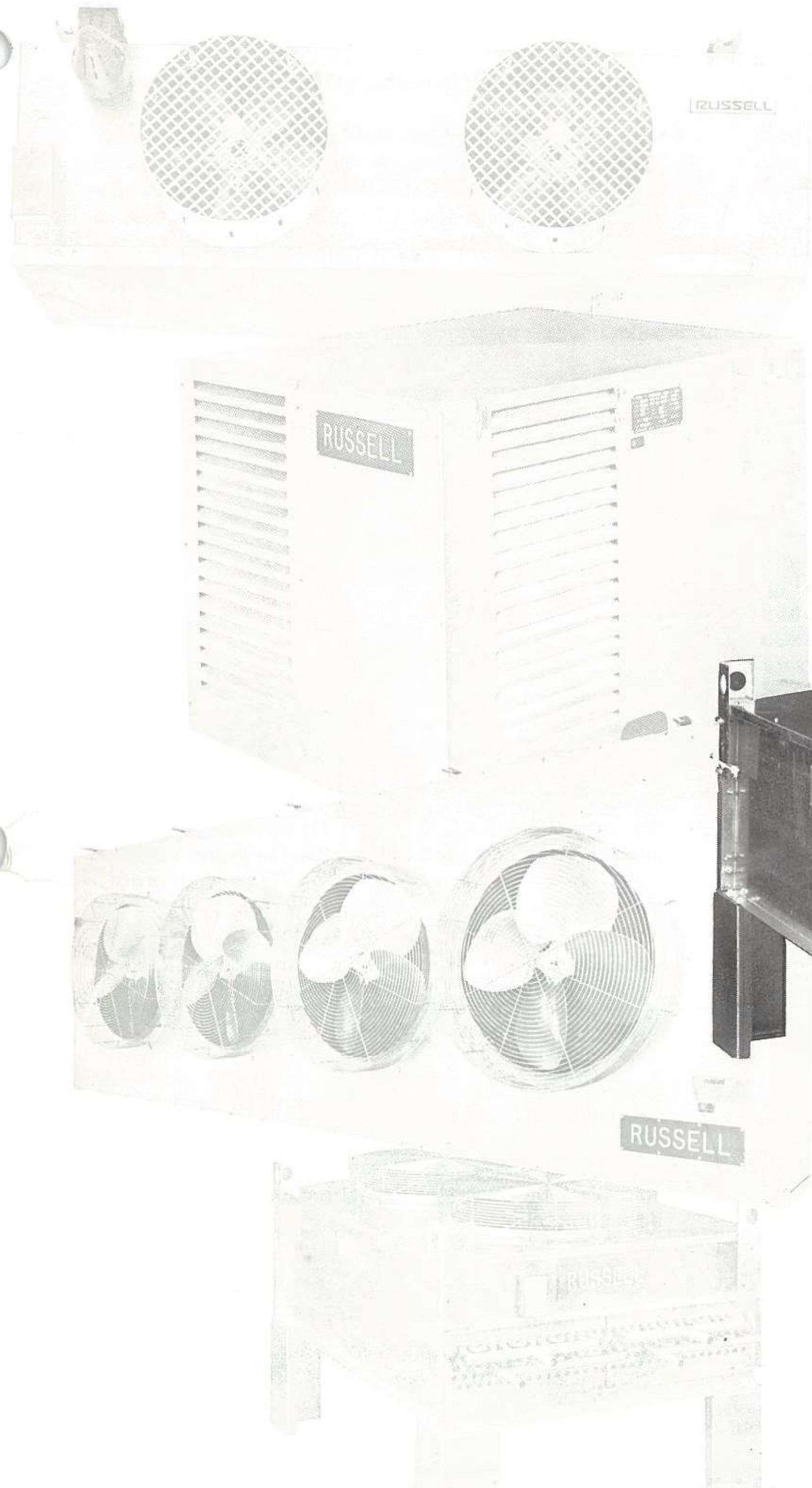
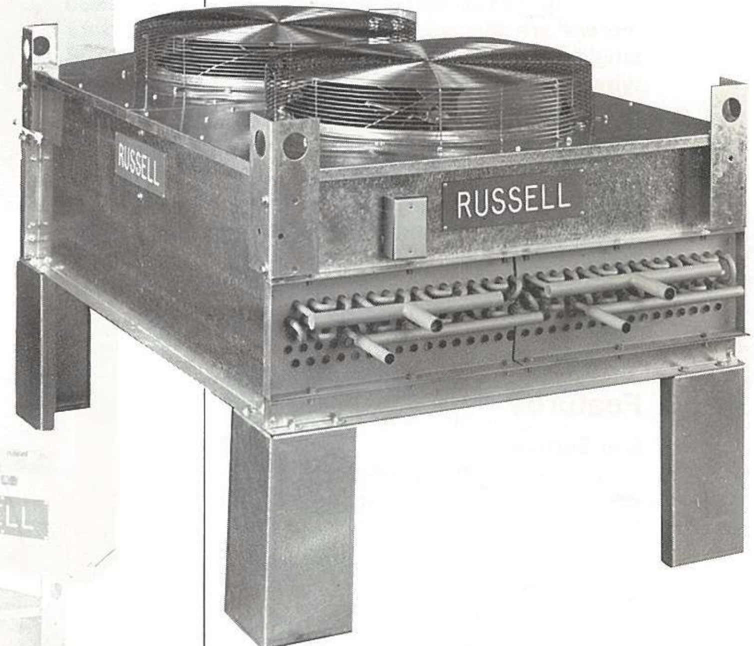
TECHNICAL
BULLETIN

MAY 83

TD TB RAC



THERMO-TEMP AIR COOLED CONDENSERS



Russell

Russell Coil Company

221 South Berry Street   Brea, California 92621

Russell Thermo-Temp Air Cooled Condensers

General

Russell Thermo-Temp Air cooled condensers, models RAC, TD and TB cover 38 different models from ¾ thru 108 nominal tons.

Models RAC, available in capacities ranging from ¾ tons through 3 tons are direct drive arranged with legs for horizontal or vertical discharge. Fan motors on these units are shaded-pole internally protected, 1050 RPM, mounted on heavy motor supports inside the housing.

Models TD, Direct-drive vertical discharge only (vertical & horizontal standard 5-8.5), are available in capacities from 5 tons through 108 tons. Fan motors are permanent split-capacitor type, ball bearing, permanently lubricated, thermally protected. Motors are 200-230 volt, 60 cycle, single phase. Three phase motors are also available. TD 5 thru 37 wired for single phase connection as standard. TD 45 thru 108 wired for three phase connection. Standard TD Models (units without fan control) UL-CSA listed.

Models TB, belt-drive, vertical discharge only, are available in capacities from 26 tons through 90 tons. Belt drive fans have individual three phase motors. Motors are permanently lubricated, ball bearing 230/460 volt, 60 cycle, 3 phase. All motors have inherent thermal protection. Motors for operation on 208 volt systems are available - specify on order.

Features

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

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

Bearings
Heavy duty industrial type ball bearings and heavy steel shafts are standard on all units (Models TB) equipped with belt drive fans. Bearings used have an average life expectancy of 200,000 hours. All bearings are sealed assuring containment of the lubricant and exclusion of contaminants.

Mechanical Specifications

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

Housings
The smaller capacity RAC & TD 5-8.5 model casings are constructed from heavy gauge textured aluminum. Models TD 9.5 & larger and Models TB are made from sturdy, heavy gauge, galvanized steel, designed to provide maximum housing rigidity as well as to provide excellent resistance against corrosion. Large access panels are provided on TB Models.

Fans
All RAC & TD fan blades are constructed of heavy gauge aluminum. Fan blades for TB Models are heavy steel construction coated with zinc-iridite. Fans on all models are operated at low tip speeds and are statically balanced and factory run before shipment.

Motors and Wiring
All motors for RAC, TD, and TB are equipped with inherent overload protectors rated for group installation. Direct drive motors on Models TD are drip proof, permanent split capacitor type, ball bearing. Belt driven fan motors, Models TB, are three phase, open drip-proof types, positioned inside the housing for weather protection, mounted on adjustable bases. All units are factory wired. All leads are marked and terminated in a readily accessible junction box.

Drive and Bearings
All belt drive units, Models TB, have motors and bearings mounted on a common base. Bearings are mounted in a heavy cast iron frame. Each bearing is provided with lube lines to external grease fittings as standard equipment.

Optional Features

Fan Cycling Controls
Cycles condenser fan(s) in response to ambient temperature on multiple fan units. (Models TD and TB only).

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

Selecting Your Russell Thermo-Temp Air Cooled Condenser

Based on Total Heat Rejection at the Condenser

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

Heat Rejection Factors / Compressor Capacity X Factor = Condenser Load

Table 1 Open Compressors

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

Table 2 Suction Cooled Compressors

Temp. Evap.	Condensing Temperature 90	100	105	110	115	120	125	130
-40	1.67	1.71	1.75	1.79	1.84	1.90	*	*
-35	1.63	1.67	1.70	1.73	1.78	1.83	*	*
-30	1.58	1.62	1.65	1.68	1.72	1.77	*	*
-25	1.54	1.58	1.60	1.64	1.67	1.71	1.76	*
-20	1.49	1.53	1.56	1.58	1.63	1.66	1.70	1.75
-15	1.46	1.50	1.52	1.54	1.58	1.62	1.65	1.69
-10	1.42	1.46	1.48	1.50	1.53	1.57	1.62	1.64
0	1.36	1.40	1.42	1.44	1.47	1.50	1.54	1.56
10	1.31	1.34	1.36	1.38	1.40	1.43	1.47	1.49
20	1.26	1.29	1.31	1.33	1.35	1.37	1.40	1.43
30	1.22	1.25	1.26	1.28	1.30	1.32	1.35	1.37
40	1.18	1.21	1.22	1.24	1.26	1.27	1.30	1.32
50	1.14	1.17	1.18	1.20	1.21	1.23	1.25	1.27

Total Heat Rejection, MBH — R-12***

Table 3 Models RAC

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

Table 4 Models TD Vertical Discharge

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

Table 5 Models TD & TB Vertical Discharge

TD*	26**	31**	35**	37	45	51	55	62	73	83	90	108
10	124.0	152.4	165.0	177.5	217.5	244.5	264.5	295.0	350.5	400.0	426.5	497.0
15	185.0	228.5	247.0	266.0	326.0	366.0	397.0	442.0	526.0	600.0	639.0	745.0
20	248.0	304.7	330.0	355.0	435.0	489.0	529.0	590.0	701.0	800.0	853.0	993.0
25	310.0	380.9	412.0	444.0	544.0	611.0	661.0	737.0	876.0	999.0	1065.0	1243.0
30	370.0	457.0	495.0	533.0	653.0	733.0	794.0	885.0	1052.0	1200.0	1279.0	1490.0

* TD Temperature difference between entering air & condensing temperature
** TD & TB in these sizes are dimensionally different. See Page 9.
*** For R22 or R502 multiply load by .952 then select unit

Selection Example

Example

Suction Cooled Compressor	285,000 BTUH
Belt Driven Condenser	
Evaporator or Suction Temp.	40°F
Refrigerant	R-12
Condensing Temp. Desired	120°F
Ambient Air Design Temp.	95°F
Temperature Difference (TD)	25°F

Solution

Step 1. From Table 2, opposite 40° Evaporator Temp. and under 120° condensing, select heat rejection factor of 1.27.

Step 2. Multiply net refrigerating effect by this factor:
285,000 X 1.27 = 361,950 BTUH

Step 3. From page 2, Table 5, opposite 25° TD, select Thermo-Temp Model TB-31.

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

Air Conditioning	25° TD
High & Medium Temperature Refrigeration	20° TD
Low Temperature Refrigeration	15° TD

How To Divide Thermo-Temp into Multiple Systems

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

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

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

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

Step 3.
In the "Example," where all compressors are suction cooled and the specifications call for a vertical discharge condenser, the total condenser heat rejection requirement was found to be 162,902 BTUH. Referring to Table No. 4, opposite 20° TD, it is readily seen that Model TD-17 meets the heat rejection requirements and is the indicated selection.

Step 4.
Determine the portion of the total condenser surface required for each system. This information is required by Russell along with the net refrigeration effect and suction temperature to calculate individual circuiting for each system. This information is also useful in establishing refrigerant charge covered in Table 13.

Example / Based on 90° Design Ambient

Compr.	Refrig. Type	Suction Temp.	Cond. Temp.	TD	BTUH Evap. NRE		THR Factor Table 1 or 2		Base Mult. for TD Table7		Refrig. Type Mult. Table 6		Corrected Total Heat Rej.	% of Unit Surface for Each System
1	R-12	+20°	110°	20°	14000	X	1.33	X	1	X	1.0	=	18620	18620 / 162,902 X 100 = 11.4
2	R-12	+20°	110°	20°	10000	X	1.33	X	1	X	1.0	=	13300	13300 / 162,902 X 100 = 8.2
3	R502	- 20°	105°	15°	30000	X	1.56	X	1.33	X	.952	=	59256	59256 / 162,902 X 100 = 36.4
4	R-12	+30°	110°	20°	14500	X	1.28	X	1	X	1.0	=	18560	18560 / 162,902 X 100 = 11.4
5	R-12	+20°	110°	20°	12500	X	1.33	X	1	X	1.0	=	16625	16625 / 162,902 X 100 = 10.2
6	R502	- 20°	105°	15°	18500	X	1.56	X	1.33	X	.952	=	36541	36541 / 162,902 X 100 = 22.4
													THR = 162,902	↑ Using this as divisor

Select TD 17 from Table 4

Table 6 Refrig. Type Multiplier

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

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

Table 7 Base Multiplier on TD

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

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

Low Ambient Head Pressure Controls

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

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

Fan Cycling Head Pressure Control* (1)

The optional fan cycling head pressure control is available on all multiple fan condenser models TD and TB and offers satisfactory head pressure control for ambient air temperatures as low as the minimum temperatures listed in Tables 8 and 9. The control package consists of one or two ambient air temperature-sensing thermostats and any required contactors mounted in a weatherproof control box. All components are factory wired for one or multiple step fan control. Should field adjustment of the thermostat(s) be required, recommended cut-in and cut-out settings also are listed in Tables 8 and 9.

The fan section of each Russell Thermo-Temp condenser is fully partitioned to prevent air by-pass through venturi section where fan(s) has cycled.

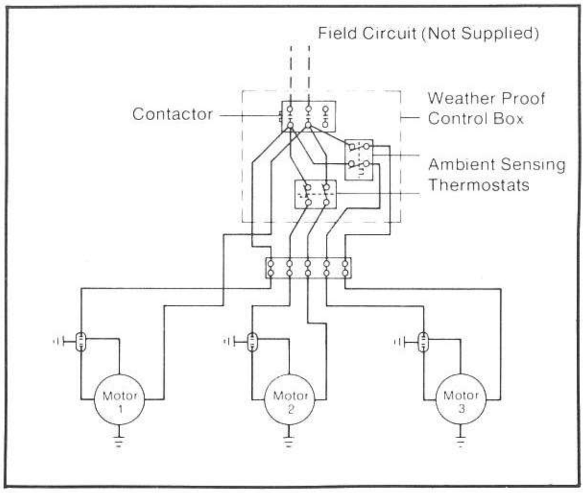
Table 8 Models TD-9.5 to TD-17, TB-26 to TB-90
Models TD-31 and TD-37

Design TD	Min. Outside Temp. °F	TD @ Min. Outside Temp. & 90° Cond.	Thermostat Setting Cut in	Thermostat Setting Cut out
30	35	55	63	57
25	45	45	68	62
20	54	36	73	67
15	63	27	78	72
10	72	18	83	77

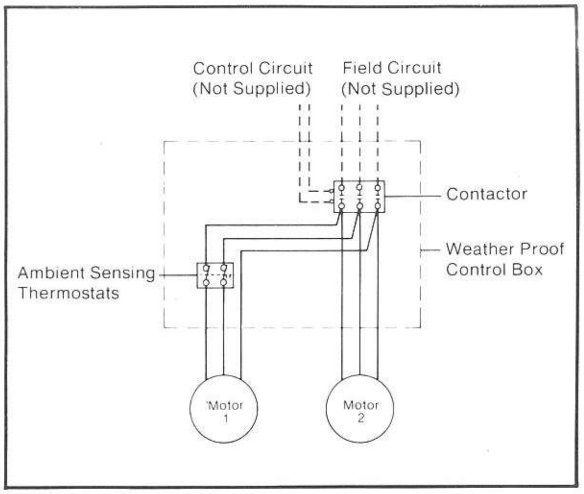
Table 9 Models TD-19 to TD-26
Models TD-45 to TD-108

Design TD	Min. Outside Temp. °F	TD @ Min. Outside Temp. & 90° Cond.	Thermostat Settings Thermostat 1 Cut in	Thermostat 1 Cut out	Thermostat 2 Cut in	Thermostat 2 Cut out	(TD108 only) Thermostat 3 Cut in	Thermostat 3 Cut out
30	15	75	63	57	51	45	41	35
25	27	63	68	62	58	52	48	42
20	40	50	73	67	65	59	55	49
15	52	38	78	72	72	66	62	56
10	65	25	83	77	79	73	69	63

Typical Fan Cycle Wiring Diagrams

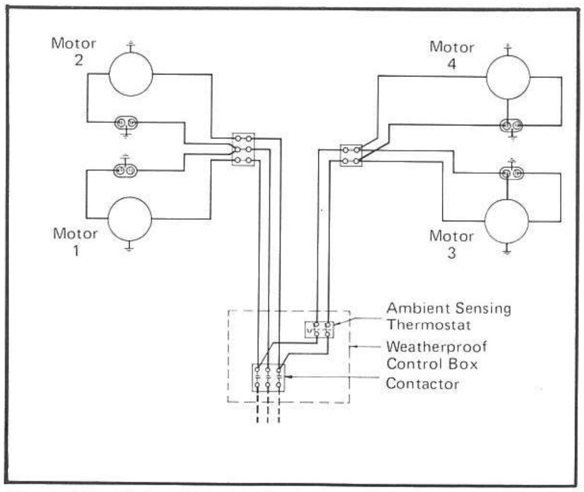


Direct Drive Units / Fan Cycling Head Pressure Control
Models TD19- 26 / 230V, 1ø

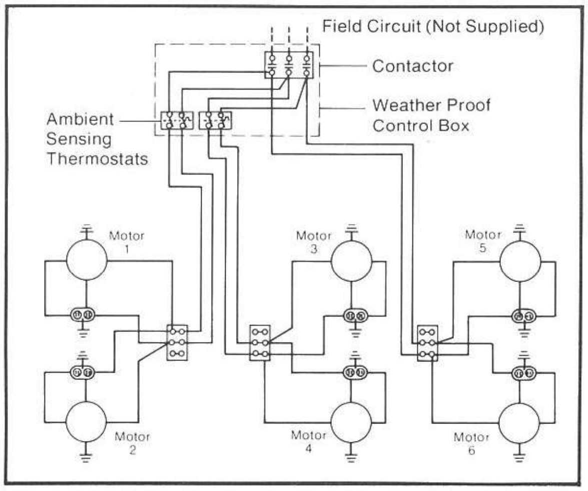


Belt Drive Units / Fan Cycling Head Pressure Control
Models TB26- 90 / 230V, 3ø Field Circuit 230V, 1ø Control Circ

*Fan cycling head pressure control package not available for Models RAC.

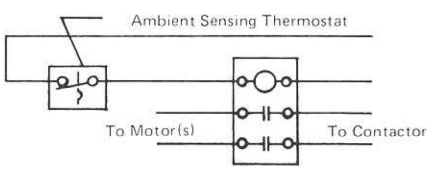


Direct Drive Units Fan Cycling Head Pressure Control
Models TD 31–37 / 230 V, 3 ø



Direct Drive Units Fan Cycling Head Pressure Control
Models TD45, 51, 55/230V, 3ø

460 Volt Connection Diagram



Fan Cycle
Contactor
460 Volts Only

Valve Installation Flooded-Type Head Pressure Control (2)

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

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

* Including Flooded Condenser see Page 7

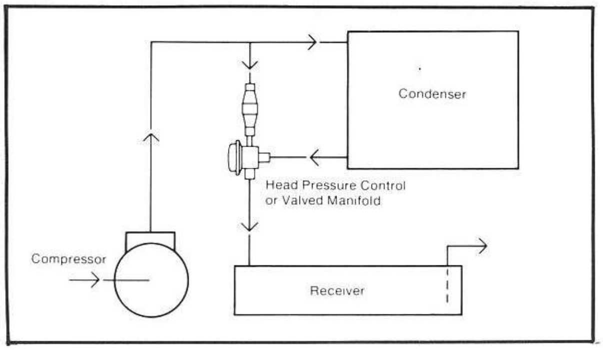


Figure 1

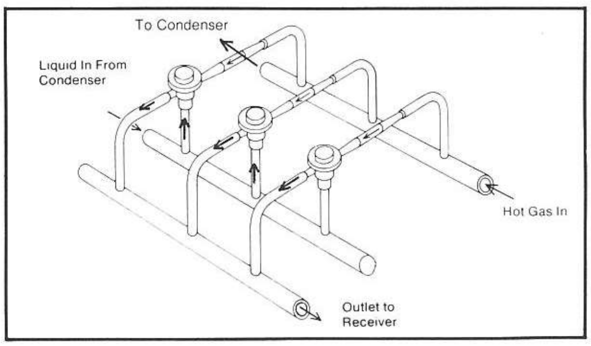


Figure 2

Flooded-Type Head Pressure Control (2)

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

How the Valves Work

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

Valve Selection

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

Select valves from Table 10 Do not undersize.

Table 10 Condenser Flooding Valve Capacities

Refrigerant-12 Maximum Capacity Tons(*)	Model	Refrigerant-22 Maximum Capacity Tons(*)	Model	Refrigerant-502 Maximum Capacity Tons(*)	Model
15	A-1	21	A-2	12	A-5
30	B-1	42	B-2	24	B-5
45	C-1	63	C-2	36	C-5
60	D-1	84	D-2	48	D-5
75	E-1	105	E-2	60	E-5
90	F-1	120	F-2	72	F-5
120	G-1	—	—	110	G-5

*Net Refrigeration Effect at the Evaporator

Table 11 Connection Sizes

Model	Single Valve or Valves Manifold Hot Gas In	Liquid Out
A	⅞″ ODS	⅝″ ODS
B	1⅜″ ODS	⅞″ ODS
C	1⅝″ ODS	1⅛″ ODS
D	2⅛″ ODS	1⅜″ ODS
E	2⅝″ ODS	1⅜″ ODS
F	2⅝″ ODS	1⅝″ ODS
G	2⅝″ ODS	1⅝″ ODS

Table 12 Valve Settings (PSIG)

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

Refrigerant Charge

The summer design refrigerant charge necessary for effective system operation is the sum of operating charge for the evaporator, refrigerant piping (suction, liquid and discharge lines), condenser and receiver. The pump-down capacity of the receiver should be somewhat greater (10% to 15%) than the total refrigerant charge required. When using the Russell low-ambient control system, additional refrigerant, over and above the summer design system charge, must be added to the system to allow for condenser flooding. The amount of this added charge is determined by the ambient in which the condenser will operate. Table 13 below lists the total unit charge for all Russell single system Thermo-Temp condensers.

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

From example page 3

System	% Surface				Unit Chg.		#
1	11.4	÷	100	X	80	=	9.1
2	8.2	÷	100	X	80	=	6.6
3	36.4	÷	100	X	80	=	29.1
4	11.4	÷	100	X	80	=	9.1
5	10.2	÷	100	X	80	=	8.1
6	21.4	÷	100	X	80	=	17.2

Table 13 Operating Charges*/R-12 (Lbs.)**

Condenser Model Number	Ambient Above 60°F Unit Charge	Ambient Between 60°F & 20°F Unit Charge	Ambient Below 20°F Unit Charge
RAC-¾	0.6	2.0	3.0
RAC-1	0.8	2.7	4.0
RAC-1½	1.0	3.5	5.0
RAC-2	1.7	5.7	8.0
RAC-3	2.3	8	11
TD-5	4.0	13	19
TD-6.5	5.0	17	24
TD-7.5	6.0	20	28
TD-8.5	8.0	27	38
TD-9.5	7.0	24	33
TD-13	10.0	34	47
TD-15.5	14.0	48	65
TD-17	17.0	58	80
TD-19	16.0	55	76
TD-23	20.0	68	95
TD-26	25.0	85	120
TD-31	28.0	96	130
TD-35	34.0	116	160
TD-37	43.0	140	240
TB-26	23.0	78	110
TB-31	30.0	100	140
TB-35	36.0	120	170
TB-37	43.0	140	204
TD,TB-45	44.0	150	208
TD,TB-51	54.0	180	256
TD,TB-55	64.0	210	304
TD,TB-62	51.0	170	242
TD,TB-73	66.0	220	314
TD,TB-83	80.0	270	380
TD,TB-90	94.0	320	445
TD-108	110.0	384	534

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

Refrigerant Line Capacities [Tons]

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

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

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

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

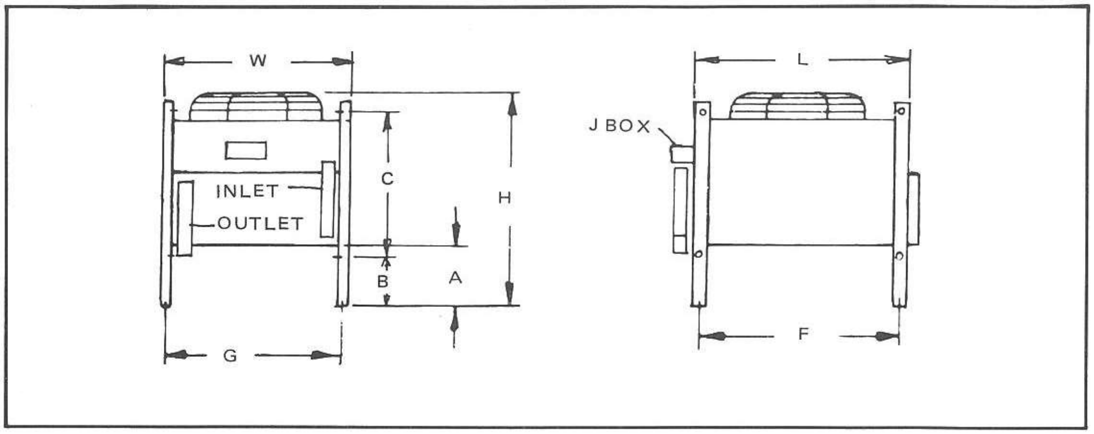
Altitude Correction Factors

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

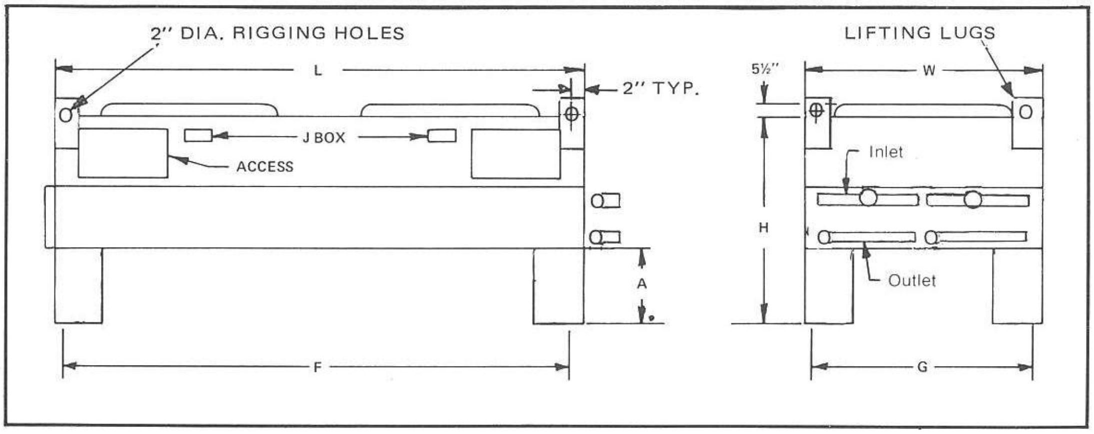
As altitude increases, the capacity of an air cooled condenser decreases because fewer pounds of air are circulated. To compensate for this, the basic calculated total heat rejection must be multiplied by the following factor (density ratio) associated with the altitude where the condenser is to be located.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

Dimensional Data

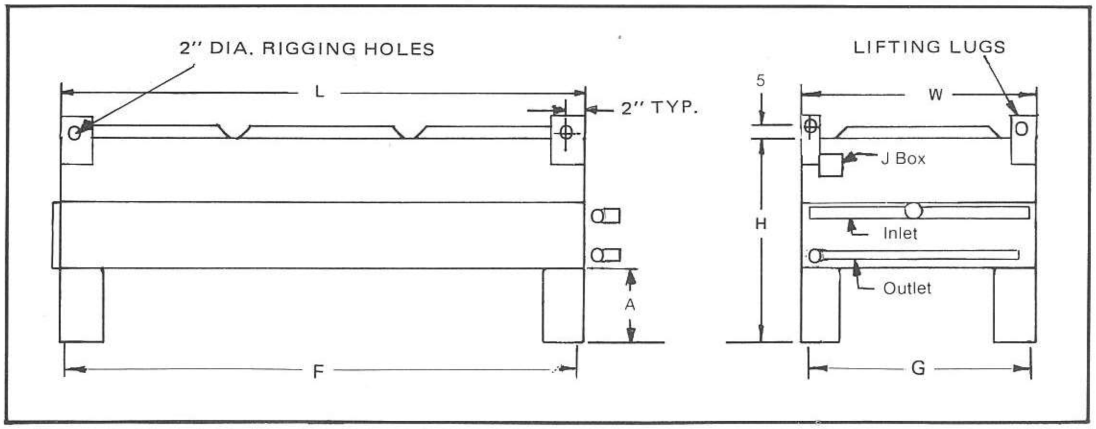
RAC-¾ thru -3 / TD-5 thru -8.5 / Horizontal or Vertical Discharge



Models TB / Belt Drive / Vertical Discharge



Models TD 9.5-90 / Direct Drive / Vertical Discharge (Horiz. Discharge Avail. 9.5-26)



Physical Dimensions in Inches

Models RAC / Direct Drive / Horizontal & Vertical Discharge

Model Number	A	B	C	F	G	H	L	W	Connections-O.D. Inlet	Connections-O.D. Outlet	Approx. Shipping Wt.
RAC-¾	6	4¾	14¾	19⅛	19½	21	21	20¼	⅝	⅝	58
RAC-1	6	4¾	14¾	19⅛	19½	21	21	20¼	⅝	⅝	65
RAC-1½	6	4¾	14¾	23⅛	25½	22	25	26¼	⅝	⅝	89
RAC-2	6	4¾	14¾	23⅛	25½	22	25	26¼	⅝	⅝	110
RAC-3	6	4¾	14¾	23⅛	25½	22	25	26¼	⅞	⅞	145

Models TD / Direct Drive

Model Number	A	B	C	F	G	H	L	W	Connections-O.D. Inlet	Connections-O.D. Outlet	Approx. Shipping Wt.
TD-5	10	8¾	19	41½	34¼	31½	43½	35½	1⅛	1⅛	195
TD-6.5	10	8¾	19	41½	34¼	31½	43½	35½	1⅜	1⅜	220
TD-7.5	10	8¾	19	41½	34¼	31½	43½	35½	1⅜	1⅜	245
TD-8.5	10	8¾	19	41½	34¼	31½	43½	35½	1⅜	1⅜	285
TD-9.5	15			58½	38¾	34	63¼	43½	1⅝	1⅛	434
TD-13	15			58½	38¾	34	63¼	43½	1⅝	1⅛	484
TD-15.5	15			58½	38¾	34	63¼	43½	1⅝	1⅛	534
TD-17	15			58½	38¾	34	63¼	43½	1⅝	1⅛	581
TD-19	15			88½	38¾	34	93¼	43½	2⅛	1⅜	656
TD-23	15			88½	38¾	34	93¼	43½	2⅛	1⅜	731
TD-26	15			88½	38¾	34	93¼	43½	2⅛	1⅜	806
TD-31	15			58½	78¾	35½	63¼	83½	2-1⅝	2-1⅛	991
TD-35	15			58½	78¾	35½	63¼	83½	2-1⅝	2-1⅛	1081
TD-37	18			94½	48¾	45¼	99¼	53½	2-1⅝	2-1⅜	1176
TD-45	18			103½	68¾	39¾	108¼	73½	2-2⅛	2-1⅝	1923
TD-51	18			103½	68¾	39¾	108¼	73½	2-2⅛	2-1⅝	2078
TD-55	18			103½	68¾	39¾	108¼	73½	2-2⅛	2-1⅝	2233
TD-62	22			118½	88¾	42¾	123¼	93½	2-2⅛	2-1⅝	2315
TD-73	22			118½	88¾	42¾	123¼	93½	2-2⅛	2-1⅝	2520
TD-83	22			118½	88¾	42¾	123¼	93½	2-2⅝	2-2⅛	2735
TD-90	22			118½	88¾	42¾	123¼	93½	2-2⅝	2-2⅛	2960
TD-108	22			156½	88¾	42¾	161¼	93½	2-2⅝	2-2⅛	3300

Models TB / Belt Drive / Vertical Discharge

Model Number	A	F	G	H	L	W	Connections-O.D. Inlet	Connections-O.D. Outlet	Approx. Shipping Wt.
TB-26	18	94½	48¾	45¼	99¼	53½	2-1⅝	2-1⅛	1221
TB-31	18	94½	48¾	45¼	99¼	53½	2-1⅝	2-1⅛	1301
TB-35	18	94½	48¾	45¼	99¼	53½	2-1⅝	2-1⅛	1376
TB-37	18	94½	48¾	45¼	99¼	53½	2-1⅝	2-1⅜	1451
TB-45	18	103½	68¾	46¼	108¼	73½	2-2⅛	2-1⅝	1933
TB-51	18	103½	68¾	46¼	108¼	73½	2-2⅛	2-1⅝	2083
TB-55	18	103½	68¾	46¼	108¼	73½	2-2⅛	2-1⅝	2243
TB-62	22	118½	88¾	51¾	123¼	93½	2-2⅛	2-1⅝	2320
TB-73	22	118½	88¾	51¾	123¼	93½	2-2⅛	2-1⅝	2530
TB-83	22	118½	88¾	51¾	123¼	93½	2-2⅝	2-2⅛	2745
TB-90	22	118½	88¾	51¾	123¼	93½	2-2⅝	2-2⅛	2970

Specifications

Models RAC / Direct Drive

Model Number	Total CFM	Condenser Fans No.	Dia.	RPM	Fan Motors No.	HP	Total Motor Amps 115V	230V
RAC-¾	1440	1	16	1050	1	1/12	4.0	2.0
RAC-1	1200	1	16	1050	1	1/12	4.0	2.0
RAC-1½	2600	1	20	1050	1	1/6	5.6	2.8
RAC-2	2500	1	20	1050	1	1/6	5.6	2.8
RAC-3	2400	1	20	1050	1	1/6	5.6	2.8

Models TD / Direct Drive

Model Number	Total CFM	Condenser Fans No.	Diam.	RPM	Fan Motors* No.	HP	Total Motor Amps 200V-230V**		460V**		Wiring Arrangement Stand.	Optional
TD-5	5750	1	24	1100	1	½	4.2		2.1		1 phase	
TD-6.5	5400	1	24	1100	1	½	4.2		2.1		1 phase	
TD-7.5	5150	1	24	1100	1	½	4.2		2.1		1 phase	
TD-8.5	4900	1	24	1100	1	½	4.2		2.1		1 phase	
TD-9.5	11500	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
TD-13	10800	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
TD-15.5	10300	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
TD-17	9800	2	24	1100	2	½	8.4	7.3	4.2	3.6	1 phase	3 phase
TD-19	16200	3	24	1100	3	½	12.6	7.3	6.3	3.6	1 phase	3 phase
TD-23	15450	3	24	1100	3	½	12.6	7.3	6.3	3.6	1 phase	3 phase
TD-26	14700	3	24	1100	3	½	12.6	7.3	6.3	3.6	1 phase	3 phase
TD-31	21000	4	24	1100	4	½	16.8	11.1	8.4	5.6	1 phase	3 phase
TD-35	20000	4	24	1100	4	½	16.8	11.1	8.4	5.6	1 phase	3 phase
TD-37	19300	4	24	1100	4	½	16.8	11.1	8.4	5.6	1 phase	3 phase
TD-45	30200	6	24	1100	6	½	14.5		7.3		3 phase	
TD-51	29000	6	24	1100	6	½	14.5		7.3		3 phase	
TD-55	28400	6	24	1100	6	½	14.5		7.3		3 phase	
TD-62	49000	9	24	1100	9	½	21.8		10.9		3 phase	
TD-73	46500	9	24	1100	9	½	21.8		10.9		3 phase	
TD-83	44500	9	24	1100	9	½	21.8		10.9		3 phase	
TD-90	42000	9	24	1100	9	½	21.8		10.9		3 phase	
TD-108	49200	12	24	1100	12	½	29.0		14.6		3 phase	

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

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

Models TB / Belt Drive / Vertical Discharge

Model Number	Total CFM	Fans No.	Diam.	Motors, 230/460V, 60 CY, 3Ø No.	HP	Total Amps.
TB-26	21750	2	36	2	1½	11.2/5.6
TB-31	21000	2	36	2	1½	11.2/5.6
TB-35	20000	2	36	2	1½	11.2/5.6
TB-37	19300	2	36	2	1½	11.2/5.6
TB-45	30200	2	42	2	2	13.2/6.6
TB-51	29000	2	42	2	2	13.2/6.6
TB-55	28400	2	42	2	2	13.2/6.6
TB-62	55000	2	48	2	5	28.4/14.2
TB-73	52500	2	48	2	5	28.4/14.2
TB-83	51000	2	48	2	5	28.4/14.2
TB-90	48400	2	48	2	5	28.4/14.2

Russell

Russell Coil Company
A subsidiary of Ardco Inc.

221 South Berry Street, Brea, California 92621
Brea 714 529-1935 / LA 213 691-3246

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.