

DCI Inverter Diagnostics Single Head Systems

MODELS AFFECTED:

This Bulletin describes Diagnostic and Test procedures for the following models:

XLLDCI9RCA XLLDCI12RCA XLLDCI18RC XLLDCI24RC XLLDCI30RC
KLDCI9RCA KLDCI12RCA KLDCI18RCA SXDCI12RCA SXDCI18RCA
GCLDCI9RC GCLDCI12RC GCLDCI18RC GCLDCI24RC GCLDCI30RC

The XLLDCI9RCA, XLLDCI12RCA, KLDCI9RCA, KLDCI12RCA and SXDCI12RC Indoor units can also be used on the DUO, TRIO and QUATTRO Inverters, and the KLDCI18RC and SXDCI18RC can be used on the TRIO and QUATTRO. The information in this Bulletin for the Indoor units still applies when the Indoor unit is used in multi-head configurations.

DESCRIPTION:

This bulletin describes the diagnosis of these units, including general failures, Self-Diagnostics, Test functions, Sensor (Thermistor) checks and corrective actions. It covers single-head Inverter systems - the XLLDCI, KLDCI and SXDCI (indoor) and GCLDCI (outdoor) units.

Since the multi-head systems use the above Indoor units, this Bulletin also applies to the Indoor Units of the Duo, Trio and Quattro Inverters. However, for complete diagnostic information on the multi-head units, please refer to the applicable Service Bulletins.

1. General Failures and Corrective Actions:

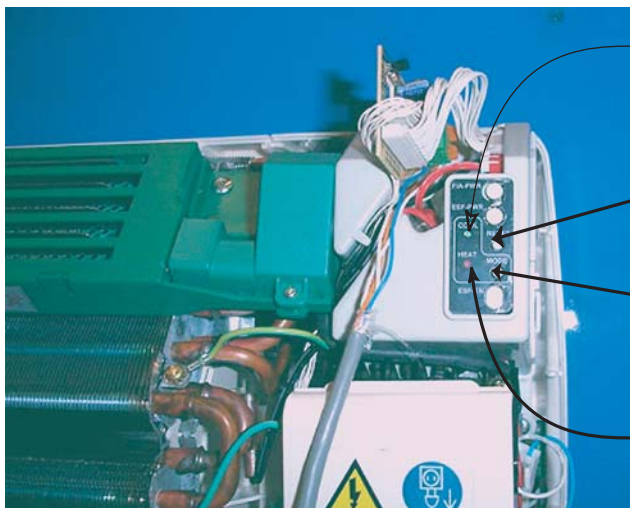
The first step in diagnosing faults on these units is to review the symptoms as listed in Table 1 on page 4, and follow the diagnostic/corrective actions suggested.

2. Indoor Unit Diagnostics:

On the Indoor Unit, to start the self-diagnostics, push and hold the MODE button for 5 seconds. The unit will start the self-diagnostics regardless of whether it is operating or in standby. The unit will continue in Standby, Cool or Heat while in Diagnostic mode.

On the XLLDCI's, the MODE button is located on the indoor unit under the filter cover on the right hand side (see the photo below). On the KLDCI units, the MODE button is located under the Return Air Grille, adjacent to the Standby and Operate LED's. On the SXDCI units, the MODE button is located on the Display Panel at the top of the Unit.

On holding the MODE button down, there will be 3 short beeps and the Cool and Heat (green and red) LED's will begin flashing.



COOL L.E.D.

RESET Button

MODE Button

HEAT L.E.D.

The diagnostic indication (if any) is shown by the pattern of flashes of the Heat (red) and Cool (green) L.E.D's.

The Heat (red) LED will flash 5 times in 5 seconds, then stop for 5 seconds, then flash again 5 times repeatedly.

Diagnostic codes are shown by the sequence of Cool (green) LED flashes in step with the Heat (red) LED flashes.

Use Table 2 "INDOOR Unit Diagnostic Codes", on page 5 to determine the fault. For example if on the Indoor Unit the green LED flashes with the second red LED flash (only) the fault is the Indoor Coil Sensor is shorted (2nd row of the table).

XLLDCI Indoor Unit (with covers removed)

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3. Outdoor Unit Diagnostics:

3.1 Display on Outdoor Unit:

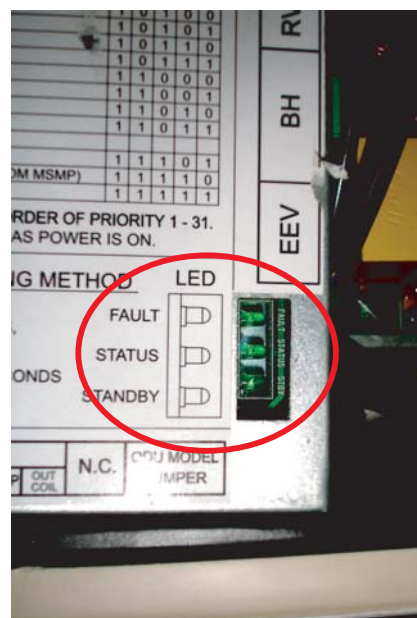
There is a set of 3 L.E.D's on the Inverter Power Module, under the top cover of the Outdoor Unit. See the photo to the right. These L.E.D's display the status of the Outdoor unit at all times when power is "On".

DANGER!
Shock Hazard!

The Outdoor Unit is powered with 380VDC.
It takes 5 minutes for this voltage to dissipate after the unit is powered down.

The fault code display is similar to that used on the Indoor unit. The Status LED flashes five times, pauses, then flashes 5 times again. The Fault LED may or may not flash with each Status LED flash.

Table 3, "OUTDOOR Unit Diagnostic Codes", on page 6, shows the interpretation of the codes. For example, if the Fault LED flashes only once, on the third flash of the Status LED, the Diagnostic is indicating that the Compressor Top Sensor is shorted.



GCLDCI Outdoor Unit
Diagnostic L.E.D's

NOTE:

There is a Diagnostic table printed on the cover of the Inverter Power Module. That table has to be read from right to left. The table given in this bulletin reads left to right, the normal convention in English-speaking countries.

The display on the Inverter Power Module shows the last fault even if the system has recovered from that fault.

3.2 Display of Outdoor Diagnostics on the Indoor Unit:

The Indoor Unit can display the diagnostics from the Outdoor unit as well as its' own diagnostics. The method of displaying Outdoor diagnostics on the Indoor Unit is as follows:

- Initiate the display of the Indoor diagnostics as in 2. above,
- To show the Outdoor diagnostics in place of the Indoor diagnostics, press the Mode button momentarily. The Indoor unit will give three beeps, and then display the Outdoor diagnostic.

The unit will switch between Indoor and Outdoor diagnostics whenever the Mode button is pressed momentarily. When showing the Indoor diagnostic, the Standby, Operate, Filter & Timer LED's are on steady, when showing the Outdoor diagnostic on the Indoor unit, the Standby, Operate, Filter & Timer LED's flash.

When an Outdoor diagnostic is shown on the Indoor Unit, it has the same fault code as when displayed on the Outdoor Unit, the Heat LED flashing in place of the Status LED, and the Cool LED flashing in place of the Fault LED. Faults from which the system has recovered will be cleared on exiting diagnostic mode.

To get out of Diagnostic mode press and hold the Mode button again for 5 Seconds, until the unit beeps three times, or use the Remote Control to change the setpoint or operating mode.

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4. Checking the Refrigerant Circuit - TEST MODE:

A Test Mode is available on the single-head inverter units to facilitate checking the Refrigerant circuit. Test mode stops the dynamic adjustment of the system, sets the compressor and fans to run at a fixed speed, and sets the Electronic Expansion Valve to a fixed opening.

When not in this mode, Superheat measurements on the system are meaningless, since the operating conditions are continually changing.

The capacity of the unit can be checked at three different levels - Minimum, Nominal and Maximum. These levels are selected according to the Indoor Fan speed selected by the Remote Control, as follows:

Indoor Fan on Low speed:	Minimum Capacity
Indoor Fan on High speed:	Nominal Capacity
Indoor Fan on Auto:	Maximum Capacity.

To put the unit into Test Mode, change the Setpoint (using the Remote) to 16°C (cooling) or 30°C (heating), select the appropriate Indoor Fan speed, turn the unit "On" using the Remote Control, then press and hold the Mode button on the Indoor Unit until 3 beeps are heard.

The unit will show the diagnostics as described above, as well as operating in Test mode.

When the unit is running Cooling in Test Mode, at Nominal Capacity (Indoor Fan Speed on High), it should show a superheat of 6°K, referenced to an outside air temp of 35°C and a return air temp of 27°C.

In Test Mode, the Operating Point can be changed by selecting the appropriate Indoor Fan speed.

To end Test Mode, exit from Diagnostic Mode by pressing and holding the MODE button until three beeps are heard.

5. Checking the Sensors:

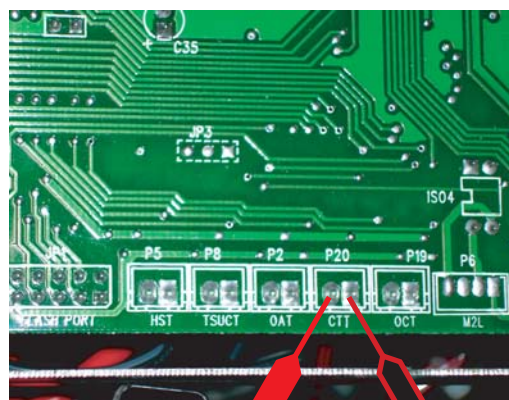
The sensors on the Indoor Unit can be checked using the usual methods.

The sensors on the Outdoor unit are not readily accessible. They can be accessed by removing the cover of the IPM Module, as shown in the photo to the right. The unit should be powered down before removing the cover, and powered up after the cover has been removed. The sensors are floating at about 160VDC above AC Ground, so these measurements must be done carefully to avoid the risk of electrical shock or a short which could damage the IPM PCB.

The DC voltage across any sensor can then be measured by putting a multimeter probes onto the solder pads of the PCB, as shown. The Voltage-Temperature chart is given on page 8 of this Bulletin. This voltage should be checked against the temperature that the sensor should be reporting - i.e., if checking the OCT sensor, check the sensor voltage against the actual Outdoor Coil Temperature.

These sensors can also be checked in a "Power Off" condition, without removing the IPM cover, by removing the front panel of the outdoor unit, and unplugging the sensor from the PCB. The Sensors' resistance can then be measured, and compared to the specified resistance at that temperature, as given by the table on page 8.

Inverter Power Module PCB
(with cover removed)



Example - Put Multimeter probes here to measure DC voltage across CTT sensor.

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TABLE 1 - General Faults & Corrective Actions

No	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1	Power supply indicator (Red LED) does not light up	No power supply	Check power supply. If power supply is OK check fuse in Outdoor Unit. If OK, check Indoor Unit display. If OK, replace Control Box Assy.
2	Unit does not respond to remote control command	Remote control message not received by the indoor unit.	Check remote control batteries, if batteries are OK, check display and display wiring, if OK, replace display PCB. If still not OK replace Control Box Assy.
3	Unit responds to remote control message but Operate indicator (Green LED) does not light up	Problem with display PCB	Replace display PCB. If still not OK replace Control Box Assy.
4	Indoor fan does not start (louvers are opened and Green LED does light up)	Unit in heat mode and coil is still not warm.	Change to cool mode and check.
		Problem with PCB or capacitor	Change to high speed and check power supply to motor is higher than 130VAC (for Triac controlled motor) or higher than 220VAC for fixed speed motors, if OK replace capacitor, if not OK replace controller
5	Indoor fan works when unit is OFF, and indoor fan speed is not changed by remote control command.	PCB problem	Replace controller
6	Compressor does not start	Electronics control problem or protection	Perform diagnostics and follow the actions described.
7	Compressor stops during operation and Green LED remains on	Electronic control or power supply problem	Perform Self-Diagnostics on the Outdoor Unit, and follow the actions described.
8	Compressor is on but outdoor fan does not work	Problem with outdoor electronics or outdoor fan	Check outdoor fan motor as per section 12.5.3 of the Service Manual. If not OK, replace motor. If OK replace IPM.
9	Unit works in wrong mode (cool instead of heat or heat instead of cool)	Electronics or power connection to RV	Check RV power connections, if OK, Check RV operation with direct 230VAC power supply, if OK, replace IPM.
10	All components are operating properly but no cooling or no heating	Refrigerant leak	Check refrigeration system.
11	Compressor is over heated and unit does not generate capacity	EEV problem	Check EEV
12	Units goes into protections and compressor is stopped with no clear reason	Control problem or refrigeration system problem	Perform Indoor & Outdoor Self-diagnostics, and follow the actions described.
13	Compressor motor is generating noise and no suction occurs	Phase order to compressor is wrong	Check compressor phase order.
14	Water leakage from indoor unit	Indoor unit drain tube is blocked	Check and open drainage tube.
15	Freezing of outdoor unit in heat mode and outdoor unit base is blocked with ice		Connect base heater.
16	Unit operates with wrong fan speeds or wrong frequency	Wrong jumper settings	Perform Self-diagnostics. Check if unit is operating from EEPROM parameters.

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TABLE 2
INDOOR Unit Diagnostic Codes

		5 Seconds				
		5 Flashes - Heat LED				
		1 *	2 *	3 *	4 *	5 *
		Green Flashes - Cool LED				
	Problem					
1	Indoor Coil Sensor is disconnected.	*	-	-	-	-
2	Indoor Coil Sensor is shorted.	-	*	-	-	-
3	Return Air Sensor is disconnected.	*	*	-	-	-
4	Return Air Sensor is shorted.	-	-	*	-	-
7	Communication Mismatch.	*	*	*	-	-
8	No Communication.	-	-	-	*	-
9	No Encoder. Indoor fan or PCB Fault	*	-	-	*	-
11	Outdoor unit fault	*	*	-	*	-
17	Anti Freeze Protection.	*	-	-	-	*
18	De-icing.	-	*	-	-	*
19	Outdoor Unit Protection.	*	*	-	-	*
20	Indoor Coil HP Protection	-	-	*	-	*
21	Overflow Protection	*	-	*	-	*
24	EEPROM Not updated	-	-	-	*	*
25	Bad EEPROM	*	-	-	*	*
26	Bad Communication	-	*	-	*	*
27	Using EEPROM Data	*	*	-	*	*
28	MODEL A (2.5kW)	-	-	*	*	*
29	MODEL B (3.5kW)	*	-	*	*	*
30	MODEL C (5.0kW)	-	*	*	*	*
31	MODEL D (7.2kW)	*	*	*	*	*
0	No Fault	-	-	-	-	-

- NOTES:**
- For suggested corrective action, see the table on P.7.
 - If more than one fault occurs, only one fault will be indicated at a time, in order of priority from the top of the Table to the bottom.
 - Diagnostic codes of "MODEL A, MODEL B, MODEL C, MODEL D" are not faults. They are model codes only.
 - Diagnostic Codes 17 through 21 show that the system is operating in a Protection Mode. This may not be a fault. Please refer to the Service Manual to determine if the Protection Mode is appropriate or not.

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TABLE 3
OUTDOOR Unit Diagnostic Codes

Fault No.		Problem		5 Seconds				
				5 Flashes - I/D Heat LED or O/D Status LED				
				1 🌸	2 🌸	3 🌸	4 🌸	5 🌸
Green Flashes - I/D Cool LED or O/D Fault LED								
1	Outdoor Coil Sensor is disconnected.	🌸	-	-	-	-		
2	Outdoor Coil Sensor is shorted.	-	🌸	-	-	-		
3	Compressor Top Sensor is disconnected.	🌸	🌸	-	-	-		
4	Compressor Top Sensor is shorted.	-	-	🌸	-	-		
5	Heat Sink Sensor is disconnected.	🌸	-	🌸	-	-		
6	Heat Sink Sensor is Shorted.	-	🌸	🌸	-	-		
7	Outdoor Air Sensor is disconnected.	🌸	🌸	🌸	-	-		
8	Outdoor Air Sensor is Shorted.	-	-	-	🌸	-		
9	Suction Temp Sensor is disconnected.	🌸	-	-	🌸	-		
10	Suction Temp Sensor is shorted.	-	🌸	-	🌸	-		
11	Inverter Power Module Fault	🌸	🌸	-	🌸	-		
12	Bad EEPROM	-	-	🌸	🌸	-		
13	DC Under-voltage Protection.	🌸	-	🌸	🌸	-		
14	DC Over-voltage Protection.	-	🌸	🌸	🌸	-		
15	AC Under-voltage Protection.	🌸	🌸	🌸	🌸	-		
16	IDU-ODU Communication mismatch	-	-	-	-	🌸		
17	No Communication	🌸	-	-	-	🌸		
20	Heat Sink overheating	-	-	🌸	-	🌸		
21	In Deice Mode	🌸	-	🌸	-	🌸		
22	Compressor overheating	-	🌸	🌸	-	🌸		
23	Compressor over current.	🌸	🌸	🌸	-	🌸		
24	No outdoor fan feed back	-	-	-	🌸	🌸		
25	Outdoor fan locked.	🌸	-	-	🌸	🌸		
26	Compressor locked	-	🌸	-	🌸	🌸		
27	Bad Communication	🌸	🌸	-	🌸	🌸		
0	No Fault	-	-	-	-	-		

- NOTES:**
- For corrective action, see the Table on Page 7.
 - Note that the Fault Table printed on the Electronics cover of the Outdoor Unit shows the fault code flashes listed from right to left, not left to right. Note also that Fault 0, "NO FAULT", is shown as a different code. The code in this Bulletin is correct.
 - If more than one fault occurs, only one fault will be indicated at a time, in order of priority from the top of the Table to the bottom.

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Table 4: INDOOR DIAGNOSTICS CORRECTIVE ACTION

Diagnostic Code	Fault	Probable Cause	Corrective Action
1-4	All Sensor failures		Check sensor connections. Check resistances or voltage for accuracy. Replace sensors as required.
7	Communication Mismatch	Indoor and Outdoor controllers are different versions.	Replace Indoor Controller
8	No Communication	Communication or Ground wiring is not good.	Check Indoor to Outdoor wiring and grounding.
9	No Encoder	Indoor electronics or fan motor.	Check motor wiring. If OK, replace motor. If still not OK, replace Indoor controller.
11	Outdoor Unit Fault		Switch to Outdoor diagnostics.
24	EEPROM not updated.	System using ROM parameters and not EEPROM parameters.	No action, unless special parameters are required for unit operation.
25	Bad EEPROM	Communication wiring or ground wiring is not good.	No action, unless special parameters are required for unit operation.
26	Bad communication.	Communication quality is low reliability.	Check Indoor & Outdoor wiring & grounding.
27	Using EEPROM data.	No problem. System is using EEPROM data.	

Table 5: OUTDOOR DIAGNOSTICS CORRECTIVE ACTION

Diagnostic Code	Fault	Probable Cause	Corrective Action
1-10	All Sensor failures		Check sensor connections. Check resistances or voltage for accuracy. Replace sensors as required.
11	IPM fault. (IPM is the Inverter Power Module)	Electronics hardware problem.	Check all wiring and jumper settings. wiring OK, replace Outdoor Electronics
12	Bad EEPROM		No action, unless special parameters are required for unit operation.
13, 14	DC under/over voltage	Electronics hardware problem.	Check outdoor unit power supply voltage.
15	AC under voltage		Check outdoor unit power supply voltage.
16	Indoor & Outdoor communication mismatch	Indoor & Outdoor controllers are different versions.	Replace Indoor controller
17	No communication	Communication wiring or ground wiring is not good.	Check Indoor & Outdoor wiring and grounding.
26	Compressor lock.		Switch unit to Standby & re-start.
27	Bad communication.	Communication quality is poor.	Check Indoor & Outdoor wiring and grounding,.

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**Table 6: INVERTER THERMISTOR
TEMPERATURE - RESISTANCE - VOLTAGE TABLE**

Temp °C	Resist. Ohms	RAT ICT OCT DC Volts	CTT HST DC Volts
-20	107,387	0.42	0.09
-19	100,942	0.45	0.10
-18	94,931	0.47	0.10
-17	89,320	0.50	0.11
-16	84,081	0.53	0.12
-15	79,186	0.56	0.12
-14	74,610	0.59	0.13
-13	70,332	0.62	0.14
-12	66,328	0.65	0.15
-11	62,581	0.68	0.15
-10	59,071	0.72	0.16
-9	55,783	0.75	0.17
-8	52,700	0.79	0.18
-7	49,809	0.83	0.19
-6	47,097	0.87	0.20
-5	44,550	0.91	0.21
-4	42,159	0.95	0.22
-3	39,913	0.99	0.24
-2	37,801	1.04	0.25
-1	35,816	1.08	0.26
0	33,948	1.13	0.27
1	32,190	1.17	0.29
2	30,535	1.22	0.30
3	28,977	1.27	0.32
4	27,508	1.32	0.33
5	26,123	1.37	0.35
6	24,817	1.42	0.37
7	23,586	1.47	0.38
8	22,423	1.52	0.40
9	21,326	1.57	0.42
10	20,289	1.63	0.44
11	19,309	1.68	0.46
12	18,384	1.73	0.48
13	17,508	1.79	0.50
14	16,680	1.84	0.52
15	15,896	1.90	0.54
16	15,155	1.95	0.57
17	14,452	2.01	0.59
18	13,787	2.06	0.62
19	13,157	2.12	0.64

Temp °C	Resist. Ohms	RAT ICT OCT DC Volts	CTT HST DC Volts
20	12,559	2.17	0.67
21	11,992	2.23	0.69
22	11,455	2.28	0.72
23	10,945	2.33	0.75
24	10,461	2.39	0.77
25	10,001	2.44	0.80
26	9,565	2.50	0.83
27	9,150	2.55	0.86
28	8,756	2.60	0.89
29	8,381	2.65	0.92
30	8,024	2.70	0.95
31	7,685	2.75	0.98
32	7,363	2.80	1.02
33	7,055	2.85	1.05
34	6,763	2.90	1.08
35	6,484	2.95	1.12
36	6,219	3.00	1.15
37	5,966	3.04	1.19
38	5,725	3.09	1.22
39	5,495	3.13	1.26
40	5,276	3.18	1.29
41	5,067	3.22	1.33
42	4,867	3.26	1.36
43	4,676	3.30	1.40
44	4,494	3.34	1.44
45	4,320	3.38	1.47
46	4,154	3.42	1.51
47	3,996	3.46	1.55
48	3,844	3.49	1.58
49	3,699	3.53	1.62
50	3,560	3.56	1.66
51	3,427	3.60	1.70
52	3,300	3.63	1.73
53	3,179	3.66	1.77
54	3,062	3.69	1.81
55	2,951	3.73	1.84
56	2,844	3.76	1.88
57	2,742	3.78	1.92
58	2,644	3.81	1.96
59	2,550	3.84	1.99

Temp °C	Resist. Ohms	RAT ICT OCT DC Volts	CTT HST DC Volts
60	2,460	3.87	2.03
61	2,373	3.89	2.06
62	2,290	3.92	2.10
63	2,211	3.94	2.14
64	2,135	3.97	2.17
65	2,061	3.99	2.21
66	1,991	4.01	2.24
67	1,923	4.03	2.28
68	1,859	4.06	2.31
69	1,796	4.08	2.34
70	1,736	4.10	2.38
71	1,679	4.12	2.41
72	1,624	4.13	2.44
73	1,570	4.15	2.48
74	1,519	4.17	2.51
75	1,470	4.19	2.54
76	1,423	4.20	2.57
77	1,377	4.22	2.60
78	1,333	4.24	2.63
79	1,291	4.25	2.66
80	1,250	4.27	2.69
81	1,211	4.28	2.72
82	1,173	4.29	2.74
83	1,137	4.31	2.77
84	1,102	4.32	2.80
85	1,068	4.33	2.83
86	1,036	4.35	2.85
87	1,004	4.36	2.88
88	974	4.37	2.90
89	945	4.38	2.93
90	917	4.39	2.95
91	889	4.40	2.98
92	863	4.41	3.00
93	838	4.42	3.02
94	813	4.43	3.05
95	790	4.44	3.07
96	767	4.45	3.09
97	745	4.46	3.11
98	724	4.47	3.13
99	703	4.47	3.15

Temp °C	Resist. Ohms	RAT ICT OCT DC Volts	CTT HST DC Volts
100	683	4.48	3.17
101	664	4.49	3.19
102	646	4.50	3.21
103	628	4.51	3.23
104	610	4.51	3.25
105	593	4.52	3.26
106	577	4.53	3.28
107	562	4.53	3.30
108	546	4.54	3.32
109	532	4.54	3.33
110	517	4.55	3.35
111	504	4.56	3.36
112	490	4.56	3.38
113	477	4.57	3.39
114	465	4.57	3.41
115	453	4.58	3.42
116	441	4.58	3.44
117	429	4.59	3.45
118	418	4.59	3.46
119	408	4.60	3.48
120	397	4.60	3.49
121	387	4.61	3.50
122	377	4.61	3.51
123	368	4.61	3.52
124	359	4.62	3.54
125	350	4.62	3.55
126	341	4.62	3.56
127	333	4.63	3.57
128	325	4.63	3.58
129	317	4.64	3.59
130	309	4.64	3.60
131	302	4.64	3.61
132	294	4.64	3.62
133	287	4.65	3.63
134	280	4.65	3.64
135	274	4.65	3.64
136	267	4.66	3.65
137	261	4.66	3.66
138	255	4.66	3.67
139	249	4.66	3.68
140	243	4.67	3.69

Note:

RAT = Return Air Thermistor
 ICT = Indoor Coil Thermistor
 OCT = Outdoor Coil Thermistor
 CTT = Compressor Top Thermistor
 HST = Heat Sink Thermistor

All types of thermistor have the same nominal resistance at a given temperature. However they use different circuitry, so they develop different DC voltages when operating.

DANGER - SHOCK HAZARD
The Outdoor PCB always has 380VDC on it
whenever power is ON. All the Thermistors on
the Outdoor unit are at a high DC voltage
relative to AC Ground.