the required capacity by the Elevation Correction Factor in the table below to correct the requirement to Sea Level Conditions. The proper condenser can then be selected from the appropriate table on Pages 4, 5, 6 or 7.

**SINGLE SECTION CONDENSERS**

All units are available for single section applications. All double fan-width units are furnished with dual section coils and can be field manifolded for single-section installations.

\* Sound pressure ratings in dBA 30 feet from condenser

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



## SELECTION EXAMPLE

Given:

- Ambient Air Temperature = 95° F
- Maximum Condensing Temperature = 110° F
- Evaporator Temperature = 20° F
- Refrigerant = R-22
- Compressor Capacity = 290,000 BTUH
- Compressor Type = Suction Cooled Semi-Hermetic

Solution:

Using the heat of compression factor (1.33) from Table 7 for 110° F condensing temperature and 20° F evaporator temperature, the required total heat rejection is:

$$290,000 \times 1.33 = 385,700 \text{ BTUH}$$

Selection is made for R-22 at a 15° TD  
(TD = Condensing Temp. minus Ambient Temp.)  
There are two selection methods featured below.

### Method 1

Select the condenser from Table 1 under the column headed R-22 at 15° TD. The correct selection of a single fan-width unit with standard speed fan motors is an WCS-053 with a capacity of 402.0 MBH (= 402,000 BTUH).

Since the unit selection will almost never have the exact required capacity, the actual TD will vary slightly from the design TD. The actual TD can be calculated using the following formula:

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

For this example the actual TD would be:

$$\text{Actual TD} = \frac{15^\circ \times 385,700}{402,000} = 14.4^\circ \text{F}$$

### Method 2

Calculate the required MBH per degree TD

$$\text{MBH per } ^\circ\text{TD} = \frac{\text{BTUH}}{\text{TD} \times 1000} = \frac{385,700}{15^\circ \times 1000} = 25.7$$

Select the condenser from Table 1 under the column headed R-22 at 1° TD. The correct selection of a single fan-width unit with standard speed fan motors is a WCS-053 with a capacity of 26.8 MBH/° TD (= 26,800 BTUH/° TD).

## ALTERNATE FIN SPACING

Performance data for condensers at alternate fin spacings are in Tables 3 and 4. This data is presented in MBH/° TD only, so Selection Method 2 must be used. The following illustrates the procedure for an 8 FPI condenser. Determine the required MBH/° TD as above, using the given example (= 25.7). Select the condenser from Table 3 under the column headed R-22 for 8 FPI. The correct selection of a single fan-width unit with standard speed fan motors is a WCS-065 (8 FPI) with a capacity of 28.51 MBH/° TD (= 28,510 BTUH/° TD).

$$\text{Actual TD} = \frac{15^\circ \times 25.7}{28.51} = 13.5^\circ$$

## Elevation Correction Factors

Elevation (ft.)	1000	2000	3000	4000	5000	6000	8000	10000	12000	14000	16000
Correction Factor	.94	.93	.90	.88	.86	.83	.79	.75	.71	.66	.62

Refer to page 8 for detailed selection procedure

**Table 6: Heat Rejection Factors**

Open Compressors

Evap Temp °F	Condensing Temperature °F								
	90	95	100	105	110	115	120	125	130
-30	1.37	1.39	1.42	1.44	1.47	†	†	†	†
-20	1.33	1.35	1.37	1.39	1.42	1.44	1.47	†	†
-10	1.28	1.30	1.32	1.34	1.37	1.39	1.42	1.44	1.47
0	1.24	1.26	1.28	1.30	1.32	1.34	1.37	1.39	1.41
+10	1.21	1.23	1.24	1.26	1.28	1.30	1.32	1.34	1.36
+20	1.17	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.32
+30	1.14	1.15	1.17	1.18	1.20	1.22	1.24	1.25	1.27
+40	1.12	1.14	1.15	1.16	1.17	1.18	1.20	1.21	1.23
+50	1.09	1.11	1.12	1.13	1.14	1.16	1.17	1.19	1.20

† Beyond the normal limits for single stage compressor application.  
For two stage application use the formulas above.

**Table 7: Heat Rejection Factors**

Suction Cooled Semi-Hermetic Compressors

Evap Temp °F	Condensing Temperature °F								
	90	95	100	105	110	115	120	125	130
-40	1.66	1.70	1.73	1.76	1.80	1.90	2.00	†	†
-35	1.61	1.64	1.68	1.70	1.74	1.82	1.90	†	†
-30	1.57	1.60	1.62	1.65	1.68	1.74	1.80	†	†
-25	1.53	1.56	1.58	1.60	1.63	1.67	1.72	†	†
-20	1.49	1.51	1.53	1.55	1.58	1.61	1.65	†	†
-15	1.46	1.48	1.50	1.51	1.54	1.57	1.61	†	†
-10	1.42	1.44	1.46	1.48	1.50	1.53	1.57	1.60	1.64
-5	1.39	1.41	1.43	1.45	1.47	1.50	1.53	1.56	1.60
0	1.36	1.38	1.40	1.42	1.44	1.47	1.50	1.53	1.56
+5	1.33	1.35	1.37	1.39	1.41	1.43	1.46	1.49	1.52
+10	1.31	1.32	1.34	1.36	1.38	1.40	1.43	1.46	1.49
+15	1.28	1.30	1.32	1.33	1.35	1.37	1.40	1.43	1.46
+20	1.26	1.27	1.29	1.31	1.33	1.35	1.37	1.40	1.43
+25	1.24	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.40
+30	1.22	1.23	1.25	1.26	1.28	1.30	1.32	1.34	1.37
+35	1.20	1.21	1.23	1.25	1.26	1.27	1.29	1.31	1.34
+40	1.18	1.19	1.21	1.23	1.24	1.25	1.27	1.29	1.31
+45	1.16	1.17	1.19	1.21	1.22	1.23	1.25	1.26	1.28
+50	1.14	1.15	1.17	1.19	1.20	1.22	1.23	1.24	1.26

† Beyond the normal limits for single stage compressor application.  
For two stage application use the formulas above.

### MULTI-SECTION CONDENSERS

Witt furnishes air-cooled condensers with more than one section for applications on which multiple refrigeration systems are connected to one condenser. All units except the CDS-001 (CDL-001) can be multi-sectioned. The condenser coil is divided into the proper number of sections and each section is supplied with an inlet and outlet connection.

Each section is tagged for identification. When ordering, the sections must be placed in numerical sequence. The sections will be arranged in sequence with the number one section being on the left end when facing the header end of the unit.

#### MULTI-SECTION CONDENSER SELECTION EXAMPLE:

*Given:*

Refer to Table 8, the Multi-Section Calculation Form below. Four suction cooled semi-hermetic compressors are shown with their operating conditions. Design ambient temperature is 95° F.

*Procedure:*

1. Complete the customer data in columns 1 through 7 in Table 8 below.
2. Fill in the heat of compression factors in column 8. If the compressor manufacturer's data is not available, use values from Table 7.
3. Select TD correction factors from Table 10 and place in column 10. This converts the capacities to the equivalent of 30° TD.
4. Multiply the values in column 7 by the values in column 8 and tabulate the results in column 9.
5. The values in column 9 are the actual heat rejections for each section. These values can be used to size the condenser connections using Table 11. For this example, section Number 1 has a heat rejection of 128.3 MBH. Using the R-22 column in Table 11, find the hot gas connection to be 1 1/8 OD and the liquid connection to be 7/8 OD. Enter these values in columns 15 and 16.
6. Next multiply the heat rejection values in column 9 by the TD correction factors in column 10 and tabulate the results in column 11.

7. Add all of the items in column 11 to obtain the total MBH required at a 30° TD. Use this value and the procedure on Pages 8 & 9 to select the proper condenser model. For this example, the total MBH is 769.2. Therefore, the unit with standard speed fan motors and double fan-width configuration, having enough capacity to meet this requirement, is a WCS-054 with standard fin spacing.
8. Table 9 provides MBH per face tube at 30° TD for 8 through 14 FPI versions of the condensers, with standard fin spacing values in bold face type. Enter the MBH per face tube for the WCS-054 into column 12. Note that the MBH per face tube value varies with each refrigerant type. To determine the number of face tubes required for each section, divide column 11 by column 12 and enter the results in column 13.
9. Each section's number of face tubes in column 13 is a mathematical value and must be rounded off to a whole number and entered into column 14. Round each number off such that the section size assigned to each system is no smaller than 10% undersized. In this example, the condenser was slightly oversized, so the extra face tubes were added to the low temperature sections.
10. Total the values in column 14. The sum must equal the number of circuits available for the WCS-054 as shown in Table 9. If it does not, one or more of the column 14 numbers will have to be adjusted so the sum does equal the available circuits.
11. The actual TD in each coil section may vary slightly from the design TD. The actual TD can be calculated using the following formula:

$$TD = \frac{\text{Design TD} \times \text{adjusted THR @ 30° TD}}{\text{MBH per tube @ 30° TD} \times \text{No. of Tubes used}}$$

In terms of columns in the form below, the formula is:

For this example, the actual TD for section No. 3 would be:

$$TD = \frac{10 \times 149.4}{10.9 \times 15} = 9.1^\circ\text{F}$$

Table 8:

### MULTI-SECTION CALCULATION FORM

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sect. No.	Compressor Model	Refrig. Type	Design TD °F	Cond. Temp. °F	Evap. Temp. °F	Compressor Capacity (MBH)	Heat of Comp. Factor	Heat Rejection (MBH)	TD Corr. Factor	Adjusted Thr (MBH) At 30°TD	MBH Per Face Tube At 30°TD	No. Face Tubes Req'd.	No. Face Tubes Selected	Hot Gas Conn. Size (OD)	Liq. Conn. Size (OD)
1	3DB-1000	22	15	110	+20	96.5	1.33	128.3	2.0	256.7	11.2	22.92	23	1 1/8	7/8
2	3DA-0750	22	15	110	+20	81.1	1.33	107.8	2.0	215.7	11.2	19.26	19	1 1/8	7/8
3	3DB-075E	404A	10	105	-25	31.1	1.60	49.8	3.0	149.4	10.9	13.71	15	1 1/8	7/8
4	3DF-090E	404A	10	105	-35	28.9	1.70	49.1	3.0	147.4	10.9	13.52	15	1 1/8	7/8

**Table 9: Multi-Circuiting Data**

Total Heat of Rejection † (MBH per Face Tube @ 30° TD)

Model Size	Face Tubes	R-22				R-404A, R-507				R-22				R-404A, R-507						
		Fins Per Inch				Fins Per Inch				Fins Per Inch				Fins Per Inch						
		8	10	12	14	8	10	12	14	8	10	12	14	8	10	12	14			
<b>SINGLE FAN-WIDTH MODELS</b>																				
<i>CDS</i>	<i>CDL</i>	<i>CDS—1140 RPM Motors</i>								<i>CDL—825 RPM Motors</i>										
002	002	20	1.7	—	—	—	1.7	—	—	—	1.5	—	—	—	1.5	—	—	—		
004	003	24	—	<b>2.3</b>	—	—	—	<b>2.3</b>	—	—	—	—	<b>2.0</b>	—	—	—	<b>1.9</b>	—	—	
005	004	24	—	<b>3.1</b>	—	—	—	<b>3.0</b>	—	—	—	—	<b>2.5</b>	—	—	—	<b>2.5</b>	—	—	
008	006	24	—	<b>4.6</b>	—	—	—	<b>4.5</b>	—	—	—	—	<b>3.9</b>	—	—	—	<b>3.8</b>	—	—	
010	008	24	—	<b>6.0</b>	—	—	—	<b>5.9</b>	—	—	—	—	<b>5.1</b>	—	—	—	<b>4.9</b>	—	—	
012	009	24	—	<b>6.9</b>	—	—	—	<b>6.8</b>	—	—	—	—	<b>5.6</b>	—	—	—	<b>5.4</b>	—	—	
<i>WCS</i>	<i>WCL</i>	<i>WCS—1140 RPM Motors</i>								<i>WCL—825 RPM Motors</i>										
015	013	36	<b>6.0</b>	—	—	—	<b>5.9</b>	—	—	—	<b>5.3</b>	—	—	—	<b>5.2</b>	—	—	—	—	
016	014		—	<b>6.7</b>	—	—	—	<b>6.6</b>	—	—	—	—	<b>5.7</b>	—	—	—	<b>5.6</b>	—	—	—
020	017		—	<b>8.1</b>	—	—	—	<b>7.9</b>	—	—	—	<b>6.8</b>	—	—	—	<b>6.7</b>	—	—	—	—
022	018		—	<b>8.8</b>	—	—	—	<b>8.6</b>	—	—	—	—	<b>7.4</b>	—	—	—	<b>7.2</b>	—	—	—
025	023		7.4	8.4	9.2	<b>9.8</b>	7.2	8.2	9.0	<b>9.6</b>	6.9	7.9	8.6	<b>9.2</b>	6.8	7.7	8.4	<b>9.1</b>	—	—
028	027		10.1	<b>11.2</b>	—	—	9.9	<b>11.0</b>	—	—	9.6	<b>10.7</b>	—	—	9.4	<b>10.5</b>	—	—	—	—
031	030		—	—	12.0	<b>12.6</b>	—	—	11.8	<b>12.3</b>	—	—	11.0	<b>11.5</b>	—	—	10.7	<b>11.3</b>	—	—
—	031		—	—	—	—	—	—	—	—	11.6	12.6	<b>13.2</b>	—	11.4	12.3	<b>13.0</b>	—	—	—
036	034		12.3	13.3	14.0	<b>14.4</b>	12.0	13.0	13.7	<b>14.1</b>	—	—	—	<b>13.3</b>	—	—	—	<b>13.1</b>	—	—
041	039		15.1	<b>16.8</b>	—	—	14.8	<b>16.4</b>	—	—	14.5	<b>16.1</b>	—	—	14.2	<b>15.8</b>	—	—	—	—
046	041		—	—	18.0	<b>18.9</b>	—	—	17.6	<b>18.5</b>	—	—	16.9	<b>17.6</b>	—	—	16.5	<b>17.2</b>	—	—
050	049		18.1	19.6	<b>20.6</b>	—	17.7	19.2	<b>20.2</b>	—	16.8	18.3	<b>19.2</b>	—	16.5	17.9	18.8	<b>18.8</b>	—	—
053	051		20.1	<b>22.3</b>	—	—	19.7	<b>21.9</b>	—	—	19.2	<b>21.4</b>	—	—	18.8	<b>20.9</b>	—	—	—	—
059	055		—	—	24.0	<b>25.2</b>	—	—	23.5	<b>24.7</b>	—	—	22.2	<b>23.0</b>	—	—	21.8	<b>22.5</b>	—	—
065	058		23.8	25.9	<b>27.4</b>	—	23.3	25.4	<b>26.9</b>	—	22.2	24.1	<b>24.6</b>	—	21.7	23.6	<b>24.1</b>	—	—	—
069	063		—	—	—	<b>28.8</b>	—	—	—	<b>28.3</b>	—	—	—	<b>26.6</b>	—	—	—	<b>26.1</b>	—	—
077	069		26.2	28.8	30.7	<b>32.1</b>	25.7	28.2	30.1	<b>31.5</b>	24.1	26.4	27.8	<b>28.9</b>	23.6	25.9	27.2	<b>28.3</b>	—	—
081	077		31.3	<b>33.7</b>	—	—	30.7	<b>33.0</b>	—	—	29.6	<b>31.8</b>	—	—	29.0	<b>31.2</b>	—	—	—	—
084	—		—	—	35.2	—	—	—	34.5	—	—	—	—	—	—	—	—	—	—	—
088	082		—	—	—	<b>36.8</b>	—	—	—	<b>36.1</b>	—	—	33.1	<b>34.0</b>	—	—	32.4	<b>33.3</b>	—	—
096	092	37.4	<b>40.3</b>	—	—	36.7	<b>39.5</b>	—	—	35.5	<b>38.1</b>	—	—	34.8	<b>37.4</b>	—	—	—	—	
098	095	—	—	41.3	—	—	—	40.4	—	—	—	39.8	—	—	—	39.0	—	—	—	
105	099	—	—	—	<b>44.0</b>	—	—	—	<b>43.1</b>	—	—	—	<b>40.8</b>	—	—	—	<b>39.9</b>	—	—	
<b>DOUBLE FAN-WIDTH MODELS</b>																				
<i>WCS</i>	<i>WCL</i>	<i>WCS—1140 RPM Motors</i>								<i>WCL—825 RPM Motors</i>										
047	043	72	7.4	8.4	9.2	<b>9.8</b>	7.2	8.2	9.0	<b>9.6</b>	6.8	7.7	8.4	<b>9.0</b>	6.6	7.5	8.2	<b>8.8</b>	—	
054	052		10.1	<b>11.2</b>	—	—	9.9	<b>10.9</b>	—	—	9.6	<b>10.7</b>	—	—	9.4	<b>10.4</b>	—	—	—	—
060	056		—	—	12.0	<b>12.6</b>	—	—	11.7	<b>12.3</b>	—	—	11.1	<b>11.4</b>	—	—	10.9	<b>11.2</b>	—	—
066	059		12.0	13.0	<b>13.7</b>	—	11.8	12.8	<b>13.4</b>	—	11.1	11.7	<b>12.3</b>	—	10.9	11.4	<b>12.0</b>	<i>26.7</i>	—	—
070	064		—	—	—	<b>14.4</b>	—	—	—	<b>14.1</b>	—	—	—	<b>13.2</b>	—	—	—	<b>12.9</b>	—	—
075	068		11.7	13.3	14.5	<b>15.6</b>	11.5	13.0	14.3	<b>15.3</b>	10.6	12.0	13.2	<b>14.1</b>	10.4	11.8	12.9	<b>13.8</b>	—	—
080	076		15.0	<b>16.8</b>	—	—	14.7	<b>16.4</b>	—	—	14.4	<b>15.8</b>	—	—	14.1	<b>15.5</b>	—	—	—	—
085	—		—	—	17.8	—	—	—	17.4	—	—	—	—	—	—	—	—	—	—	—
090	086		—	—	—	<b>18.9</b>	—	—	—	<b>18.5</b>	—	—	16.7	<b>17.7</b>	—	—	16.3	<b>17.4</b>	—	—
099	091		18.1	19.6	<b>20.6</b>	—	17.7	19.2	<b>20.2</b>	—	16.6	18.0	<b>19.0</b>	—	16.3	17.7	<b>18.6</b>	—	—	—
106	098		—	—	—	<b>22.0</b>	—	—	—	<b>21.6</b>	—	—	—	<b>20.3</b>	—	—	—	<b>19.9</b>	—	—
108	103		20.1	<b>22.3</b>	—	—	19.7	<b>21.9</b>	—	—	19.2	<b>21.4</b>	—	—	18.8	<b>20.9</b>	—	—	—	—
121	111		—	—	24.0	<b>25.2</b>	—	—	23.5	<b>24.7</b>	—	—	22.2	<b>23.0</b>	—	—	21.8	<b>22.5</b>	—	—
132	118		23.8	25.9	<b>27.4</b>	—	23.3	25.4	<b>26.9</b>	—	22.2	24.1	<b>24.6</b>	—	21.7	23.6	<b>24.1</b>	—	—	—
140	127		—	—	—	<b>28.8</b>	—	—	—	<b>28.3</b>	—	—	—	<b>26.6</b>	—	—	—	<b>26.1</b>	—	—
154	138		26.2	28.8	30.7	<b>32.1</b>	25.7	28.2	30.1	<b>31.5</b>	24.1	26.4	27.8	<b>28.9</b>	23.6	25.9	27.2	<b>28.3</b>	—	—
162	155		31.3	<b>33.7</b>	—	—	30.7	<b>33.0</b>	—	—	29.6	<b>31.8</b>	—	—	29.0	<b>31.2</b>	—	—	—	—
170	—		—	—	35.2	—	—	—	34.5	—	—	—	—	—	—	—	—	—	—	—
177	164		—	—	—	<b>36.8</b>	—	—	—	<b>36.1</b>	—	—	33.1	<b>34.0</b>	—	—	32.4	<b>33.3</b>	—	—
193	183		37.4	<b>40.3</b>	—	—	36.7	<b>39.5</b>	—	—	35.5	<b>38.1</b>	—	—	34.8	<b>37.4</b>	—	—	—	—
200	190	—	—	41.3	—	—	—	40.4	—	—	—	39.8	—	—	—	39.0	—	—	—	
212	196	—	—	—	<b>44.0</b>	—	—	—	<b>43.1</b>	—	—	—	<b>40.8</b>	—	—	—	<b>39.9</b>	—	—	

**Table 10: TD Correction Factors**

Design TD	TD Corr. Factor
10	3.0
15	2.0
20	1.5
25	1.2
30	1.0

**Table 11: Connection Sizing**

THR Per Unit Section (MBH)	Hot Gas (Inlet) Size (ODS) †		Liquid (Outlet) Size (ODS) †	
	R-22	R-404A	R-22	R-404A
3	5/8	5/8	5/8	5/8
6	5/8	5/8	5/8	5/8
9	5/8	5/8	5/8	5/8
12	5/8	5/8	5/8	5/8
18	5/8	5/8	5/8	5/8
24	5/8	7/8	5/8	5/8
36	7/8	7/8	5/8	5/8
48	7/8	7/8	5/8	5/8
60	7/8	1 1/8	5/8	7/8
72	1 1/8	1 1/8	7/8	7/8
90	1 1/8	1 1/8	7/8	7/8
120	1 1/8	1 3/8	7/8	1 1/8
180	1 3/8	1 5/8	1 1/8	1 3/8
240	1 5/8	1 5/8	1 3/8	1 3/8
300	1 5/8	1 5/8	1 3/8	1 3/8
360	2 1/8	2 1/8	1 5/8	1 5/8
480	2 1/8	2 1/8	1 5/8	1 5/8
600	2 1/8	2 5/8	1 5/8	2 1/8
720	2 5/8	2 5/8	2 1/8	2 1/8
840	2 5/8	2 5/8	2 1/8	2 1/8
960	2 5/8	2 5/8	2 1/8	2 1/8

† Use R-404A sizes for R-502 & 507 & 134a

† Performance in **Bold Type Face** indicates standard FPI—Regular Type Face indicates alternate FPI. Assign the appropriate number of face tubes to each section using the procedure on Page 10.

## Flooded Condenser Control Option And Refrigerant Charge Calculations

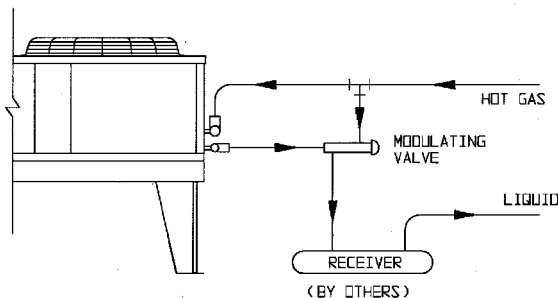
This completely automatic system always maintains a minimum preset pressure.

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.

### 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 1: Flooded Condenser Valve Piping**



**Table 12: Head Pressure Control Valve Capacity**

Control Valve			Valve Capacity (MBH)				
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 (MBH)				
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

### Valve Selection

Select valve from Table 12 based on:

- Refrigerant type
- Evaporator temperature
- Net refrigeration effect at the evaporator

Figure 1 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

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 13, by the appropriate factor from Table 14. 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 14, 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 14 would have to be based on 10° TD.

### Refrigerant Charge - Single Section Unit

*Given:*

A WCS-054 condenser with a standard R-404A charge of 15.7 lbs.(see Table 13). 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 14. Therefore, the required charge is 15.7 x 4.6 = 72.2 lbs. If the compressor used on the system had 50% capacity reduction, the correction factor from Table 14 would have to be for 5° TD or 4.8.

**Refrigerant Charge - Multi-Section Unit**

Given:

A WCS-016 condenser split into 2 sections. One section has 22 face tubes of R-404A at a 10° TD and the other section has 14 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, the number of face tubes must be multiplied by the charge per face tube from Table 13 and the correction factor from Table 14.

For the R-404A section:

22 face tubes x 0.15 lb./face tube x 4.5 = 14.9 lb.

For the R-22 section:

14 face tubes x 0.17 lb./face tube x 4.3 = 10.2 lb.

If the compressors have capacity reduction, this must be taken into consideration, as 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 14) when calculating refrigerant charge as shown above.

Given:

- Model WCS-075 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 19 (page 16) states that 40° minimum ambient will produce 90° condensing temperature under the given conditions for fan cycling alone, and with no fan speed control.  
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 for a Charge Correction Factor equal to 3.0 opposite the TD factor of 2.0.

**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 on Page 12 to calculate the refrigerant charge for a condenser equipped with both Flooded and Fan Cycling Controls.

**Table 14: Refrigerant Charge Correction Factor**

Minimum Ambient Temp ° F.	Low Ambient Flooded Condenser					
	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 13: Standard Refrigerant Charge**

Unit Size	Number Face Tubes Available	R-22 †		R-404A & 507	
		Lbs. Per Face Tube	Lbs. Total Unit	Lbs. Per Face Tube	Lbs. Total Unit

**SINGLE FAN-WIDTH MODELS**

CDS	CDL	20	0.02	0.45	0.02	0.39
001	001					
002	002					
004	003					
005	004					
008	006					
010	008					
012	009					

WCS	WCL	24	0.05	1.20	0.04	1.03
015	013					
016	014					
020	017					
022	018					
025	023					
028	027					
031	030					
—	031					
036	034					
041	039					
046	041					
050	049					
053	051					
059	055					
065	058					
069	063					
077	069					
081	077					
084	—					
088	082					
096	092					
098	095					
105	099					

**DOUBLE FAN-WIDTH MODELS**

WCS	WCL	26	0.05	1.95	0.07	1.68
047	043					
054	052					
060	056					
066	059					
070	064					
075	068					
080	076					
085	—					
090	086					
099	091					
106	098					
108	103					
121	111					
132	118					
140	127					
154	138					
162	155					
170	—					
177	164					
193	183					
200	190					
212	196					

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

## Piping Recommendations

Witt offers the following general guidelines for routing and sizing lines to air-cooled condensers. For further information please consult the ASHRAE Guide or other accepted piping handbooks.

### Discharge Lines

Consider the following three issues when designing and sizing discharge lines.

#### 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 15 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 15 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 15: 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: Double Hot Gas Riser

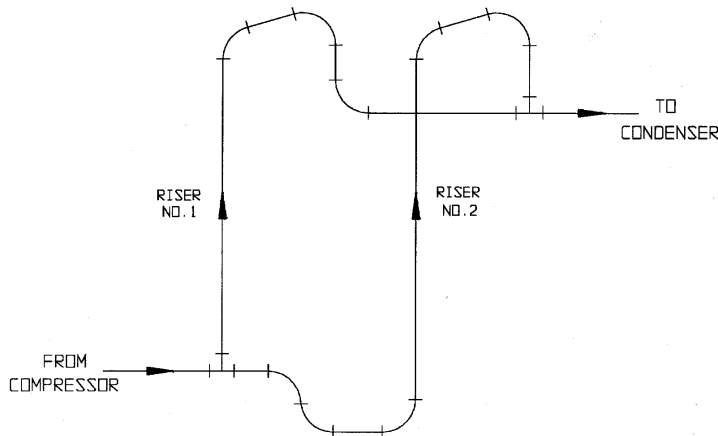


Table 17: Weight of Refrigerant \*

Line Size O.D.	Liquid Line 110° F.		Suction Line 40° F.   -20° F.		Discharge Line 115° F.	
	R-22	R-404A	R-22	R-404A	R-22	R-404A
		R-507		R-507		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-134a: Multiply R-22 charge by 1.01

Table 16: Liquid Line Sizing

Line Size (O.D.) Type L Tubing	Net Refrigerating Effect (MBH)			
	Condenser To Receiver Piping †		Receiver To Exp. Valve Piping *	
	R-22	R-404A	R-22	R-404A
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. Use R-404A sizing for R-502 & 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.

Liquid Lines

Receiver-to-expansion valve liquid lines can generally 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 from the condenser to the receiver. 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 can 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 16 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.

See Table 17 for the weight of refrigerant in liquid, suction and discharge lines.



### Fan Cycling Control Option

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 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.

Table 18 shows how the fans are cycled. The fan, or fans, nearest the header end of the unit run continuously.

#### Multi-Fan Units

The fan cycling control package consists of a weatherproof 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 Figures 3, 4 and 5 for wiring diagrams.

Table 19 shows the minimum ambient temperature for units equipped with fan cycling controls based on design TD and percent compressor capacity.

**Table 18: Fan Cycling Arrangement**

Single Fan-Width		Double Fan-Width	
Fan Config.	Fans Cycled Per Control	Fan Config.	Fans Cycled Per Control
1 x 2	1	2 x 2	1 pair
1 x 3	1, 1	2 x 3	1 pair, 1 pair
1 x 4	1, 1, 1	2 x 4	1 pair, 1 pair, 1 pair
1 x 5	2, 1, 1	2 x 5	2 pairs, 1 pair, 1 pair
1 x 6	2, 2, 1	2 x 6	2 pairs, 2 pairs, 1 pair

**Table 19: Minimum Ambient Temperature With Fan Cycling Control**

Unit Size		Fan Config.	TD	Minimum Amb. Temp. - ° F. At Percent Compressor Capacity Shown										
CDS WCS	CDL WCL			Less Fan Speed Control				With Fan Speed Control						
				100%	75%	50%	25%	100%	75%	50%	25%			
008-036	006-034	1 x 2	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			
047	043	2 x 2	15	63	60	56	63	51	51	51	60			
			10	72	66	61	65	64	61	57	64			
041	039	1 x 3	30	15	24	32	51	-15	1	18	44			
			046 & 050	041 & 049	1 x 3	25	27	33	38	54	3	14	26	48
					20	40	42	45	57	20	28	35	53	
075-106	068-098	2 x 3	15	52	51	51	60	38	41	44	57			
			10	65	61	57	64	55	54	53	61			
			30	-2	11	24	47	-25	-15	7	39			
053-069	051-063	1 x 4	25	13	22	31	51	-15	1	18	44			
			20	28	33	39	54	6	17	28	49			
			108-140	103-127	15	44	45	47	58	27	33	39	54	
10	59	57			54	62	48	49	50	60				
077-088	069-082	1 x 5	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			
154-177	138-164	2 x 5	15	36	40	43	57	18	26	34	52			
			10	54	53	52	61	42	44	46	58			
			30	-20	-10	10	40	-25	-25	- 8	31			
096-105	092-099	1 x 6	25	-10	5	20	45	-25	-18	5	38			
			20	10	20	30	50	-14	2	18	44			
			193-212	183-196	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.



**Fan Speed Control Options**

Available only with Fan Cycling Control Option on Multi-Fan Units.

Designed to enhance the performance of the Fan Cycling Control Option by reducing the RPM and air volume of the lead (header end) fan motor(s) after all other (lag) fans have cycled off. The lead fan(s) must run continuously, even in the lowest ambient temperature. By reducing their CFM, adequate head pressure can be maintained at lower ambients without resorting to flooded- condenser head pressure control. On systems equipped with flooded condenser control, the Fan Speed Control will permit a lower refrigerant charge than is possible with only the basic Fan Cycling Controls.

**Pressure Controlled Fan Speed (not available on 575V)**

Includes Penn P-66 Speed Controller, 24 volt transformer, single phase fan motor and pressure line piped from the last return bend in the circuit opposite the header end to the speed control. Double fan-width units require two controllers for the two lead fan motors. All components are factory mounted and wired. Controller decreases fan motor RPM as head pressure decreases.

**Temperature Controlled Fan Speed**

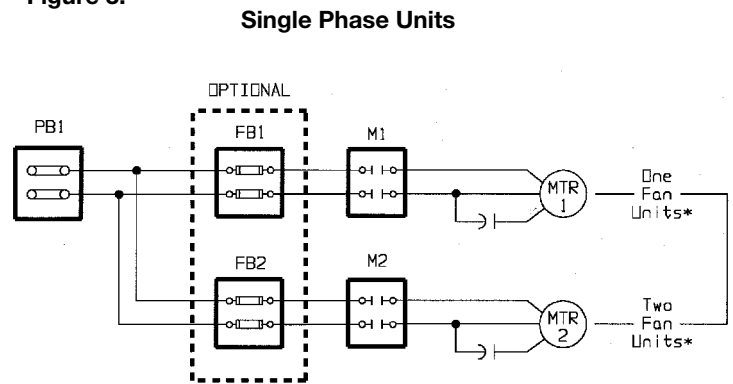
Includes Hoffman Speed Controller and single phase fan motor. Double fan-width units require one controller for the two lead fan motors. All components are factory mounted. Controller sensing element is mounted on the last return bend in the circuit, opposite the header end. Controller decreases fan motor RPM as liquid temperature decreases.

**Wiring Options**

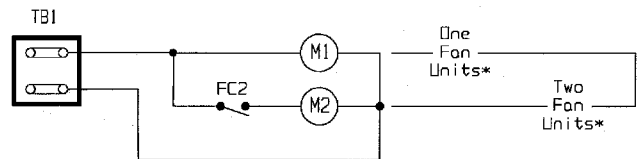
Standard units are furnished with the motor leads terminated in a single weatherproof enclosure located opposite the header end of the unit. A terminal block is provided on six-fan units and larger.

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. These components are installed in a weather-proof enclosure, factory mounted and completely wired. See Figures 3, 4 and 5 for wiring details.

Figure 3:



Control Circuit



\* Refer to Table 19 (Page 16) for model number vs.fan configuration

**Legend**

- FB1 - FB3 .....Fuse Blocks
- FC2 - FC3 .....Fan Cycling Controls
- M1 - M3 .....Fan Motor Contactors
- MTR1 - MTR3 .....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. PB1 is not furnished on single fan units.
3. Field control wiring connections are made to terminal block TB1.
4. Contactor holding coils can be furnished in most voltages, including 24, 115, 208-230 or 460 volts.
5. Fan cycling controls FC2 and FC3 can be furnished either as ambient temperature controls or pressure controls.

Table 20: Motor Amps

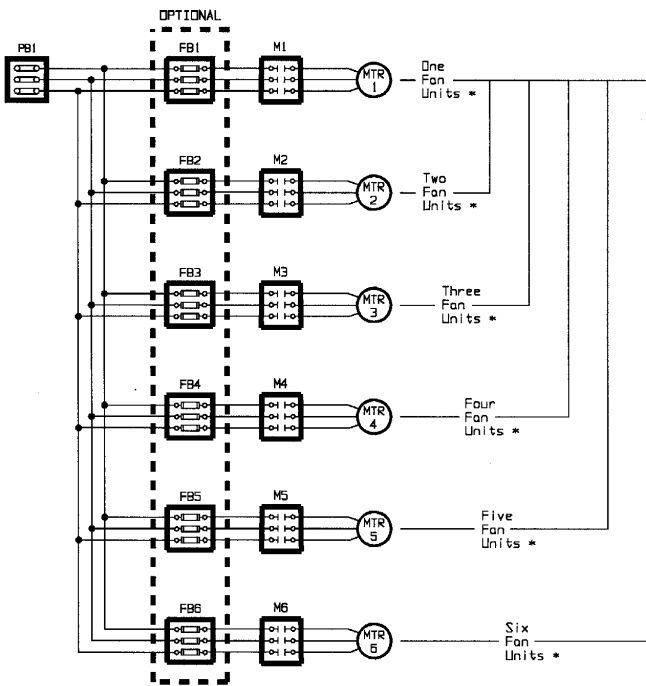
1140 RPM		
1/2 HP	208-230/1/60	2.5 a.
	208-230/3/60	2.0 a.
	460/3/60	1.0 a.
	575/1/60	1.0 a.
1 HP	208-230/1/60	4.9 a.
	208-230/3/60	4.0 a.
	460/3/60	2.0 a.
	575/3/60	1.7 a.
1 1/2 HP	208-230/1/60	N/A
	208-230/3/60	6.5 a.
	460/3/60	3.3 a.
	575/3/60	2.4 a.
825 RPM		
1/4 HP	208-230/1/60	1.4 a.
	208-230/3/60	1.1 a.
	460/3/60	0.6 a.
	575 Volt.	N/A
1/2 HP	208-230/1/60	2.7 a.
	208-230/3/60	2.2 a.
	460/3/60	1.1 a.
	575 Volt.	N/A
1 1/2 HP	208-230/1/60	N/A
	208-230/3/60	6.5 a.
	460/3/60	3.3 a.
	575 Volt.	N/A

# TYPICAL WIRING — THREE PHASE UNITS

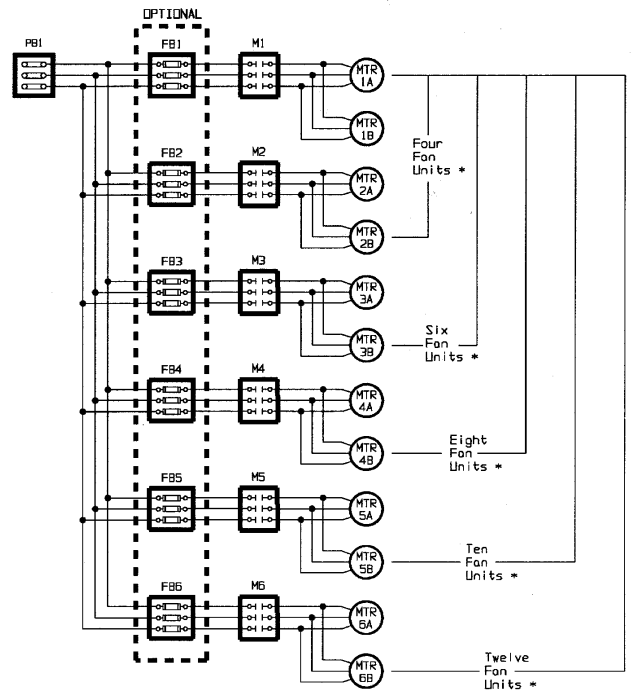
Figure 4: — Single Fan-Width Units

Figure 5: — Double Fan Width Units

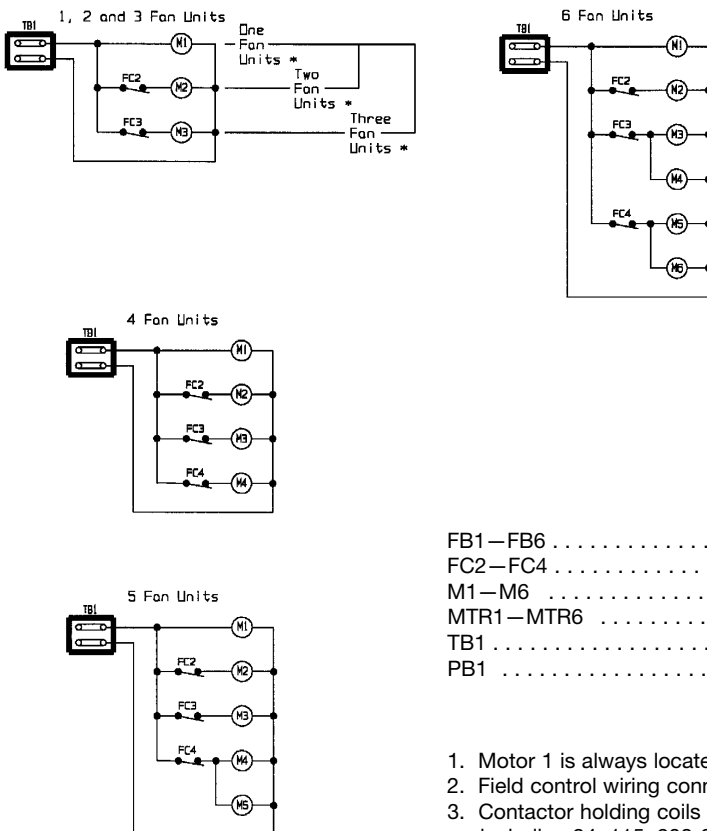
### Power Wiring



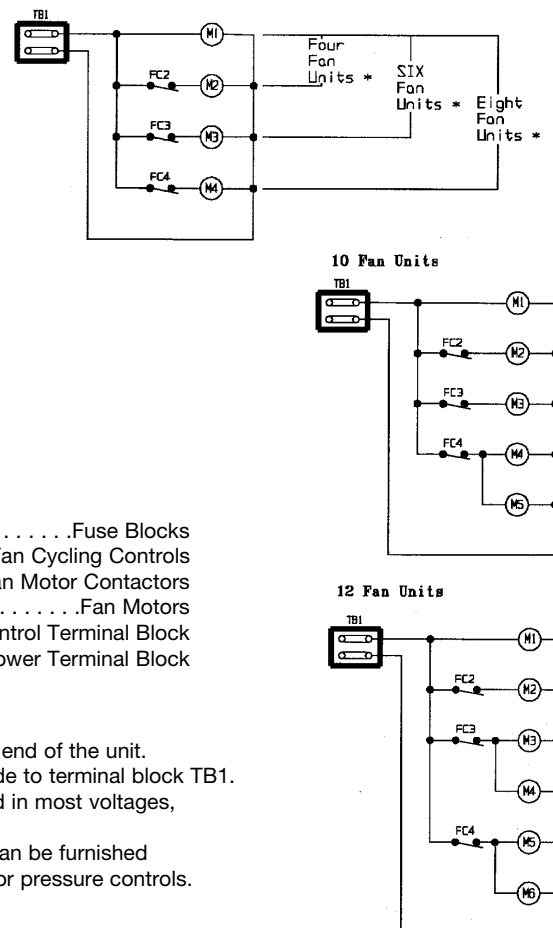
### Power Wiring



### Control 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.

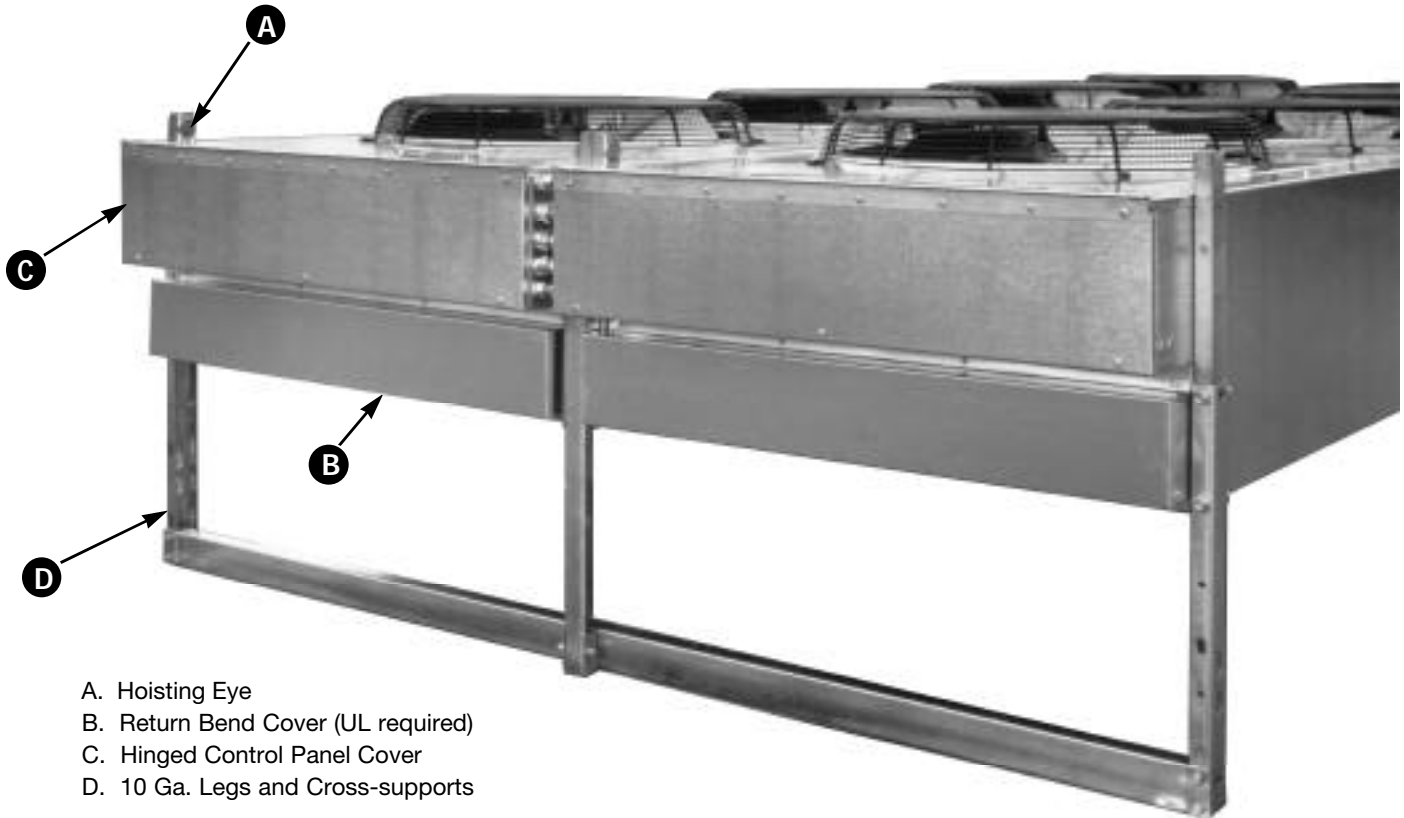
**MODEL WCS & WCL CONDENSERS****STANDARD FEATURES**

- *Direct Drive Fans*
  - 1140 RPM—Model WCS
  - 825 RPM—Model WCL
- *Horizontal Air Discharge available*
- *Single and Double Fan-Width models*
- *44 Model Sizes — WCS (42—WCL)*
- *Shipped in operating position*
- *Hoisting Eyes for easy rigging*
- *Galvanized Steel Casing and Frame*

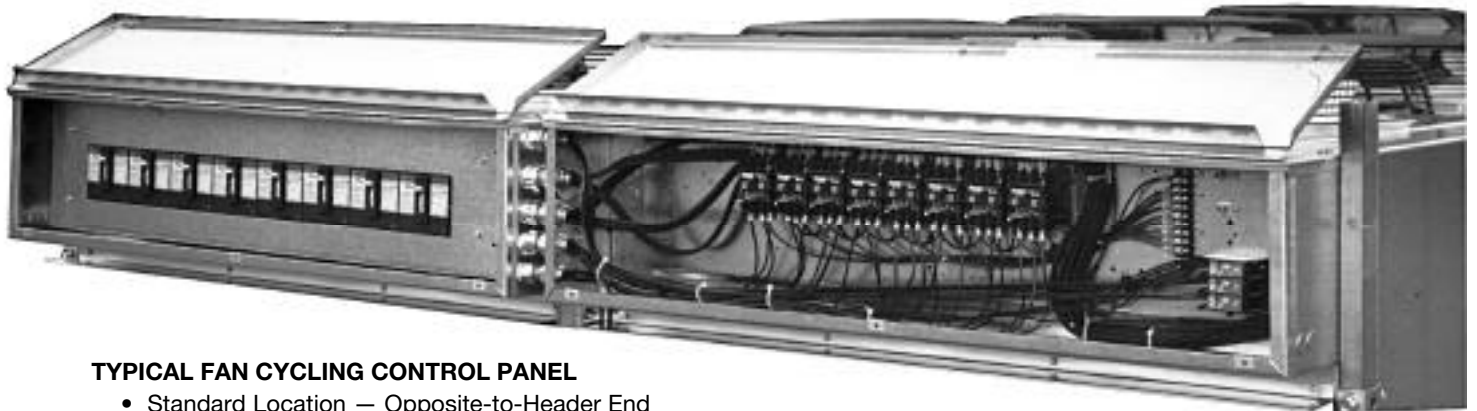
**OPTIONAL FEATURES †**

- *Multi-Circuiting*
- *Dedicated Sub-Cooling Circuits*
- *Special Fin Coatings*
- *Variable Speed Fans on Header End*
- *Disconnect Switch Mounted*
- *Complete line of Control Panel Options (page 20)*
- *“Flip-Top” Fan Panels (page 21)*
- *Gravity Dampers*
- *Flooded-Condenser Type Head Pressure Control*

† See page 3 for complete listing



- A. Hoisting Eye
- B. Return Bend Cover (UL required)
- C. Hinged Control Panel Cover
- D. 10 Ga. Legs and Cross-supports



**TYPICAL FAN CYCLING CONTROL PANEL**

- Standard Location — Opposite-to-Header End  
Side or Header-End Mount available
- Weather-Tight Enclosure
- Options:
  - Temperature or Pressure Controls
  - Variable Speed Control (Lead Fans)
  - Custom Wiring and Logic
  - Output Relay Boards
  - Motor Fusing or Circuit Breakers
  - Motor Contactors
  - Control Transformers

*Individual Fan Contactor & Circuit Breaker option shown*



**'FLIP-TOP' VENTURI PANELS**

- Makes Coil Cleaning Quick & Thorough  
Dirt can be flushed back thru the coil to avoid coil plugging.
- Permits Easy Fan and Motor Service

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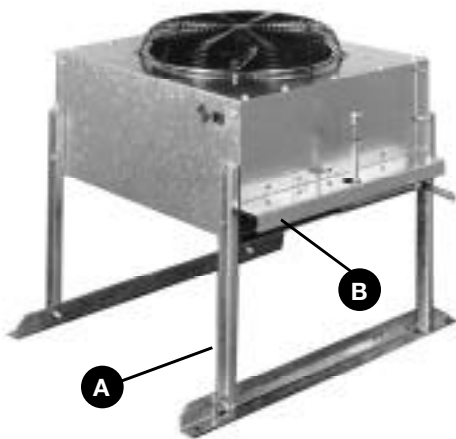
**Small Frame Models**

**DUAL FAN UNITS**

- 8 thru 12 Tons — Standard Fan-Speed Models
- 6 thru 9 Tons — Low Fan-Speed Models

**SINGLE FAN UNITS**

- 1 thru 5 Tons — Standard Fan-Speed Models
- 1 thru 4 Tons — Low Fan-Speed Models



**DETAILS**

- A. Universal Mounting Legs  
Horizontal or Vertical
- B. Header Guard (UL Required)



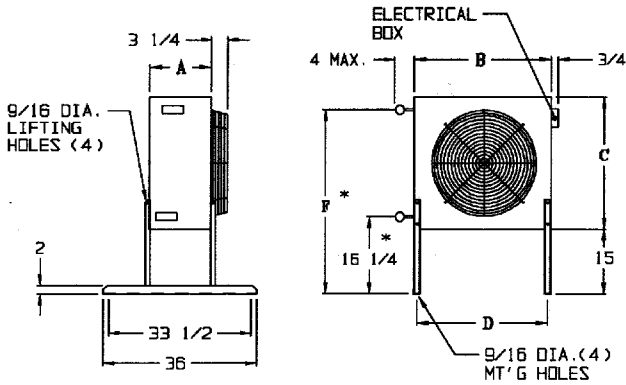
**FEATURES**

- Heavy Gauge Galvanized Steel Casing & Legs

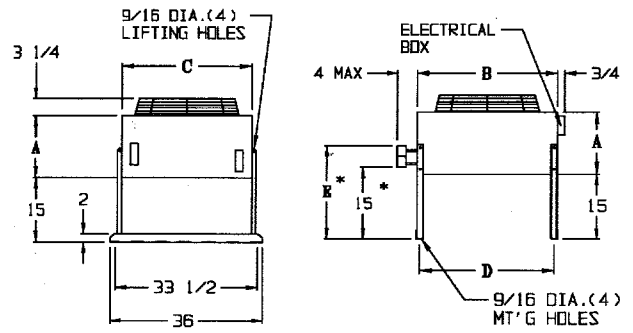
## Dimensional Data

CDS 001 thru 005  
CDL 001 thru 004

Horizontal Discharge

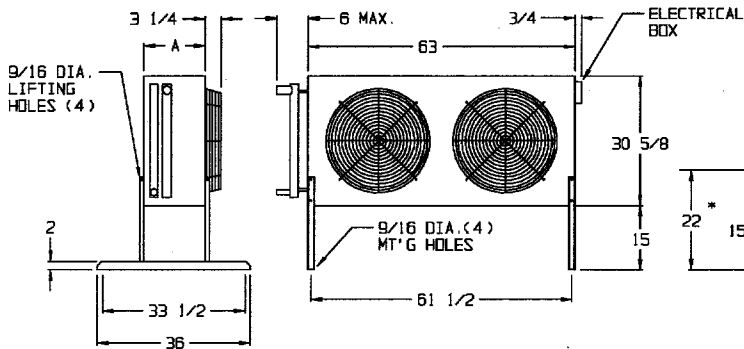


Vertical Discharge

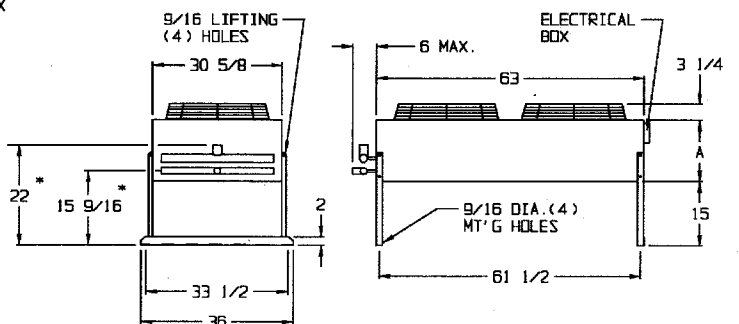


CDS 008 thru 012  
CDL 006 thru 009

Horizontal Discharge



Vertical Discharge



### Dimensions in Inches

Unit Size		No. Fans	A	B	C	D	E	F	Weight (Lbs.)	
CDS	CDL								Net	Shipping
001	001	1	12 9/16	28	25 5/8	26 1/2	15	40	109	153
002	002	1	12 9/16	28	25 5/8	26 1/2	16 1/2	40	121	165
004	003	1	14 1/2	33	30 5/8	31 1/5	16 1/2	45	144	188
005	004	1	14 1/2	33	30 5/8	31 1/2	17 1/2	45	160	204
008	006	2	14 1/2	--	--	--	--	--	234	303
010	008	2	14 1/2	--	--	--	--	--	259	328
012	009	2	15 3/4	--	--	--	--	--	283	352

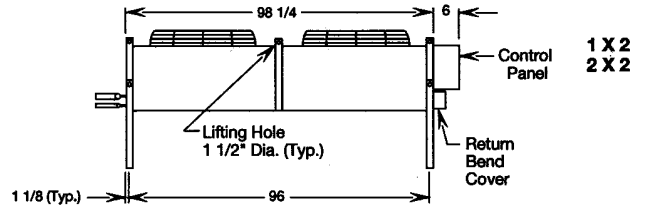
**UNIT WEIGHTS**

Single Fan-Width Units			Double Fan-Width Units		
Unit Size		Approx. Net Weight (Lbs.)	Unit Size		Approx. Net Weight (Lbs.)
WCS	WCL		WCS	WCL	
015	013	510	047	043	1080
016	014	518	054	052	1130
020	017	536	060	056	1190
022	018	555	066	059	1300
025	023	580	070	064	1330
028	027	630	075	068	1560
031	030	650	080	076	1650
—	031	710	085	—	1710
036	034	730	090	086	1740
041	039	900	099	091	1870
046	041	930	106	098	1910
050	049	1010	108	103	2180
053	051	1135	121	111	2300
059	055	1201	132	118	2530
065	058	1327	140	127	2590
069	063	1360	154	138	2980
077	069	1582	162	155	3110
081	077	1654	170	—	3140
084	—	1676	177	164	3080
088	082	1698	193	183	3730
096	092	2002	200	190	3770
098	095	2030	212	196	3820
105	099	2052			

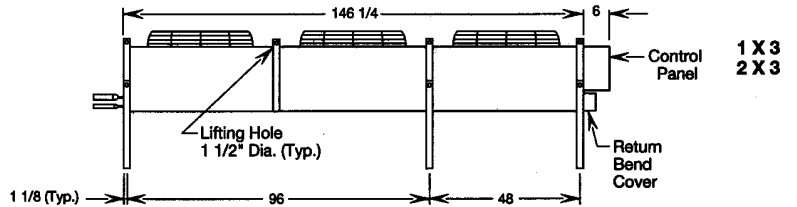
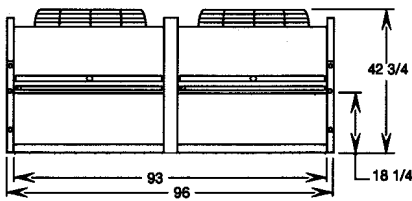
**Dimensional Data**

**CD/WC**

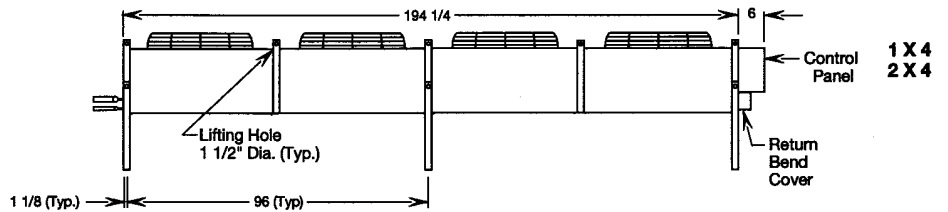
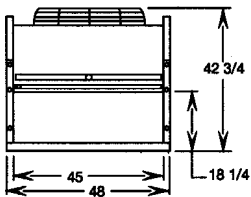
**FAN CONFIG.**



**END VIEW—Double Fan-Width Models**



**END VIEW—Single Fan-Width Models**

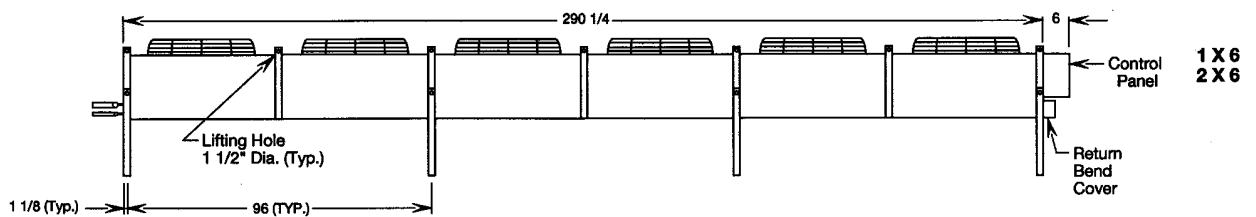
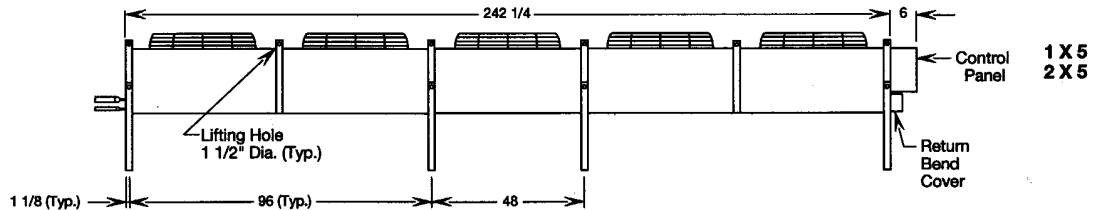


**NOTES**

Mounting legs are retracted for shipping purposes and must be lowered into position for unit installation.

Control panel can be mounted at opposite end if required.

Units are available for horizontal air discharge—contact factory for details.



## General

*Units shall be furnished as per the following specifications - WITT Model CDS, CDL, WCS & WCL air-cooled condensers, arranged for vertical airflow (horizontal optional). All units to be UL Listed.*

### Unit Cabinets

- Cabinets shall be constructed of heavy-gauge, corrosion resistant galvanized steel for maximum casing rigidity.
- All multiple fan units shall be divided by full width baffles to separate individual fan sections, prevent air bypass and provide additional casing reinforcement.
- All WCS / WCL shall be provided with lifting eyes for rigging.
- All CD units shall have 12 gauge galvanized steel mounting legs and rails. Legs shall be shipped with the unit for field assembly. Headers are arranged for either horizontal or vertical airflow.
- All WC units shall have 10 gauge galvanized steel legs.
- All WC units can be arranged for vertical or horizontal airflow. Airflow must be specified for the header to have the correct connection locations.

### Condenser Coil

- Coils shall be constructed of 3/8 inch O.D. (1 thru 4 fan-length units — 1/2 inch OD. on 5 & 6 fan-length units) seamless copper tubing on a staggered pattern.
- Tubes shall be mechanically expanded into continuous full-collared plate-type aluminum (or optional copper) fins for permanent metal-to-metal contact.
- All coils shall be factory pressure and leak tested at 450 psi. The coils are shipped with a dry nitrogen holding charge.

### Fans

- All fans shall be aluminum propeller blade type with painted steel hubs. Fans shall be dynamically balanced and factory tested before shipping to ensure quiet operation.
- Fans shall have dual square head set screws spaced 90 degrees apart which seat onto flats on the motor shafts.
- Fan diameters shall not exceed 30 inches.

### Fan Guards

- Fan guards shall be heavy gauge, close meshed steel wire with vinyl coating for maximum rigidity, long life and attractive appearance.

### Fan Motors

- Fan motors shall be heavy duty PSC or three phase open drip-proof type with permanently lubricated ball bearings and built-in overload protection.
- All motors shall be factory wired with leads terminating in a weather-tight enclosure located opposite the header end of the unit. Leads on WC units terminate at a power block.
- Fan motors on CD units shall be a rigid base type mounted to 12 gauge galvanized steel rails. Fan motors on Model WC units shall be mounted in welded heavy gauge rod frames.

*Witt reserves the right to make design changes and modifications to its products without notice.*