LARKIN

AIR COOLED CONDENSERS
MODEL RC

SPECIFICATION AND SELECTION DATA

RC-SPEC94A
June, 1996

Replaces RC-SPEC94
3/94

Larkin's Newest Direct Drive Condenser Series

The Larkin RC series of direct drive condensers are available in 71 models ranging from 21 to 212 nominal tons. The condensers are designed for outdoor application with housing available in aluminum finish or painted galvanized steel.

The condensers are available in 1140 or low noise 830 RPM fan motors in either single or double row of fans. Fan motors and blades have been selected for optimum performance at minimum noise levels.

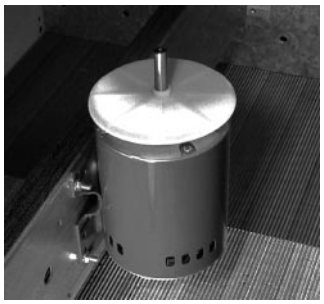
Condenser coils are designed for optimum heat transfer and are designed to operate with the new generation of CFC-free refrigerants. Condenser coils incorporate the patented Floating Tube design which virtually eliminate the possibility of tube sheet leaks.

Our engineers have designed the condenser for ease of installation and dependable operation. Extensive testing of the condenser insures long and trouble-free service life.

The condenser design incorporates the features most desired in air cooled condensers. An extensive list of options and fan cycle control panels complement the condenser design and allow the condenser to match the most rigid application requirements.

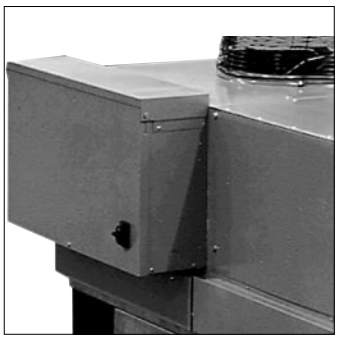
Condenser Features

- Complete range of capacities with 71 models ranging from 21 to 212 nominal tons.
- Modular design with models in both single and dual row of fan configurations.
- Direct drive fan motors in 1140 or 830 RPM.
- High efficiency three phase fan motors with ball bearings and internal overload protection.
- Two styles of housings available. Aluminum housing or painted galvanized steel for attractive appearance. Both enclosures provide corrosion protection for outdoor applications.



Fan motor securely mounted to channel rail.

- Patented floating tube coil designed to eliminate tube sheet leaks. (U.S. Patent No. 5,158,134)
- High efficiency condenser coil designed for optimum performance. Condenser coils are copper tubes with corrugated aluminum fins.
- Weatherproof control panel with factory mounted door interrupt switch.
- Internal baffles provided between all fan cells.



Weatherproof control panel protects wiring.

- Condensers up to 4 fans in length use 3/8 diameter tube to minimize refrigerant charge. Five and six fan (1 row of fans) and 10 and 12 fans (2 rows of fans) use 1/2 diameter tube to minimize refrigerant pressure drop.
- PVC coated steel fan guards.
- UL and UL listed for Canada.

Available Options

- Multi-circuiting at no additional charge.
- All condensers available with 8, 10, or 12 fins per inch spacing.
- Alternate coil construction including coated fins, Heresite® coated fins and copper fins.
- Fan cycle control panels.
- Variable speed fan motor and controls.
- Side access doors to facilitate coil cleaning.
- Hinged fan panels.
- Outlet gravity dampers.
- Extended condenser legs for increased ground clearance.
- Sealtite wiring.
- RCX models with 1 HP, 830 RPM motors and RCQ models with 1½ HP, 540 RPM motors. See supplemental bulletin RCSPEC-94-SUPP.

Features

Ease of Installation

The condensers are designed to reduce the cost and time required for installation. All lifting brackets are factory installed, and the legs are designed for quick installations. Fan motors are factory wired to a control panel providing a single point for field wiring. A wide variety of fan cycling control panels can be factory mounted and wired to the condenser, eliminating the need for a field mounted built-up control panel.

Lifting lugs are factory mounted for easy rigging and installation.

Dynamic Stress Testing

Larkin condensers have been thoroughly tested to guarantee high performance.

Fan motor and blade assemblies have undergone dynamic stress testing. This testing measures the stress levels and frequency of vibration of the fan during actual operation of the condenser. This type of testing insures a design with low vibration levels and long, trouble-free service life of the air moving assembly.

Condenser Housing

Condenser housings are designed for attractive appearance and corrosion protection. Cabinets are available in painted galvanized steel or economical mil finish aluminum. Painted units are grey with contrasting black angular legs.

Condensers have a unique internal frame design consisting of heavy gauge galvanized steel tube sheets and motor rails. Fan motors are bolted to motor rail for increased reliability and reduced noise and vibration.

Full width fan baffles are provided to increase unit rigidity and prevent windmilling during fan cycling.

Condenser Coils

Condensers use high efficiency coils with corrugated aluminum fins bonded to staggered copper tubes. Condenser coils are designed to operate with the new generation of environmentally safe refrigerants. Condensers up to four fans in length use 3/8 inch diameter tubes for minimum refrigerant charge. Five and six fans (1 row of fans) and 10 and 12 fans (2 rows of fans) use 1/2 inch diameter tubes to minimize refrigerant pressure drop.

Floating Tube

All condensers use the *Patented Floating Tube Design* (U.S. Patent No. 5,158,134) to eliminate refrigerant leaks at the tube sheets. Additional tubes are added to the condenser coil. These tubes are expanded into the aluminum fins and condenser tube sheets. These anchor tubes support the weight of the coil, but are not a part of the refrigerant circuit.

Patented design floating tubes dramatically reduce tube sheet leaks.

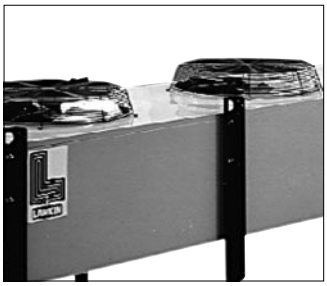
The tubes in the refrigerant circuit are expanded into the fins, but *"float"* through oversized holes in the tube sheets. Tube sheet leaks are virtually eliminated, since the tubes which carry refrigerant never come in contact with the tube sheet.

Fan Motors

Condenser fan motors are high efficiency, three phase motors designed for outdoor condenser applications. Motors have thermal overload protection and permanently lubricated ball bearings. Separate fan motors are designed for either 1140 or 830 RPM applications. All motors are factory wired to a condenser control panel to provide a single point for field wiring. Fan motors are suitable for 50 hertz application. 575/3/60 motors are available for Canadian applications. Alternate motors are available at 830 and 540 RPM for reduced noise and increased condenser efficiency. See supplemental bulletin CH-B-58-SUPP.

Fan Blades

Direct drive fan blades are designed to pull air through the condenser coil to insure uniform air distribution over the entire coil. Fan blades have been selected and laboratory tested for optimum performance and minimum noise at each operating speed. Fan blades are heavy gauge aluminum, riveted to a painted steel spider.



PVC coated steel wire fan guards provide maximum corrosion protection.

Fan Guards

Fan guards are PVC coated steel for maximum corrosion protection. Fan guards have extended height to increase the distance from the fan blade to the guard, reducing the noise level of the condenser.

Table 1. RC6 Condenser Capacity (1140 RPM).

RC6 Model	Fan Config.	R-404A, R-502 and R-507 Total Heat of Rejection, MBH					* R-22 Total Heat of Rejection, MBH					Maximum No. of Circ. Avail.
		1°TD	10°TD	15°TD	20°TD	30°TD	1°TD	10°TD	15°TD	20°TD	30°TD	
Single Row of Fans												
0339	1 x 2	11.07	111	166	221	332	11.30	113	170	226	339	14
0399	1 x 2	13.00	130	195	260	390	13.27	133	199	265	398	14
0447	1 x 2	14.60	146	219	292	438	14.90	149	224	298	447	14
0525	1 x 2	17.14	172	257	343	515	17.50	175	263	350	525	14
0597	1 x 3	19.53	195	293	391	586	19.93	199	299	399	598	21
0669	1 x 3	21.89	219	328	438	657	22.33	223	335	447	670	21
0741	1 x 3	24.24	242	364	485	727	24.73	247	371	495	742	28
0797	1 x 4	26.04	260	391	521	781	26.57	266	399	531	797	21
0893	1 x 4	29.20	292	438	584	876	29.80	298	447	596	894	21
0989	1 x 4	32.34	323	485	647	970	33.00	330	495	660	990	28
1049	1 x 4	34.30	343	515	686	1029	35.00	350	525	700	1050	28
1131	1 x 5	36.95	369	554	739	1108	37.70	377	566	754	1131	21
1205	1 x 5	39.36	394	590	787	1181	40.17	402	603	803	1205	28
1331	1 x 5	43.48	435	652	870	1304	44.37	444	666	887	1331	28
1447	1 x 6	47.24	472	709	945	1417	48.20	482	723	964	1446	28
1597	1 x 6	52.14	521	782	1043	1564	53.20	532	798	1064	1596	28
Double Row of Fans												
0678	2 x 2	22.15	221	332	443	664	22.60	226	339	452	678	2 @ 14
0798	2 x 2	26.04	260	391	521	781	26.57	266	399	531	797	2 @ 14
0894	2 x 2	29.20	292	438	584	876	29.80	298	447	596	894	2 @ 14
0990	2 x 2	32.34	323	485	647	970	33.00	330	495	660	990	2 @ 14
1050	2 x 2	34.30	343	515	686	1029	35.00	350	525	700	1050	2 @ 14
1196	2 x 3	39.04	390	586	781	1171	39.83	398	598	797	1195	2 @ 21
1280	2 x 3	41.81	418	627	836	1254	42.67	427	640	853	1280	2 @ 21
1340	2 x 3	43.77	438	657	875	1313	44.67	447	670	893	1340	2 @ 21
1484	2 x 3	48.48	485	727	970	1454	49.47	495	742	989	1484	2 @ 28
1594	2 x 4	52.07	521	781	1041	1562	53.13	531	797	1063	1594	2 @ 21
1788	2 x 4	58.38	584	876	1168	1751	59.57	596	894	1191	1787	2 @ 21
1980	2 x 4	64.65	646	970	1293	1939	65.97	660	990	1319	1979	2 @ 28
2100	2 x 4	68.60	686	1029	1372	2058	70.00	700	1050	1400	2100	2 @ 28
2262	2 x 5	73.86	739	1108	1477	2216	75.37	754	1131	1507	2261	2 @ 21
2410	2 x 5	78.73	787	1181	1575	2362	80.33	803	1205	1607	2410	2 @ 28
2522	2 x 5	82.39	824	1236	1648	2472	84.07	841	1261	1681	2522	2 @ 28
2662	2 x 5	86.93	869	1304	1739	2608	88.70	887	1331	1774	2661	2 @ 28
2892	2 x 6	94.47	945	1417	1889	2834	96.40	964	1446	1928	2892	2 @ 28
3026	2 x 6	98.85	988	1483	1977	2965	100.87	1009	1513	2017	3026	2 @ 28
3194	2 x 6	104.30	1043	1565	2086	3129	106.43	1064	1597	2129	3193	2 @ 28

* For R-134A capacity, multiply R-22 capacity by 0.95; for 50 HZ capacity multiply by 0.92.

Table 2. RC8 Condenser Capacity (830 RPM).

RC8 Model	Fan Config.	R-404A, R-502 and R-507 Total Heat of Rejection, MBH					* R-22 Total Heat of Rejection, MBH					Maximum No. of Circ. Avail.
		1°TD	10°TD	15°TD	20°TD	30°TD	1°TD	10°TD	15°TD	20°TD	30°TD	
Single Row of Fans												
0319	1 x 2	10.45	105	157	209	314	10.67	107	160	213	320	14
0381	1 x 2	12.45	124	187	249	373	12.70	127	191	254	381	14
0407	1 x 2	13.30	133	199	266	399	13.57	136	204	271	407	14
0441	1 x 2	14.44	144	217	289	433	14.73	147	221	295	442	14
0481	1 x 2	15.75	157	236	315	472	16.07	161	241	321	482	14
0571	1 x 3	18.69	187	280	374	561	19.07	191	286	381	572	21
0641	1 x 3	20.97	210	315	419	629	21.40	214	321	428	642	21
0691	1 x 3	22.54	225	338	451	676	23.00	230	345	460	690	28
0761	1 x 4	24.89	249	373	498	747	25.40	254	381	508	762	21
0813	1 x 4	26.59	266	399	532	798	27.13	271	407	543	814	21
0885	1 x 4	28.91	289	434	578	867	29.50	295	443	590	885	28
0963	1 x 4	31.49	315	472	630	945	32.13	321	482	643	964	28
1023	1 x 5	33.45	335	502	669	1004	34.13	341	512	683	1024	21
1139	1 x 5	37.21	372	558	744	1116	37.97	380	570	759	1139	28
1223	1 x 5	39.98	400	600	800	1200	40.80	408	612	816	1224	28
1367	1 x 6	44.62	446	669	892	1339	45.53	455	683	911	1366	28
1469	1 x 6	47.99	480	720	960	1440	48.97	490	735	979	1469	28
Double Row of Fans												
0640	2 x 2	20.87	209	313	417	626	21.30	213	320	426	639	2 @ 14
0768	2 x 2	24.89	249	373	498	747	25.40	254	381	508	762	2 @ 14
0814	2 x 2	26.59	266	399	532	798	27.13	271	407	543	814	2 @ 14
0886	2 x 2	28.91	289	434	578	867	29.50	295	443	590	885	2 @ 14
0964	2 x 2	31.49	315	472	630	945	32.13	321	482	643	964	2 @ 14
1144	2 x 3	37.37	374	561	747	1121	38.13	381	572	763	1144	2 @ 21
1284	2 x 3	41.94	419	629	839	1258	42.80	428	642	856	1284	2 @ 21
1380	2 x 3	45.08	451	676	902	1352	46.00	460	690	920	1380	2 @ 28
1526	2 x 4	49.82	498	747	996	1495	50.83	508	763	1017	1525	2 @ 21
1628	2 x 4	53.18	532	798	1064	1595	54.27	543	814	1085	1628	2 @ 21
1770	2 x 4	57.82	578	867	1156	1735	59.00	590	885	1180	1770	2 @ 28
1928	2 x 4	62.95	629	944	1259	1888	64.23	642	964	1285	1927	2 @ 28
2048	2 x 5	66.87	669	1003	1337	2006	68.23	682	1024	1365	2047	2 @ 21
2272	2 x 5	74.38	744	1116	1488	2231	75.90	759	1139	1518	2277	2 @ 28
2448	2 x 5	79.97	800	1200	1599	2399	81.60	816	1224	1632	2448	2 @ 28
2732	2 x 6	89.25	892	1339	1785	2677	91.07	911	1366	1821	2732	2 @ 28
2850	2 x 6	93.10	931	1397	1862	2793	95.00	950	1425	1900	2850	2 @ 28
2938	2 x 6	95.97	960	1440	1919	2879	97.93	979	1469	1959	2938	2 @ 28

* For R-134A capacity, multiply R-22 capacity by 0.95; for 50 HZ capacity multiply by 0.92.

Table 3. Condenser Specifications for RC6 models, 1140 RPM.

RC6 Model	Fan Configuration	Number of Fans	CFM	FLA		Connections		Approx. Net Weight (Lbs.)
				208-230/3/60	460/3/60	Inlet	Outlet	
Single Row of Fans								
0339	1 x 2	2	23,000	14.0	7.0	1 3/8	1 3/8	730
0399	1 x 2	2	23,200	14.0	7.0	1 5/8	1 5/8	770
0447	1 x 2	2	21,900	14.0	7.0	1 5/8	1 5/8	790
0525	1 x 2	2	20,700	14.0	7.0	1 5/8	1 5/8	880
0597	1 x 3	3	34,800	21.0	10.5	2 1/8	2 1/8	1190
0669	1 x 3	3	32,900	21.0	10.5	2 1/8	2 1/8	1210
0741	1 x 3	3	31,800	21.0	10.5	2 1/8	2 1/8	1240
0797	1 x 4	4	46,400	28.0	14.0	2 1/8	2 1/8	1580
0893	1 x 4	4	43,900	28.0	14.0	2 1/8	2 1/8	1620
0989	1 x 4	4	42,400	28.0	14.0	2 1/8	2 1/8	1650
1049	1 x 4	4	41,500	28.0	14.0	2 1/8	2 1/8	1760
1131	1 x 5	5	54,900	35.0	17.5	2 1/8	2 1/8	2020
1205	1 x 5	5	54,800	35.0	17.5	2 5/8	2 5/8	2000
1331	1 x 5	5	51,800	35.0	17.5	2 5/8	2 5/8	2200
1447	1 x 6	6	65,800	42.0	21.0	2 5/8	2 5/8	2390
1597	1 x 6	6	62,200	42.0	21.0	2 5/8	2 5/8	2630
Double Row of Fans								
0678	2 x 2	4	46,000	28.0	14.0	2 @ 1 3/8	2 @ 1 3/8	1540
0798	2 x 2	4	46,400	28.0	14.0	2 @ 1 5/8	2 @ 1 5/8	1580
0894	2 x 2	4	43.900	28.0	14.0	2 @ 1 5/8	2 @ 1 5/8	1620
0990	2 x 2	4	42,400	28.0	14.0	2 @ 1 5/8	2 @ 1 5/8	1650
1050	2 x 2	4	41,500	28.0	14.0	2 @ 1 5/8	2 @ 1 5/8	1760
1196	2 x 3	6	69,700	42.0	21.0	2 @ 2 1/8	2 @ 2 1/8	2360
1280	2 x 3	6	67,000	42.0	21.0	2 @ 2 1/8	2 @ 2 1/8	2380
1340	2 x 3	6	65,800	42.0	21.0	2 @ 2 1/8	2 @ 2 1/8	2420
1484	2 x 3	6	63,600	42.0	21.0	2 @ 2 1/8	2 @ 2 1/8	2480
1594	2 x 4	8	92,900	56.0	28.0	2 @2 1/8	2 @ 2 1/8	3150
1788	2 x 4	8	87,800	56.0	28.0	2 @ 2 1/8	2 @ 2 1/8	3230
1980	2 x 4	8	84,800	56.0	28.0	2 @ 2 1/8	2 @ 2 1/8	3300
2100	2 x 4	8	83,000	56.0	28.0	2 @ 2 1/8	2 @ 2 1/8	3570
2262	2 x 5	10	109,700	70.0	35.0	2 @ 2 1/8	2 @ 2 1/8	4040
2410	2 x 5	10	109,700	70.0	35.0	2 @ 2 5/8	2 @ 2 5/8	3990
2522	2 x 5	10	106,000	70.0	35.0	2 @ 2 5/8	2 @ 2 5/8	4130
2662	2 x 5	10	103,700	70.0	35.0	2 @ 2 5/8	2 @ 2 5/8	4390
2892	2 x 6	12	131,600	84.0	42.0	2 @ 2 5/8	2 @ 2 5/8	4790
3026	2 x 6	12	127,200	84.0	42.0	2 @ 2 5/8	2 @ 2 5/8	4960
3194	2 x 6	12	124,400	84.0	42.0	2 @ 2 5/8	2 @ 2 5/8	5270

NOTES: 1. All fan blades are 30” diameter.
2. All motors are 1 1/2 HP, 208-230/460/3/60, 1140 RPM

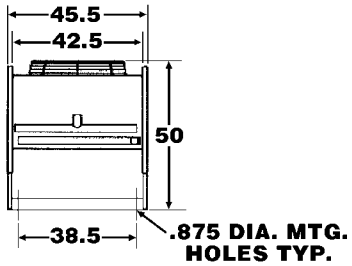
Table 4. Condenser Specifications for RC8 models, 830 RPM.

RC8 Model	Fan Configuration	Number of Fans	CFM	FLA		Connections		Approx. Net Weight (Lbs.)
				208-230/3/60	460/3/60	Inlet	Outlet	
Single Row of Fans								
0319	1 x 2	2	20,500	13.2	6.6	1 3/8	1 3/8	770
0381	1 x 2	2	20,900	13.2	6.6	1 5/8	1 5/8	790
0407	1 x 2	2	20,100	13.2	6.6	1 5/8	1 5/8	790
0441	1 x 2	2	19,600	13.2	6.6	1 5/8	1 5/8	800
0481	1 x 2	2	17,900	13.2	6.6	1 5/8	1 5/8	880
0571	1 x 3	3	31,300	19.8	9.9	2 1/8	2 1/8	1180
0641	1 x 3	3	29,300	19.8	9.9	2 1/8	2 1/8	1210
0691	1 x 3	3	28,400	19.8	9.9	2 1/8	2 1/8	1240
0761	1 x 4	4	41,800	26.4	13.2	2 1/8	2 1/8	1580
0813	1 x 4	4	40,200	26.4	13.2	2 1/8	2 1/8	1590
0885	1 x 4	4	39,200	26.4	13.2	2 1/8	2 1/8	1600
0963	1 x 4	4	35,800	26.4	13.2	2 1/8	2 1/8	1760
1023	1 x 5	5	50,200	33.0	16.5	2 1/8	2 1/8	1990
1139	1 x 5	5	49,000	33.0	16.5	2 5/8	2 5/8	2000
1223	1 x 5	5	44,800	33.0	16.5	2 5/8	2 5/8	2200
1367	1 x 6	6	58,800	39.6	19.8	2 5/8	2 5/8	2390
1469	1 x 6	6	53,700	39.6	19.8	2 5/8	2 5/8	2630
Double Row of Fans								
0640	2 x 2	4	40,900	26.4	13.2	2 @ 1 3/8	2 @ 1 3/8	1540
0768	2 x 2	4	41,800	26.4	13.2	2 @ 1 5/8	2 @ 1 5/8	1580
0814	2 x 2	4	40,200	26.4	13.2	2 @ 1 5/8	2 @ 1 5/8	1590
0886	2 x 2	4	39,200	26.4	13.2	2 @ 1 5/8	2 @ 1 5/8	1600
0964	2 x 2	4	35,800	26.4	13.2	2 @ 1 5/8	2 @ 1 5/8	1760
1144	2 x 3	6	62,700	39.6	19.8	2 @ 2 1/8	2 @ 2 1/8	2360
1284	2 x 3	6	58,700	39.6	19.8	2 @ 2 1/8	2 @ 2 1/8	2420
1380	2 x 3	6	56,800	39.6	19.8	2 @ 2 1/8	2 @ 2 1/8	2480
1526	2 x 4	8	83,600	52.8	26.4	2 @ 2 1/8	2 @ 2 1/8	3150
1628	2 x 4	8	80,300	52.8	26.4	2 @ 2 1/8	2 @ 2 1/8	3180
1770	2 x 4	8	78,400	52.8	26.4	2 @ 2 1/8	2 @ 2 1/8	3190
1928	2 x 4	8	71,700	52.8	26.4	2 @ 2 1/8	2 @ 2 1/8	3510
2048	2 x 5	10	100,400	66.0	33.0	2 @ 2 1/8	2 @ 2 1/8	3970
2272	2 x 5	10	97,900	66.0	33.0	2 @ 2 5/8	2 @ 2 5/8	3990
2448	2 x 5	10	89,600	66.0	33.0	2 @ 2 5/8	2 @ 2 5/8	4390
2732	2 x 6	12	117,500	79.2	39.6	2 @ 2 5/8	2 @ 2 5/8	4790
2850	2 x 6	12	113,500	79.2	39.6	2 @ 2 5/8	2 @ 2 5/8	4960
2938	2 x 6	12	107,500	79.2	39.6	2 @ 2 5/8	2 @ 2 5/8	5270

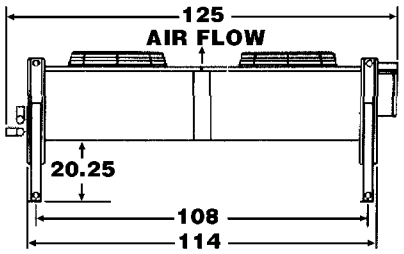
NOTES: 1. All fan blades are 30” diameter.
2. All motors are 1 1/2 HP, 208-230/460/3/60, 830 RPM.

Condenser Dimensions

End Views

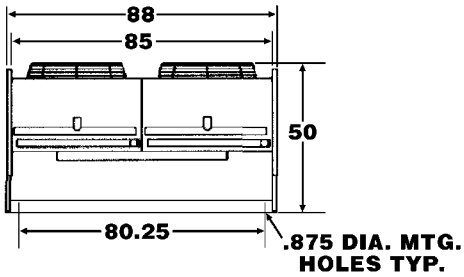


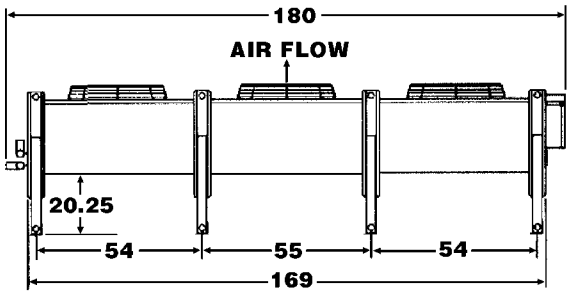
Side Views



1 x 2
2 x 2

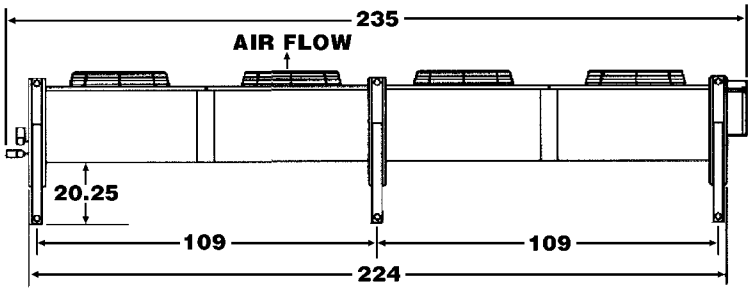
Single Row of Fans



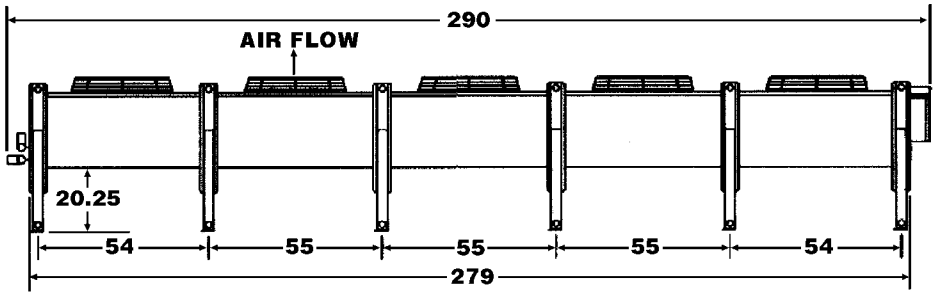


1 x 3
2 x 3

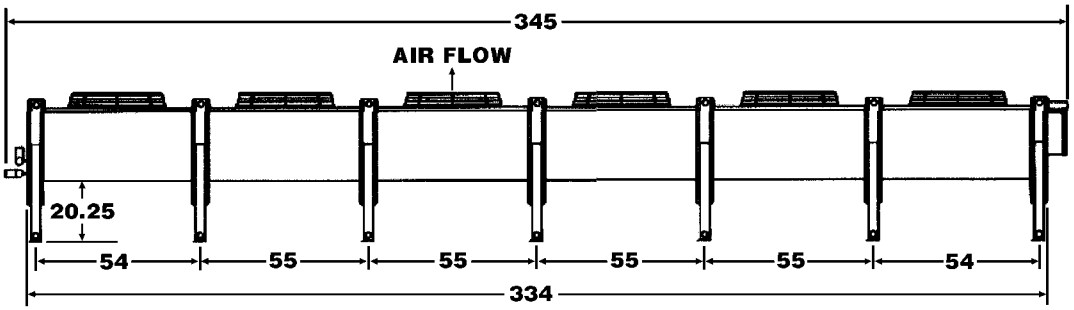
Double Row of Fans



1 x 4
2 x 4



1 x 5
2 x 5



1 x 6
2 x 6

Condenser Selection

Capacity for air cooled condensers are based on Total Heat of Rejection (THR) at the condenser. Total heat of rejection is equal to net refrigeration at the evaporator (compressor capacity) plus the energy input into the refrigerant by the compressor (heat of compression). The heat of compression will vary depending on the compressor manufacturer, type of compressor and the operating conditions of the compressor. Whenever possible, it is recommended that you obtain the heat of compression value from the compressor manufacturer.

If this is not available, the THR can be estimated using the following formula:

THR = (Compressor Capacity) * (Heat of Compression Factor, Tables 5 & 6)

Table 5 contains heat of compression factors for suction cooled compressors and Table 6 contains factors for open drive compressors.

For refrigeration systems beyond the range of Tables 5 and 6, use the following equations to estimate THR:

Open Compressors:

THR = Compressor Capacity (BTUH) + (2545) * (Break Horsepower, BHP)

Suction Cooled Compressors:

THR = Compressor Capacity (BTUH) + (3413 * KW)

The compressor capacity is effected by its altitude. If the condenser location is above sea level, an additional correction is required to the THR, as follows:

THR (altitude) = THR * Altitude Correction Factor, Table 7

Selection Example

Compressor capacity:	350,000	Refrigerant:	R-22
Evaporator temperature:	+25° F	Compressor type:	Semi-hermetic, suction cooled
Condensing temperature:	115° F	Condenser type:	1140 RPM, one row of fans
Ambient temperature	95° F	Condenser altitude:	1,000 feet

Step 1: Estimate Condenser THR

From Table 5 for suction cooled compressors, at +25° F suction and 115° F condensing temperature, select a heat of compressor factor of 1.335.

THR = Compressor Capacity * Heat of Compression Factor

= 350,000 * 1.335 = 467,250

Step 2: Correct for Altitude

From Table 7 obtain an altitude correction factor of 1.02 for 1,000 feet.

THR (design) = THR (from step 1) * Altitude Correction Factor

= 467,250 * 1.02

= 476,595

Step 3: Calculate Design Condenser T.D.

Design Condenser T.D. = Condensing Temperature - Ambient Temperature

= 115 - 95

= 20° T.D.

Step 4: Condenser Selection

Condenser capacities for condensers with one row of fans at 1140 RPM are located in Table 1. These capacities are given in MBH. Convert the THR calculated in step 2 to MBH by dividing by 1,000.

$THR_{(MBH)}$ = 476,595 ÷ 1,000

= 476.6

Locate the 20° T.D. column for R-22 refrigerant and read down until you locate a value equal to or just larger than 476.6. This value is 495. Read horizontally to the left to obtain a condenser model of RC6 049.

Step 5: Calculate Actual T.D. and Condensing Temperature

The actual condenser T.D. can be calculated by dividing the design THR by the condenser rating at 1° T.D. For the RC6 049 the rating at 1° T.D. is 24.73 MBH.

Actual T.D. = THR (Design) ÷ (Rating @ 1° T.D.)

= 476.6 ÷ 24.73

= 19.3°F T.D.

The actual condensing temperature is the actual T.D. plus the ambient temperature.

Actual Condensing Temperature = (Actual T.D.) + (Ambient)

= 19.3 + 95

= 114.3° F

Table 5. Heat of Compression Factor for Suction Cooled Compressors.

Suction Temperature, °F	Condensing Temperature, °F				
	90°	100°	110°	120°	130°
-40°	1.56	1.63	1.72	1.81	1.94
-30°	1.49	1.55	1.62	1.70	1.80
-20°	1.43	1.49	1.55	1.62	1.70
-10°	1.38	1.43	1.49	1.55	1.63
0°	1.34	1.38	1.43	1.49	1.56
5°	1.31	1.36	1.41	1.48	1.55
10°	1.29	1.34	1.39	1.44	1.52
15°	1.26	1.31	1.36	1.41	1.48
20°	1.24	1.28	1.33	1.38	1.44
25°	1.22	1.26	1.31	1.36	1.42
30°	1.20	1.24	1.28	1.33	1.39
40°	1.17	1.20	1.24	1.28	1.33
50°	1.13	1.16	1.20	1.24	1.28

Table 6. Heat of Compression Factor for Open Drive Compressors.

Evaporator Temperature, °F	Condensing Temperature, °F					
	90°	100°	110°	120°	130°	140°
-30°	1.37	1.42	1.47	----	----	----
-20°	1.33	1.37	1.42	1.47	----	----
-10°	1.28	1.32	1.37	1.42	1.47	----
0°	1.24	1.28	1.32	1.37	1.41	1.47
5°	1.23	1.26	1.30	1.35	1.39	1.45
10°	1.21	1.24	1.28	1.32	1.36	1.42
15°	1.19	1.22	1.26	1.30	1.34	1.40
20°	1.17	1.20	1.24	1.28	1.32	1.37
25°	1.16	1.19	1.22	1.26	1.30	1.35
30°	1.14	1.17	1.20	1.24	1.27	1.32
40°	1.12	1.15	1.17	1.20	1.23	1.28
50°	1.09	1.12	1.14	1.17	1.20	1.24

Table 7. Altitude Correction Factors.

Altitude	Correction Factor
0	1.00
1,000	1.02
2,000	1.05
3,000	1.07
4,000	1.10
5,000	1.12
6,000	1.15
7,000	1.17

Multi Circuiting Selection Procedure

The air cooled condensers are available with more than one refrigerant circuit. The condenser will be factory assembled with the condenser coil divided into individual refrigerant circuits, each sized for its own specific application. Each circuit is supplied with its own inlet and outlet connections, individually labeled.

Multi Circuit Condenser Selection

Given four suction cooled compressors with conditions shown in Table 8 below. The condenser shall have 830 RPM fan motors, with two rows of fans. The condenser location is at sea level and the design ambient is 95°F.

Selection Procedure

Step 1: Input customer data in Table 8 in columns 1, 2, 3, 4 and 5.

Step 2: From Table 5, select the heat of compression factor for suction cooled compressors and input into column #6.

Step 3: From Table 9 obtain the refrigerant capacity factor and input into column #7.

Step 4: Calculate the design T.D. for each circuit by subtracting the ambient temperature from the circuit design condensing temperature and input into column #8.

T.D. = Design Condensing Temperature - Ambient Temperature

Step 5: Calculate the design THR / °T.D. for each circuit. Multiply column #5 by column #6 to calculate the THR for each circuit. Divide the result by the refrigerant correction factor, column #7 to convert the capacities to a common refrigerant. Divide the result by the design T.D., column #8 to calculate the design THR / °T.D. and input into column #9.

$$\text{Design THR / °T.D.} = \frac{\text{Compressor Capacity (\#5)} * \text{Heat of Compressor Factor (\#6)}}{\text{Refrigerant Capacity Factor (\#7)} * \text{Design T.D. (\#8)}}$$

Example for circuit #1

$$\text{Design THR / °T.D.} = \frac{235{,}000 * 1.31}{1.0 \times 15}$$

$$= 20{,}523 \text{ BTUH / °T.D.}$$

Step 6: Add the design THR / °T.D. for each circuit in column #9, to get a total of 37,734 BTUH / °T.D. Divide this total by 1,000 to get 37.7 MBH / °T.D.

Step 7: From Table 2 for two rows of condenser fans with 830 RPM fan motors, locate the column for R-22 capacity at 1° T.D. Read down the column until you get to a capacity equal to or greater than 37.7 MBH / °T.D. This value is 38.13 which corresponds to a RC8 076. From Table 2 obtain the total number of feeds available as 42.

Table 8. Condenser Multi-Circuit Selection.

1	2	3	4	5	X	6	÷	7	÷	8	=	9	10	11	12
Circuit Name	Evap. Temp.°F	Design Cond. Temp.°F	Refrig. Type	Comp. Cap. BTUH	X	Heat of Compress. Factor	÷	Refrig. Cap. Factor	÷	Design Cond. T.D.	=	Design THR/°TD	No. of Feeds Per Circ.	Actual Cond. T.D.	Actual Cond. Temp. °F
1	+25	110	22	235,000	X	1.31	÷	1.0	÷	15	=	20,523	23	14.7	109.7
2	+20	110	134A	61,000	X	1.33	÷	0.95	÷	15	=	5,693	6	15.7	110.7
3	-10	105	22	31,000	X	1.46	÷	1.0	÷	10	=	4,526	5	10.0	105.0
4	-20	105	22	46,000	X	1.52	÷	1.0	÷	10	=	6,992	8	9.6	104.6
										TOTAL	=	37,734	42		
										37,734 / 1,000 = 37.7 MBH/°TD					

Step 8: Determine the number of feeds per circuit. Divide the design THR / °T.D. in column #9 by the total capacity required (37,734) and multiply this result by the number of circuits available, which is 42. Round this value to the nearest integer and place in column #10. Add the individual feeds per circuit to get a total number of feeds for the condenser. This total must equal the total number of feeds available for the condenser (42).

$$\text{Number of feeds/circuit} = \frac{\text{Design THR / °T.D.(\#9)} * \text{Number of Circuits Available (42)}}{\text{Total Capacity Required (37,734)}}$$

Step 9: Calculate actual condensing T.D., (ATD):

$$\text{ATD} = \frac{\text{Design T.D. (\#8)} * \text{Design THR/°T.D. (\#9)} * \text{Number of Feeds Available (42)}}{\text{Number Feeds / CIR (\#10)} * \text{Condenser Capacity / °T.D. (Step \#7)} * 1{,}000}$$

Example for Circuit #1

$$\text{ATD} = \frac{15 * 20{,}523 \times 42}{23 * 38.13 * 1{,}000} = 14.74$$

Input these T.D. values in column #11.

Step 10: Calculate the actual condensing temperature. Actual condensing temperature is equal to the actual condensing T.D., column #11 plus the design ambient (95°). Input these values in column #12.

If the actual condensing temperature for each circuit is too high, it may be necessary to adjust the number of feeds per circuit or to select the next larger condenser size and recalculate the number of feeds per circuit.

Table 9. Refrigerant Capacity Factor.

Refrigerant	Capacity Factor
R-22	1.0
R-134A	0.95
R-404A	0.98
R-502	0.98
R-507	0.98

Alternate Fin Spacing

Condenser fin spacing (FPI) has been selected to provide the optimum performance for each model. Many applications of condensers are in a high dust or dirt area. These applications may require a wider fin spacing to prevent the coils from being blocked. In most cases 8 or 10 fins per inch will be sufficient. Tables 10 through 15 show the condenser capacities at 8, 10 and 12 FPI. Please note, when fins per inch are fixed, some catalog units will have identical capacities.

Table 10. RC6 Condenser Capacity, 1140 RPM motors, 8 Fins Per Inch.

RC6 Model	Fan Configuration	R-404A, R-502 & R-507 Total Heat of Rejection, MBH					R-22 Total Heat of Rejection, MBH				
		1° TD	10° TD	15° TD	20° TD	30° TD	1° TD	10° TD	15° TD	20° TD	30° TD
Single Row of Fans											
0339	1 x 2	8.59	86	129	172	258	8.77	88	132	175	263
0399 0447	1 x 2	11.73	117	176	235	352	11.97	120	180	239	359
0525	1 x 2	14.01	140	210	280	420	14.30	143	215	286	429
0597 0669	1 x 3	17.61	176	264	352	528	17.97	180	270	359	539
0741	1 x 3	21.04	210	316	421	631	21.47	215	322	429	644
0797 0893	1 x 4	23.45	235	352	469	704	23.93	239	359	479	718
0989 1049	1 x 4	28.06	281	421	561	842	28.63	286	430	573	859
1131	1 x 5	30.02	300	450	600	901	30.63	306	460	613	919
1205 1331	1 x 5	36.26	363	544	725	1088	37.00	370	555	740	1110
1447 1597	1 x 6	43.51	435	653	870	1305	44.40	444	666	888	1332
Double Row of Fans											
0678	2 x 2	17.18	172	258	344	515	17.53	175	263	351	526
0798 0894	2 x 2	23.45	235	352	469	704	23.93	239	359	479	718
0990 1050	2 x 2	28.06	281	421	561	842	28.63	286	430	573	859
1196 1280 1340	2 x 3	35.21	352	528	704	1056	35.93	359	539	719	1078
1484	2 x 3	42.07	421	631	841	1262	42.93	429	644	859	1288
1594 1788	2 x 4	46.94	469	704	939	1408	47.90	479	719	958	1437
1980 2100	2 x 4	56.12	561	842	1122	1684	57.27	573	859	1145	1718
2262	2 x 5	60.01	600	900	1200	1800	61.23	612	919	1225	1837
2410 2522 2662	2 x 5	72.49	725	1087	1450	2175	73.97	740	1110	1479	2219
2892 3026 3194	2 x 6	86.99	870	1305	1740	2610	88.77	888	1332	1775	2663

NOTE:For R-134A capacity multiply R-22 capacity by 0.95.

Table 11. RC6 Condenser Capacity, 1140 RPM motors, 10 Fins Per Inch.

RC6 Model	Fan Configuration	R-404A, R-502 & R-507 Total Heat of Rejection, MBH					R-22 Total Heat of Rejection, MBH				
		1° TD	10° TD	15° TD	20° TD	30° TD	1° TD	10° TD	15° TD	20° TD	30° TD
Single Row of Fans											
0339	1 x 2	9.57	96	144	191	287	9.77	98	147	195	293
* 0399 0447	1 x 2	13.00	130	195	260	390	13.27	133	199	265	398
0525	1 x 2	15.29	153	229	306	459	15.60	156	234	312	468
* 0597 0669	1 x 3	19.53	195	293	391	586	19.93	199	299	399	598
0741	1 x 3	22.96	230	344	459	689	23.43	234	352	469	703
* 0797 0893	1 x 4	26.04	260	391	521	781	26.57	266	399	531	797
0989 1049	1 x 4	30.61	306	459	612	918	31.23	312	469	625	937
1131	1 x 5	33.19	332	498	664	996	33.87	339	508	677	1016
* 1205 1331	1 x 5	39.36	394	590	787	1181	40.17	402	603	803	1205
* 1447 1597	1 x 6	47.24	472	709	945	1417	48.20	482	723	964	1446
Double Row of Fans											
0678	2 x 2	19.14	191	287	383	574	19.53	195	293	391	586
* 0798 0894	2 x 2	26.04	260	391	521	781	26.57	266	399	531	797
0990 1050	2 x 2	30.61	306	459	612	918	31.23	312	469	625	937
* 1196 1280 1340	2 x 3	39.04	390	586	781	1171	39.83	398	598	797	1195
1484	2 x 3	45.90	459	688	918	1377	46.83	468	703	937	1405
* 1594 1788	2 x 4	52.07	521	781	1041	1562	53.13	531	797	1063	1594
1980 2100	2 x 4	61.22	612	918	1224	1837	62.47	625	937	1249	1874
2262	2 x 5	66.35	663	995	1327	1990	67.70	677	1016	1354	2031
* 2410 2522 2662	2 x 5	78.73	787	1181	1575	2362	80.33	803	1205	1607	2410
* 2892 3026 3194	2 x 6	94.47	945	1417	1889	2834	96.40	964	1446	1928	2892

NOTES: For R-134A capacity multiply R-22 capacity by 0.95.
* Denotes models with 10 fins per inch as standard.

Table 12. RC6 Condenser Capacity, 1140 RPM motors, 12 Fins Per Inch.

RC6 Model	Fan Configuration	R-404A, R-502, & R-507 Total Heat of Rejection, MBH					R-22 Total Heat of Rejection, MBH				
		1°TD	10°TD	15°TD	20°TD	30°TD	1°TD	10°TD	15°TD	20°TD	30°TD
Single Row of Fans											
0339	1 x 2	10.46	105	157	209	314	10.67	107	160	213	320
0399 0447	1 x 2	13.95	139	209	279	418	14.23	142	213	285	427
0525	1 x 2	16.17	162	243	323	485	16.50	165	248	330	495
0597 0669	1 x 3	20.91	209	314	418	627	21.34	213	320	427	640
* 0741	1 x 3	24.25	242	364	485	727	24.74	247	371	495	742
0797 0893	1 x 4	27.88	279	418	558	836	28.45	285	427	569	854
* 0989 1049	1 x 4	32.33	323	485	647	970	32.99	330	495	660	990
1131	1 x 5	35.12	351	527	702	1054	35.84	358	538	717	1075
1205 1331	1 x 5	41.20	412	618	824	1236	42.04	420	631	841	1261
1447 1597	1 x 6	49.43	494	741	989	1483	50.44	504	757	1009	1513
Double Row of Fans											
0678	2 x 2	20.90	209	314	418	627	21.33	213	320	427	640
0798 0894	2 x 2	27.90	279	419	558	837	28.47	285	427	569	854
* 0990 1050	2 x 2	32.34	323	485	647	970	33.00	330	495	660	990
1196 * 1280 1340	2 x 3	41.82	418	627	836	1254	42.67	427	640	853	1280
* 1484	2 x 3	48.48	485	727	970	1454	49.47	495	742	989	1484
1594 1788	2 x 4	55.76	558	836	1115	1673	56.90	569	854	1138	1707
* 1980 2100	2 x 4	64.65	647	970	1293	1940	65.97	660	990	1319	1979
2262	2 x 5	70.24	702	1054	1405	2107	71.67	717	1075	1433	2150
2410 * 2522 2662	2 x 5	82.39	824	1236	1648	2472	84.07	841	1261	1681	2522
2892 * 3026 3194	2 x 6	98.85	989	1483	1977	2966	100.87	1009	1513	2017	3026

NOTE: For R-134A capacity multiply R-22 capacity by 0.95.
* Denotes models with 12 Fins Per Inch as standard.

Table 13. RC8 Condenser Capacity, 830 RPM motors, 8 Fins Per Inch.

RC8 Model	Fan Configuration	R-404A, R-502 & R-507 Total Heat of Rejection, MBH					R-22 Total Heat of Rejection, MBH				
		1° TD	10° TD	15° TD	20° TD	30° TD	1° TD	10° TD	15° TD	20° TD	30° TD
Single Row of Fans											
0319	1 x 2	8.10	81	122	162	243	8.27	83	124	165	248
0381 0407	1 x 2	11.30	113	170	226	339	11.53	115	173	231	346
0441 0481	1 x 2	13.43	134	201	269	403	13.70	137	206	274	411
0571 0641	1 x 3	16.95	170	254	339	509	17.30	173	260	346	519
0691	1 x 3	20.12	201	302	402	604	20.53	205	308	411	616
0761 0813	1 x 4	22.61	226	339	452	678	23.07	231	346	461	692
0885 0963	1 x 4	26.85	269	403	537	806	27.40	274	411	548	822
1023	1 x 5	28.71	287	431	574	861	29.30	293	440	586	879
1139 1223	1 x 5	34.40	344	516	688	1032	35.10	351	527	702	1053
1367 1469	1 x 6	41.29	413	619	826	1239	42.13	421	632	843	1264
Double Row of Fans											
0640	2 x 2	16.20	162	243	324	486	16.53	165	248	331	496
0768 0814	2 x 2	22.61	226	339	452	678	23.07	231	346	461	692
0886 0964	2 x 2	26.85	269	403	537	806	27.40	274	411	548	822
1144 1284	2 x 3	33.94	339	509	679	1018	34.63	346	520	693	1039
1380	2 x 3	40.25	402	604	805	1207	41.07	411	616	821	1232
1526 1628	2 x 4	45.24	452	679	905	1357	46.17	462	693	923	1385
1770 1928	2 x 4	53.67	537	805	1073	1610	54.77	548	822	1095	1643
2048	2 x 5	57.40	574	861	1148	1722	58.57	586	879	1171	1757
2272 2448	2 x 5	68.76	688	1031	1375	2063	70.17	702	1053	1403	2105
2732 2850 2938	2 x 6	82.52	825	1238	1650	2475	84.20	842	1263	1684	2526

NOTE: For R-134A capacity multiply R-22 capacity by 0.95.

Table 14. RC8 Condenser Capacity, 830 RPM motors, 10 Fins Per Inch.

RC8 Model	Fan Configuration	R-404A, R-502 & R-507 Total Heat of Rejection, MBH					R-22 Total Heat of Rejection, MBH				
		1° TD	10° TD	15° TD	20° TD	30° TD	1° TD	10° TD	15° TD	20° TD	30° TD
Single Row of Fans											
0319	1 x 2	9.05	90	136	181	271	9.23	92	139	185	277
* 0381 0407	1 x 2	12.45	124	187	249	373	12.70	127	191	254	381
* 0441 0481	1 x 2	14.44	144	217	289	433	14.73	147	221	295	442
* 0571 0641	1 x 3	18.69	187	280	374	561	19.07	191	286	381	572
0691	1 x 3	21.69	217	325	434	651	22.13	221	332	443	664
* 0761 0813	1 x 4	24.89	249	373	498	747	25.40	254	381	508	762
* 0885 0963	1 x 4	28.91	289	434	578	867	29.50	295	443	590	885
1023	1 x 5	31.72	317	476	634	952	32.37	324	486	647	971
* 1139 1223	1 x 5	37.21	372	558	744	1116	37.97	380	570	759	1139
* 1367 1469	1 x 6	44.66	447	670	893	1340	45.57	456	684	911	1366
Double Row of Fans											
0640	2 x 2	18.10	181	271	362	543	18.47	185	277	369	554
* 0768 0814	2 x 2	24.89	249	373	498	747	25.40	254	381	508	762
0886 0964	2 x 2	28.91	289	434	578	867	29.50	295	443	590	885
* 1144 1284	2 x 3	37.37	374	561	747	1121	38.13	381	572	763	1144
1380	2 x 3	43.35	433	650	867	1300	44.23	442	664	885	1327
* 1526 1628	2 x 4	49.82	498	747	996	1495	50.83	508	763	1017	1525
* 1770 1928	2 x 4	57.82	578	867	1156	1735	59.00	590	885	1180	1770
2048	2 x 5	63.44	634	952	1269	1903	64.73	647	971	1295	1942
* 2272 2448	2 x 5	74.38	744	1116	1488	2231	75.90	759	1139	1518	2277
* 2732 2850 2938	2 x 6	89.25	892	1339	1785	2677	91.07	911	1366	1821	2732

NOTES: For R-134A capacity multiply R-22 capacity by 0.95.
* Denotes models with 10 fins per inch as standard.

Table 15. RC8 Condenser Capacity, 830 RPM Motors, 12 Fins Per Inch.

RC8 Model	Fan Configuration	R-404A, R-502, & R-507 Total Heat of Rejection, MBH					R-22 Total Heat of Rejection, MBH				
		1°TD	10°TD	15°TD	20°TD	30°TD	1°TD	10°TD	15°TD	20°TD	30°TD
Single Row of Fans											
0319	1 x 2	9.83	98	147	197	295	10.03	100	150	201	301
0381 * 0407	1 x 2	13.30	133	199	266	399	13.57	136	204	271	407
0441 0481	1 x 2	15.02	150	225	300	451	15.33	153	230	307	460
0571 0641	1 x 3	19.92	199	299	398	598	20.33	203	305	407	610
* 0691	1 x 3	22.54	225	338	451	676	23.00	230	345	460	690
0761 * 0813	1 x 4	26.59	266	399	532	798	27.13	271	407	543	814
0885 0963	1 x 4	30.06	301	451	601	902	30.67	307	460	613	920
* 1023	1 x 5	33.45	334	502	669	1003	34.13	341	512	683	1024
1139 1223	1 x 5	38.81	388	582	776	1164	39.60	396	594	792	1188
1367 1469	1 x 6	46.58	466	699	932	1397	47.53	475	713	951	1426
Double Row of Fans											
0640	2 x 2	19.66	197	295	393	590	20.06	201	301	401	602
0768 * 0814	2 x 2	26.60	266	399	532	798	27.14	271	407	543	814
0886 0964	2 x 2	30.05	300	451	601	901	30.66	307	460	613	920
1144 1284	2 x 3	39.85	398	598	797	1195	40.66	407	610	813	1220
* 1380	2 x 3	45.08	451	676	902	1352	46.00	460	690	920	1380
1526 * 1628	2 x 4	53.17	532	798	1063	1595	54.26	543	814	1085	1628
1770 1928	2 x 4	60.11	601	902	1202	1803	61.34	613	920	1227	1840
* 2048	2 x 5	66.87	669	1003	1337	2006	68.23	682	1024	1365	2047
2272 2448	2 x 5	77.62	776	1164	1552	2328	79.20	792	1188	1584	2376
2732 * 2850 2938	2 x 6	93.10	931	1397	1862	2793	95.00	950	1425	1900	2850

NOTE: For R-134A capacity multiply R-22 Capacity by 0.95.
*Denotes models with 12 Fins Per Inch as standard.

Fan Cycle Control Panels

Fan cycling panels are available to cycle fans on ambient temperature or condensing pressure or custom built control panels can be factory installed to interface with electronic refrigeration controllers.

- All fans are cycled with contactors.
- Condensers with a single row of fans cycle fans separately with one contactor per fan.
- Condensers with two rows of fans cycle fans in pairs, with one contactor for every pair of fans.
- Fans closest to the header end of the unit run continuously.
- Standard control circuit voltage is 230 volts. Control circuits with 24 or 115 volts are available on request.
- Control circuits are factory wired to a control circuit terminal board for convenient single point field wiring. Standard control circuits require an external power supply for powering control circuit (by others).
- A control circuit transformer is available on 460 volt condensers as a factory mounted option to provide power to the control circuit.

Ambient Fan Cycle

Condenser fans are controlled by ambient temperature using electronic temperature controls. Ambient fan cycling is recommended for multi-circuited condensers or single circuit condensers where there is little variation in condenser load.

Ambient fan cycling is limited in its ability to control head pressure to mild ambient conditions, see Table 16 for minimum ambients for fan cycling. Full year head pressure control can be obtained by combining ambient fan cycling with another means of head pressure control, such as condenser flooding controls or variable speed. Combining these controls with ambient fan cycling has the additional advantage of reducing the amount of refrigerant required to flood the condenser.

See Table 17 for typical settings for ambient thermostats.

Pressure Fan Cycling

Condenser fans are controlled by pressure switches which monitor condenser pressure. Pressure fan cycling is ideal for those condensers which see a significant change in condenser load. Since the controls sense condensing pressure, they can cycle fans at any ambient temperature, in response to a change in condensing pressure.

An additional pressure switch is available as an option to cycle the fan closest to the header end of the condenser. This option is only recommended for condensers with large variations in condenser load caused by heat reclaim, hot gas defrost or a high percentage of compressor unloading.

Table 16. Minimum Ambient for Fan Cycling.

Number of Fans		Design T.D.*				
Single Row	Double Row	30	25	20	15	10
2	4	35	45	55	60	70
3	6	15	30	40	55	65
4	8	0	15	30	45	60
5	10	0	10	20	35	55
6	12	0	0	10	30	50

*Based on maintaining 90°F minimum condensing temperature.

Table 17. Fan Cycling Thermostat Settings.

Number of Fans		Design	Thermostat Setting				
Single Row	Double Rows	T.D.	1	2	3	4	5
2	4	30	60				
		25	65				
		20	70				
		15	75				
		10	80				
3	6	30	60	40			
		25	65	55			
		20	70	60			
		15	75	65			
		10	80	75			
4	8	30	60	50	30		
		25	65	55	40		
		20	70	65	50		
		15	75	70	60		
		10	80	75	70		
5	10	30	60	55	45	30	
		25	65	60	50	35	
		20	70	65	60	40	
		15	75	70	65	55	
		10	80	75	70	65	
6	12	30	55	50	40	30	25
		25	65	60	55	45	35
		20	70	65	60	50	40
		15	75	70	65	60	50
		10	80	75	70	65	60

Variable Speed

Condenser head pressure control is provided by varying the air flow through the condenser by changing the RPM of the condenser fan. This control package is offered in combination with ambient fan cycling. The fan motor next to the header end of the condenser is the variable speed fan. The remainder of the fans are constant speed and are cycled separately using ambient sensing thermostats. On condensers with two rows of fans, two variable speed fans are provided (one per unit) and the remainder of the fans are constant speed and are cycled in pairs.

The variable speed control package consists of a special variable speed motor (1140 RPM, single phase) and an electronic speed control which controls the speed of the motor in response to condensing pressure. Fan motor, speed control and all related components are all factory mounted and wired. Two speed controls are provided on units with two rows of fans to allow for separate control of each fan motor.

Splitting Controls

Additional head pressure can be provided by valving off a portion of the condenser circuit and removing that portion from the refrigeration circuit, or splitting the condenser. In addition to providing a means of head pressure control, this control will reduce the amount of refrigerant required to operate the condenser with a flooded head pressure control.

Condenser splitting is recommended as a seasonal adjustment controlled by ambient temperature. A pressure switch is also provided as a backup control to prevent high head pressures from occurring during heavy load conditions.

On condensers with a single row of fans the control package consists of an ambient sensing thermostat, a pressure switch sensing condensing pressure and a splitting relay. The splitting relay provides a set of dry contacts to control the valves required to split the condenser (valves supplied by others).

On condensers with double rows of fans, additional controls and contactors are provided to cycle all of the fans on the side of the condenser which has been split off.

Except as noted above, the splitting packages do not control fan cycling. It is recommended that fan cycling be controlled by combining the splitting package with pressure fan cycling.

Control Panels for Electronic Controllers

Custom control panels can often be fabricated to interface with many of the microprocessor based electronic refrigeration controls. These panels often include individual motor fusing, individual fan motor contactors, splitting relays and printed circuit boards to interface with the microprocessor control. Contact the factory with your specific requirements.

Condenser Refrigerant Charge

The normal summer operating charge for condensers is shown in Table 18. This charge can also be used in condensers with fan cycling kits, since added refrigerant is not required for mild weather control. Table 18 also contains the additional refrigerant charge required when using flooded style head pressure controls.

Combining fan cycling with flooded head pressure controls significantly reduces the amount of winter charge required to flood the condenser. Table 19 shows the refrigerant charge required when fan cycling is used in conjunction with a flooded style head pressure control.

Table 18. Refrigerant Charge, Lbs. R-22 for Flooded Condenser.

Model		Refrigerant R-22 Charge for Summer Operation, Lbs.	Additional Refrigerant R-22 Charge Required for Flooded Condenser Operation Lbs. for 20° T.D. °F Minimum Ambient at Condenser				
RC6	RC8		+60	+40	+20	0	-20
0339	0319	8	7	16	19	21	22
0399 0447	0381 0407	12	11	24	28	32	34
0525 ——	0441 0481	15	15	31	38	43	45
0597 0669	0571 0641	19	17	35	43	48	51
0678	0640	15	15	32	38	42	45
0741 0797	0691 0761	22	22	47	57	64	67
0798 0894	0768 0814	24	21	48	57	63	67
0893	0813	22	22	48	57	64	67
0989	0885	27	29	63	77	85	90
0990 1050	0886 0964	30	29	62	77	86	90
1049	0963	27	29	63	77	85	90
1131	1023	35	41	89	108	121	128
1205	1139	43	54	118	144	161	170
1196 1280	1144 1284	38	33	70	86	96	102
1331	1223	43	54	118	114	161	170
1340	——	38	33	70	86	96	102
1447	1367	50	66	142	174	194	204
1484 1594	1380 1526	44	44	94	115	128	135
1597	1469	50	65	142	174	194	204
1788	1628	44	44	94	115	128	135
1980 2100	1770 1928	54	58	125	153	170	180
2262	2048	70	82	178	216	242	256
2410 2522 2662	2272 2448 ——	86	108	236	288	322	340
2892 3026 3194	2732 2850 2938	100	130	284	346	386	410

NOTES: For R-134A multiply charge by 0.99; For R-404A multiply charge by 0.91; For R-502 multiply charge by 1.04.
For alternate T.D.'s, multiply by flooded charge T.D. factors in table 20.

Table. 19. Additional Charge for Fan Cycling plus Flooded Condenser, Lbs. R-22.

Models		Refrigerant R-22 Charge for Summer	25°T.D. Ambient				20°T.D. Ambient				15°T.D. Ambient				10°T.D. Ambient			
RC6	RC8	Operation	+40	+20	0	-20	+40	+20	0	-20	+40	+20	0	-20	+40	+20	0	-20
0339	0319	8	3	10	14	17	8	14	17	19	13	17	20	28	18	21	22	23
0399 0447	0381 0407	12	4	15	20	25	12	21	25	28	20	26	30	32	27	32	34	35
0525 ——	0441 0481	15	5	20	28	34	17	28	34	38	26	34	40	42	36	42	45	47
0597 0669	0571 0641	19	0	7	20	28	0	19	28	35	17	30	38	42	32	41	46	50
0678	0640	15	5	20	28	34	16	28	34	38	26	34	40	42	36	42	45	46
0741	0691	22	0	9	26	37	0	25	38	47	22	40	50	56	42	54	61	66
0797	0761	22	0	0	14	26	0	11	28	38	9	30	42	57	34	49	56	61
0798 0894	0768 0814	24	8	29	41	50	24	41	50	57	40	51	59	63	54	63	67	70
0893	0813	22	0	0	14	26	0	11	28	38	9	30	42	51	34	49	56	61
0989	0885	27	0	0	18	35	0	15	38	51	11	40	56	67	45	65	75	81
0990 1050	0886 0964	30	11	40	55	67	33	55	67	75	53	69	79	84	73	84	90	94
1049	0963	27	0	0	18	35	0	15	38	51	11	40	56	67	45	65	75	81
1131	1023	35	0	0	5	31	0	0	34	58	0	38	70	83	49	79	98	112
1205	1139	43	0	0	8	41	0	0	46	77	0	51	94	111	65	106	130	149
1196 1280	1144 1284	38	0	15	40	55	0	38	57	70	33	59	75	84	63	82	91	99
1331	1223	43	0	0	5	27	0	0	30	51	0	34	62	73	43	70	86	98
1340	——	38	0	15	40	55	0	38	57	70	33	59	75	84	63	82	91	99
1447	1367	50	0	0	0	17	0	0	18	49	0	24	56	77	34	73	95	109
1484	1380	44	0	18	53	74	0	50	75	94	44	79	99	112	84	108	121	132
1594	1526	44	0	0	14	53	0	22	57	77	17	59	84	102	67	98	112	121
1597	1469	50	0	0	0	17	0	0	18	49	0	24	56	77	34	73	95	109
1788	1628	44	0	0	14	53	0	22	57	77	17	59	84	102	67	98	112	121
1980 2100	1770 1928	54	0	0	37	70	0	30	75	103	22	81	112	135	90	131	150	162
2262	2048	70	0	0	10	62	0	0	68	116	0	76	140	166	98	158	196	224
2410 2522 2662	2272 2448 ——	86	0	0	16	82	0	0	92	154	0	102	188	222	130	212	260	298
2892 3026 3194	2732 2850 2938	100	0	0	0	50	0	0	56	148	0	74	170	232	102	222	288	330

NOTES: For R-134A multiply charge by 0.99; For R-404A multiply charge by 0.91.; For R-502 multiply charge by 1.04.

Table 20. Flooded Charge T.D. Factor.

Ambient, °F	Design T.D.				
	30	25	20	15	10
+60	----	0.38	1.0	1.74	2.46
+40	0.59	0.80	1.0	1.19	1.40
+20	0.76	0.88	1.0	1.13	1.25
0	0.84	0.91	1.0	1.07	1.16
-20	0.88	0.93	1.0	1.05	1.13

Calculate Refrigerant Charge

Refrigeration operating charges are located in Table 18 for flooded condenser and Table 19 for fan cycling plus flooded condenser.

Charge for flooded condenser = summer charge (Table 18) + additional flooding charge (Table 18) * flooded charge T.D. factor (Table 20)

Charge for fan cycling + flooding = summer charge (Table 19) + additional charge for fan cycling (Table 19)

Example

Obtain the summer charge for a RC6 061. What is the flooding charge required to operate this condenser at 0° ambient at a 20°T.D. with R-22 refrigerant? What is the reduction in operating charge if fan cycling is combined with flooding?

Procedure

From Table 18, obtain the summer operating charge for a RC6-061 of 22 lbs. The charge for winter operation with flooded controls is equal to the summer operating charge of 22 lbs. plus the additional charge at 0° ambient (Table 18) of 64 lbs., times the flooded charge T.D. factor (Table 20) of 1.0 for 20°T.D.

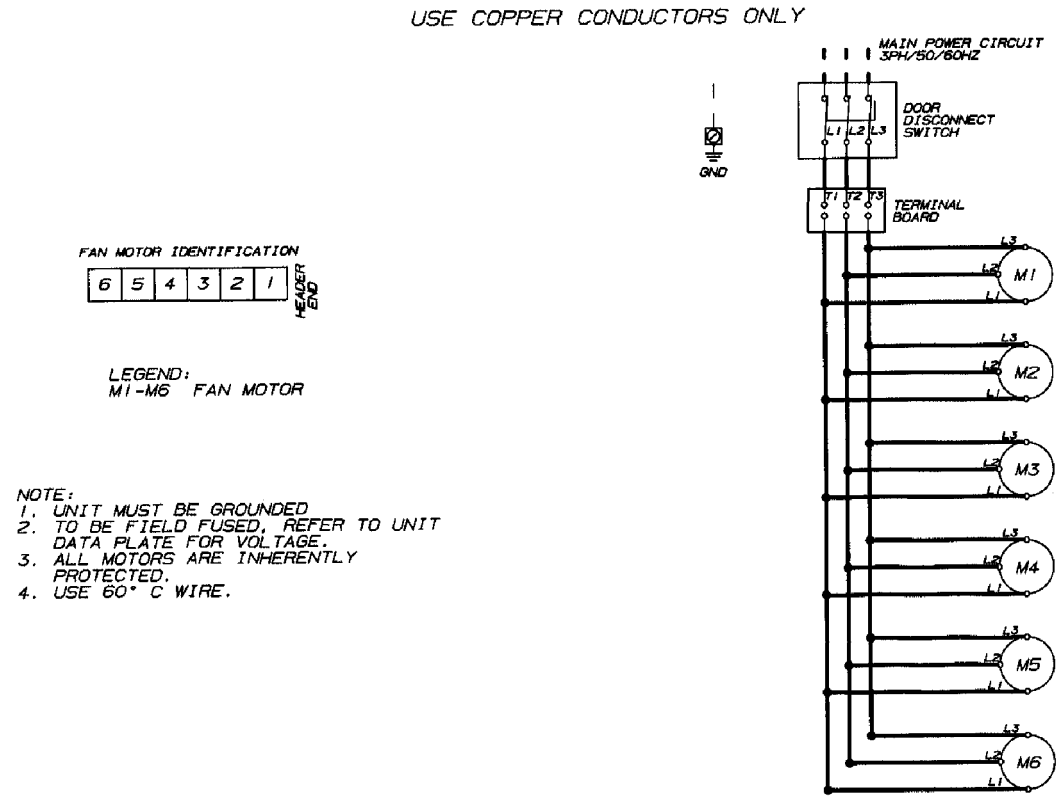
Charge for flooded condenser = 22 + (64) * 1.0
= 86 lbs.

The charge for fan cycling plus flooded condenser is obtained using Table 19. Using this table obtain the additional charge for 20°T.D. at 0° ambient, which is 28 lbs. The total charge is the summer charge (22 lbs.) plus the additional charge.

Charge for fan cycle + flooding = 22 + 28
= 50 lbs.

The savings in refrigerant charge = 86 - 50
= 36 lbs.

Diagram 1. Typical Condenser Wiring Diagrams With No Fan Cycle Controls



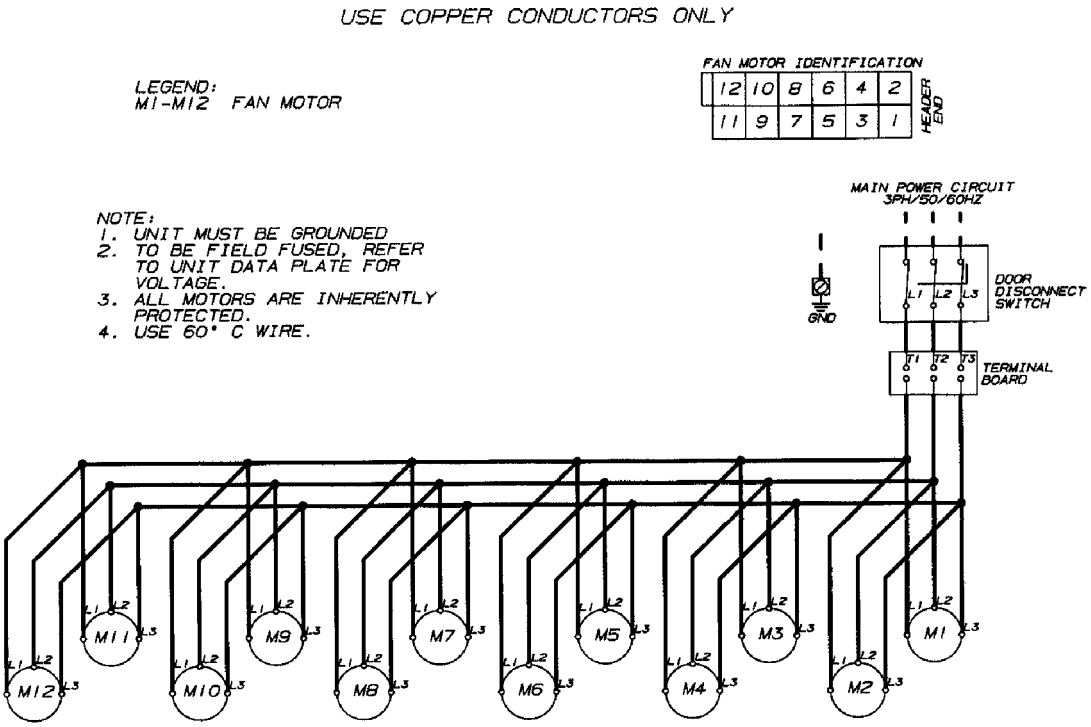


Diagram 2. Typical Condenser Wiring With Fan Cycle Controls

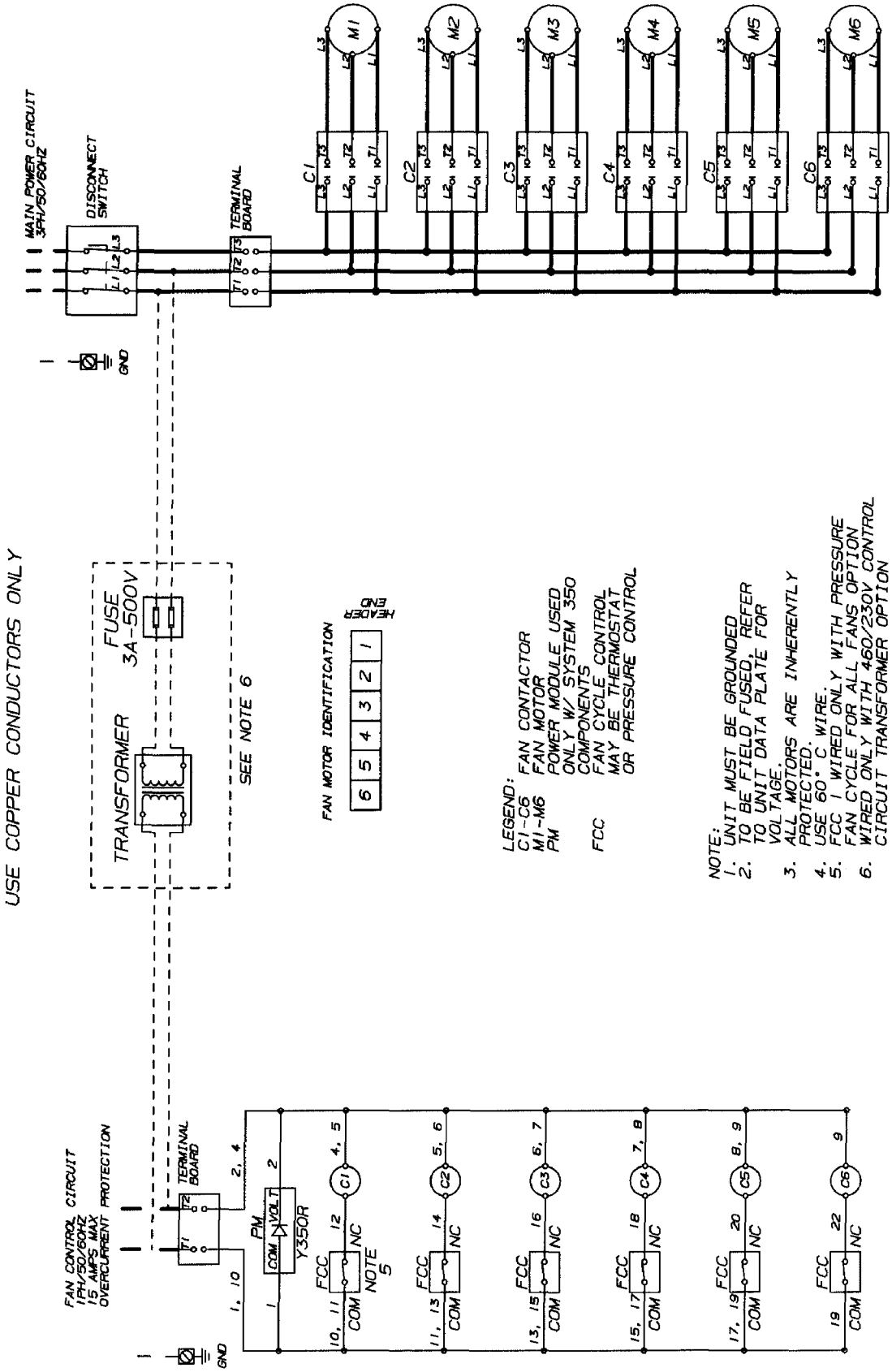
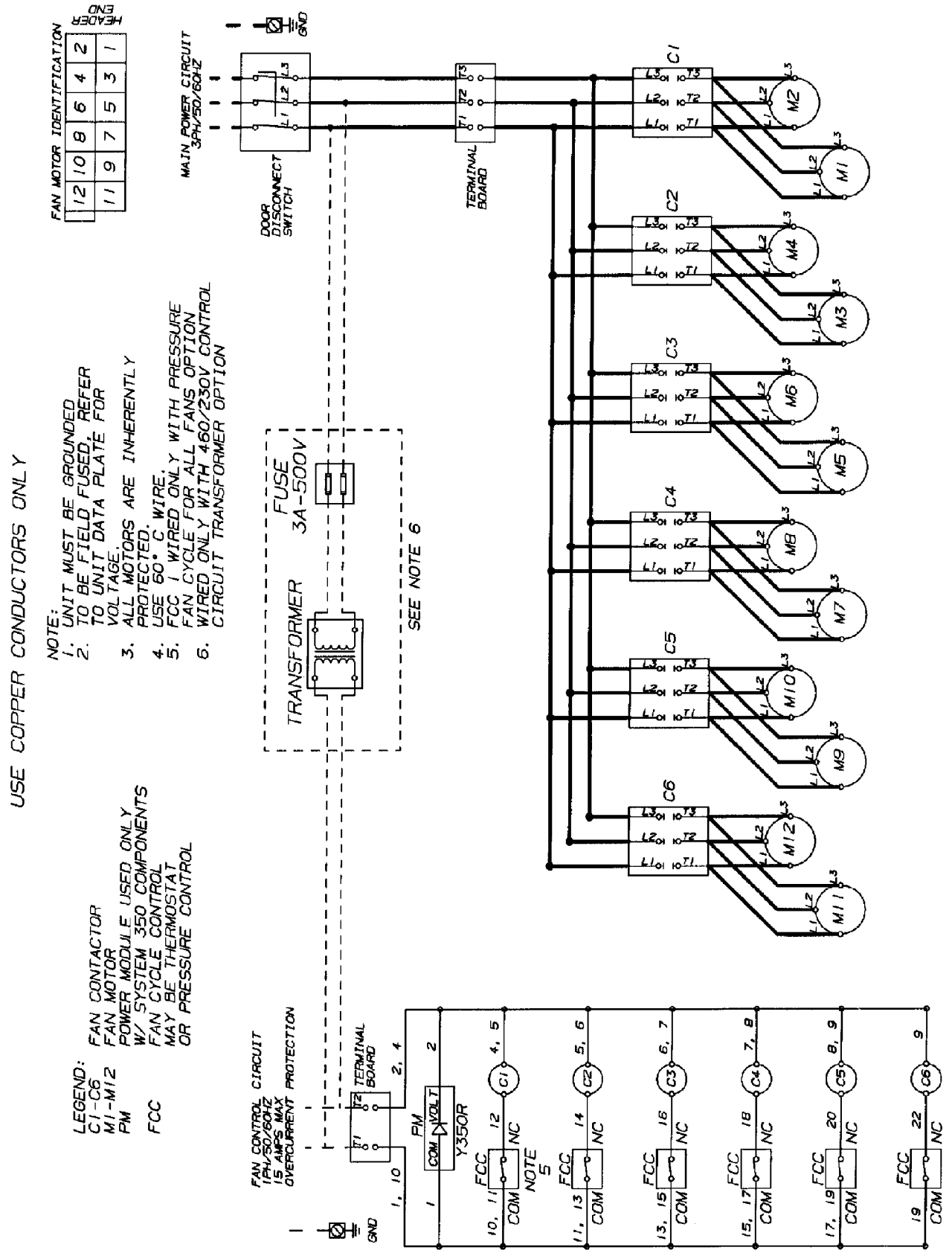


Diagram 3. Typical Condenser Wiring With Fan Cycle Controls



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