Bulletin DAC_O&I – 02
August 2016

Air Cooled Condenser
Installation and Operating Instructions

DAC Air Cooled Condensers

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For information pertaining to product dimensions and electrical and capacity data, please visit our website at www.can-coil.com or contact our offices at the locations below.

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Section 1. General Information

Cancoil air-cooled condensers have been carefully designed to provide years of reliable performance. They include many features and options that provide stable, efficient year round operation for low, medium and high temperature refrigeration applications. The wiring terminates at clearly marked terminals in the control panel and the controls are conveniently located for ease of adjustment. As with all refrigeration equipment, proper installation and set-up are required for maximum benefit.

Receiving Inspection - At delivery, inspect the equipment to make sure that the shipment is complete and there is no shipping damage. In the event of shipping damage or loss, note this on the delivery receipt and file a claim with the shipping company.

If concealed damage is found after delivery, immediately place a claim with the shipping company. Make arrangements for an inspector from the carrier to view the damage and make a determination as soon as possible.

Handling - Use proper equipment and technique when unloading and handling the condenser. Lift under the chassis with a forklift or with a spreader bar and hooks placed in the lifting holes provided in the unit. DO NOT PUT FORKS OR HOOKS UNDER THE CONDENSER COIL SECTION OF THE UNIT. Do not use the refrigerant piping as a lift point.

Unit Placement and Mounting - Allow 3 feet of clearance on all sides of the condenser section and at least 6 feet of clearance above the condenser section for proper airflow. Mechanical ventilation must be used if air-cooled equipment is located indoors. A minimum of 1000 cfm (of outside ventilation) per compressor horsepower must be supplied.

The unit should be securely anchored to a structural base to prevent movement. Avoid locations that may allow recirculation of the condenser airstream. Allow sufficient clearance around the unit for proper servicing and preventative maintenance. Follow all building codes and requirements regarding safe access to the equipment.

Catalog Products Limited Warranty

This product may be covered by Cancoil's catalog products limited warranty. For future reference, please record the following information in the space provided. Please retain this document.

Installation Date _____

Equipment Model No. _____ Equipment Serial No. _____

_____ _____

_____ _____

_____ _____

Section 2. Refrigeration Piping

All refrigeration hookups and piping should be done by a licensed mechanical contractor in accordance with applicable codes and standards. Copper tubing must be refrigeration grade only. Piping must be kept clean and dry and free of all debris and chips. Use high temperature silver solder or equivalent alloy for brazing. DO NOT USE SOFT SOLDER. To avoid oxidation inside the piping, purge the system with dry nitrogen during the brazing process. Remove all flux from the joints after brazing.

Refrigeration Line Sizes - The following information may be used to size liquid, suction and hot gas lines and suction risers for Cancoil refrigeration systems. It is based on published industry practice. The data in the tables are all based on the evaporator BTUH, at the condition given. Line lengths are based on EQUIVALENT FEET OF PIPE; allowances for valves and fittings must be included when using these tables.

Suction Line sizes are based on a pressure drop equal to 2 degrees per 100 equivalent feet of tubing. Liquid and Hot Gas lines are based on 1 degree per 100 equivalent feet. Factors are provided for other pressure drops. Suction riser capacity is the MINIMUM allowable that will return oil up a vertical riser at the given condition.

Discharge Line - The discharge line should be sized to prevent excessive pressure drop. Horizontal pipe runs should be pitched downward with a rate of 1" drop per 10 feet of length. Inverted traps should be used at the end of vertical risers to prevent liquid and oil from draining back down to the compressor.

Discharge Line – cont'd

Line Size Copper	Discharge Line Btuh for 1 Degree Pressure Loss per 100 Equivalent Ft. of Tubing at Suction Temperature and Refrigerant				
	-40		40		
OD	R 22	R 507	R 134a	R 22	R 507
0.5	10000	9000	4200	7000	6900
0.625	19000	17500	8000	13200	13000
0.75	32000	29000	13800	22500	22000
0.875	48000	44000	21000	35000	34000
1.125	100000	90000	43000	70000	68000
1.375	175000	155000	75000	121500	120000
1.625	275000	250000	118000	192000	190000
2.125	550000	500000	245000	397000	390000
2.625	1000000	900000	430000	700000	680000
3.125	-	-	690000	-	-

Notes:
use a 1.46 multiplier for 1 degree per 50'
use a 0.68 multiplier for 1 degree per 200'

Discharge Risers – Discharge risers should be sized to assure oil flow up to the condenser. On systems with parallel compressors or systems with cylinder unloading, the risers must be sized for the minimum system capacity.

Line Size Copper	Cond. Temp. 80 thru 120 Deg		
	R 22	R 507	R 134a
0.5	3225	2595	2419
0.625	5775	4647	4331
0.75	9525	7664	7144
0.875	14400	11587	10800
1.125	28050	22570	21038
1.375	47400	38140	35550
1.625	73350	59021	55013
2.125	146400	117801	109800
2.625	252000	202772	189000
3.125	393000	316228	294750

Liquid Line - The liquid line should be sized to prevent excessive pressure drop and to assure a solid liquid column to the expansion valve. If the liquid line is routed through an area that will cause HEAT GAIN, it must be insulated.

Line Size Copper	Liquid Line Btuh for 1 Degree Pressure Loss per 100 Feet of Tubing		
OD	R 134a	R 22	R 507
0.500	36000	45000	28000
0.625	70000	85000	52000
0.750	120000	150000	90000
0.875	180000	225000	140000
1.125	360000	450000	300000

Note:

use a 1.46 multiplier for 1 degree per 50'

use a 0.68 multiplier for 1 degree per 200'

Liquid Receivers - The receivers should be sized to hold the condenser winter charge (page 8) plus the evaporator charge plus the suction line charge. Receivers should be sized with a 20% safety factor.

Suction Line - The suction line should be properly sized and installed to insure oil return to the compressor. Horizontal pipe runs should be pitched downward with a rate of 1" drop per 10 feet of length. Suction lines should be insulated to minimize external heat gain and condensation, which could drip on unprotected objects causing unforeseen damage.

Line Size Copper	Suction Line Btuh for 2 Degree Pressure Loss per 100 Equivalent Ft. of Tubing at Suction Temperature and Refrigerant												
	-40		-20		0			20			40		
OD	R 22	R 507	R 22	R 507	R 134a	R 22	R 507	R 134a	R 22	R 507	R 134a	R 22	R 507
0.500	-	-	-	-	-	-	-	-	4500	4600	4200	7000	6900
0.625	-	-	3800	3500	3200	6000	5600	5100	9100	8700	8000	13200	13000
0.750	-	-	6500	5900	5500	10200	9600	8800	15500	14800	13800	22500	22000
0.875	6000	5400	10000	9000	8500	16000	14500	13500	24000	23000	21000	35000	34000
1.125	12300	11000	20500	18500	17000	32000	30000	28000	48000	46000	43000	70000	68000
1.375	22000	19400	36000	32500	30000	56000	52000	48000	84000	80000	75000	121500	120000
1.625	34000	30000	56000	50500	48000	88000	83000	77000	133000	128000	118000	192000	190000
2.125	72000	63000	118000	105000	100000	185000	170000	160000	277000	265000	245000	397000	390000
2.625	126000	110000	210000	185000	175000	325000	300000	280000	490000	460000	430000	700000	680000
3.125	200000	175000	330000	295000	280000	520000	480000	450000	780000	740000	690000	-	-

Notes:

use a 1.46 multiplier for 2 degree per 50' of tubing

use a 0.68 multiplier for 2 degree per 200' of tubing

Suction Risers - Vertical suction risers should be installed with a trap at the bottom and should have 1 additional trap per 20 feet of vertical rise. Vertical risers must be sized for proper oil return.

Line Size Copper	MINIMUM Suction Riser Btuh for Oil Return at Suction Temperature and Refrigerant												
	-40		-20		0			20			40		
OD	R 22	R 507	R 22	R 507	R 134a	R 22	R 507	R 134a	R 22	R 507	R 134a	R 22	R 507
0.5	900	700	1200	1000	1100	1400	1200	1300	1800	1500	1700	2200	1900
0.625	1700	1300	2300	1900	2100	2600	2200	2400	3300	2800	3100	4000	3600
0.75	2900	2300	3800	3200	3600	4500	3700	4100	5600	4800	5300	6900	6100
0.875	4500	3500	6000	5000	5600	7100	5800	6500	8800	7500	8300	10800	9600
1.125	9200	7200	12500	10300	11500	14500	12000	13300	18000	15400	17100	22200	19700
1.375	16500	12500	22000	18100	20200	25600	21100	23300	31600	27100	30100	39100	34600
1.625	26000	20000	34500	28600	31900	40500	33400	36900	50100	42900	47700	62000	54800
2.125	54000	41000	71000	59000	47600	60400	49800	55100	74700	64000	71100	92400	81800
2.625	70000	53000	90000	75800	84600	107400	88400	97900	132700	113700	126300	164200	145300
3.125	110000	83000	145000	120000	134000	170000	140000	155000	210000	180000	200000	260000	230000

Section 3. Electrical Wiring and Sequence of Operations

Cancoil air-cooled condensers are available with a variety of optional fan cycling controls, however many units are shipped without fan controls.

Check the unit wiring diagram for specific information regarding the model in question.

Section 4. Leak Testing and Charging

All hook-up, evacuation, testing and charging work must be done by a licensed refrigeration contractor. ***Proper procedures must be followed at all times to prevent venting of harmful refrigerants to the environment.***

Leak Testing - The system should be leak tested after all pipe connections have been made. Leak test at 175 PSIG (or higher if required by local code) with all flow control valves in the system open. A mixture of refrigerant (35 PSIG) and nitrogen (to the test pressure) should be used with an electronic leak detector. Leaks should be marked, isolated and repaired.

Evacuation - Proper evacuation and charging are critical for proper system performance, especially when using the newer refrigerants and ester oils, which have a high affinity for water. Use a good vacuum pump designed specifically for this duty.

Connect the vacuum pump to both the high side and the low side of the system with 1/4" minimum ID Copper tubing. Evacuate the system for at least 2 hours and to a pressure of 250 microns. Isolate the system with a hand valve to check the pressure.

Charging - Before starting the unit, check all electrical and mechanical connections for looseness that may have occurred during shipment. Tighten any loose connections. Proper charging procedure should be followed.

Section 5. Start-up and Check Out Procedures

1. Check the supply voltage when the system is operating. It must be within 10% of the unit nameplate voltage.
2. Check the amperage on the fan motor(s). It must be less than the value listed on the unit nameplate. The amperage on each leg must agree within 2%.
3. Verify the fan rotation direction.
4. Check that the Thermal Contacts from the Motor (if supplied) are incorporated into Control System for the Cancoil Unit.
5. Check that the VFD (if part of Control System) is wired to Fan Motor(s) through a 'Sine Wave' Filter.
6. Check the VFD (if part of the Control System) Minimum Speed Setting is 20% of the Nominal Nameplate Rating.
7. Check the operating control settings. See Section 6.

Section 6. Controls and Adjustment

The following table summarizes the controls and options typically found on Cancoil condensing units. Even though many units are ordered fully equipped with all the standard features, some units are specially configured for a particular application or specific location. These may have been built without some features, or may have additional options installed. It is important to inspect each unit at start-up and before service or maintenance to determine which components have been installed.

Low Ambient Features & Control Options

Air Cooled Condenser Feature	CAC & DAC
No Fan Controls	std
Single Fan Contactor with Thermostat	opt
Multiple Fan Contactor with Thermostats	opt
Multiple Fan contactors with Vari-speed Motor	opt
Condenser Flooding Control	opt

The following paragraphs describe the function and adjustment of the various components.

Cancoil offers a combination of ambient fan cycling and condenser flooding that has been proven effective in maintaining a stable head pressure throughout the seasons. The control system must be adjusted at start-up for proper operation. No further seasonal adjustment is required after this.

Condenser Ambient Fan Cycling Control – With all fans running, the condensing temperature will normally range from 10 to 30 degrees above the outdoor ambient temperature. The actual amount depends on the individual compressor/ condenser combination.

If the resulting head pressure is too low for proper system operation, it can be raised by cycling fans off and on in response to changes in the outdoor ambient temperature. Fan cycling thermostats should be adjusted according to the number of condenser fans as follows:

Total No. of Fans	Approximate Fan Control Settings for 95 Ambient & 115 CT					
	1st Stage	2nd Stage	3rd Stage	4th Stage	5th Stage	6th Stage
1	ON	-	-	-	-	-
2	ON	82	-	-	-	-
3 or 6*	ON	72	88	-	-	-
4 or 8*	ON	65	82	90	-	-
5 or 10*	ON	59	76	86	91	-
6 or 12*	ON	54	72	82	88	92

Note: * indicates fans cycled in pairs

The ambient fan cycling controls will maintain a condensing temperature of about 115 degrees whenever the outdoor temperatures are greater than the values shown above. If the system is expected to operate at temperatures below the minimum outdoor ambient temperatures, additional head pressure control measures are required.

Head Pressure Control Valve – If the outdoor ambient falls below the value in table above, a head pressure control valve is required to maintain stable head pressure. This control functions by allowing some of the hot gas to bypass the condenser whenever the head pressure falls below the setpoint. This causes liquid refrigerant to back up into the condenser tubes, flooding some of the tube surface. The condenser capacity is reduced and the head pressure rises. During periods of warm outdoor temperature, the liquid returns to the refrigerant receiver, and the condenser returns to full capacity.

Refrigerant Operating Charge - In order for the head pressure control valve to function properly, there must be sufficient refrigerant charge in the receiver to flood the condenser and still maintain a liquid seal at the receiver outlet. The following table lists summer operating charge for the condensing unit and the *EXTRA REFRIGERANT CHARGE* required to partially flood the condenser for low ambient operation.

Model	Summer Lbs.	Maximum Extra Lbs.	Approximate Extra Winter Charge (Lbs.)					
			Minimum Outdoor Ambient					
			-40	-20	0	20	40	60
Inline Models								
DAC 012	6.2	18.3	15.7	13.1	10.5	7.8	5.2	2.6
DAC 016	9.1	26.9	23.1	19.2	15.4	11.5	7.7	3.8
DAC 023	12.4	36.1	30.9	25.8	20.6	15.5	10.3	5.2
DAC 026	12.4	36.1	30.9	25.8	20.6	15.5	10.3	5.2
DAC 030	17.7	52.9	45.3	37.8	30.2	22.7	15.1	7.6
DAC 033	17.7	52.9	45.3	37.8	30.2	22.7	15.1	7.6
DAC 035	17.7	52.6	45.1	37.6	30.1	22.5	15.0	7.5
DAC 040	17.7	52.6	45.1	37.6	30.1	22.5	15.0	7.5
DAC 044	26.4	78.9	67.6	56.4	45.1	33.8	22.5	11.3
DAC 050	26.4	78.9	67.6	56.4	45.1	33.8	22.5	11.3
DAC 052	24.1	71.5	61.3	51.1	40.9	30.6	20.4	10.2
DAC 060	48.8	149.3	128.0	106.6	85.3	64.0	42.7	21.3
DAC 066	48.8	149.3	128.0	106.6	85.3	64.0	42.7	21.3
DAC 071	61.5	186.5	159.9	133.2	106.6	79.9	53.3	26.6
DAC 079	61.5	186.5	159.9	133.2	106.6	79.9	53.3	26.6
DAC 082	81.3	248.6	213.1	177.6	142.1	106.5	71.0	35.5
DAC 090	81.3	248.6	213.1	177.6	142.1	106.5	71.0	35.5
DAC 095	98.2	298.2	255.6	213.0	170.4	127.8	85.2	42.6
DAC 098	98.2	298.2	255.6	213.0	170.4	127.8	85.2	42.6
DAC 108	98.2	298.2	255.6	213.0	170.4	127.8	85.2	42.6
Duplex Models								
DAC 048	24.8	72.2	61.9	51.6	41.3	30.9	20.6	10.3
DAC 054	24.8	72.2	61.9	51.6	41.3	30.9	20.6	10.3
DAC 062	35.4	105.8	90.7	75.6	60.5	45.3	30.2	15.1
DAC 068	35.4	105.8	90.7	75.6	60.5	45.3	30.2	15.1
DAC 070	35.4	105.2	90.2	75.1	60.1	45.1	30.1	15.0
DAC 080	35.4	105.2	90.2	75.1	60.1	45.1	30.1	15.0
DAC 088	52.8	157.8	135.3	112.7	90.2	67.6	45.1	22.5
DAC 100	52.8	157.8	135.3	112.7	90.2	67.6	45.1	22.5
DAC 104	48.2	143	122.6	102.1	81.7	61.3	40.9	20.4
DAC 120	97.6	298.6	255.9	213.3	170.6	128.0	85.3	42.7
DAC 132	97.6	298.6	255.9	213.3	170.6	128.0	85.3	42.7
DAC 142	123	373	319.7	266.4	213.1	159.9	106.6	53.3
DAC 158	123	373	319.7	266.4	213.1	159.9	106.6	53.3
DAC 164	162.6	497.2	426.2	355.1	284.1	213.1	142.1	71.0
DAC 180	162.6	497.2	426.2	355.1	284.1	213.1	142.1	71.0
DAC 190	196.4	596.4	511.2	426.0	340.8	255.6	170.4	85.2
DAC 196	196.4	596.4	511.2	426.0	340.8	255.6	170.4	85.2
DAC 216	196.4	596.4	511.2	426.0	340.8	255.6	170.4	85.2

To assure sufficient charge for winter conditions, and to avoid nuisance high-pressure trips in summer conditions, the extra refrigerant required to flood the condenser should be weighed into the system. Do this when the system is operating with its summer charge. Make sure that all fans are “on” when adding the extra winter charge.