



rht+ RHTPlus CalComm Calibration Unit with Analogue Outputs

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1. INTRODUCTION

The rht+ RHTPlus CalComm calibration unit is designed to connect the rht+ RHTPlus range of relative humidity and air temperature probes to a PC for the purpose of calibration.

As with all capacitive type relative humidity sensors, Skye recommend a minimum annual recalibration procedure to maintain optimum accuracy from the probe.

The rht+ RHTPlus CalComm can also be used to obtain a RS232 output from rht+ RHTPlus probes fitted with RH and digital temperature sensors, for datalogging or display as required. RS232 output is not available for PT100 and thermistor temperature elements.

rht+ RHTPlus CalComm software is supplied to enable the user to setup and calibrate the rht+ RHTPlus probe, via the rht+ RHTPlus CalComm unit.

2. SOFTWARE INSTALLATION

2.1 *PC Requirements*

PC Operating System - Windows 95 / 98 / 2000 / XP

Minimum PC Specification: Pentium class processor
 16 Mb RAM
 10 Mb Hard Disk Space
 VGA monitor

Recommended Specification: Pentium 2 processor or better
 32 Mb RAM
 10 Mb Hard Disk Space
 SVGA monitor

2.2 *Installation*

Insert the rht+ RHTPlus CalComm CD-ROM into the CD disk drive of the PC and click on the “Start” button (bottom left of the screen). Move up the pull down menu to “Run” and click the mouse button. You will be prompted to select a file to execute, type “D:\setup” followed by clicking the “OK” button.

This will load the Setup Program which will guide you through the install process. At the Welcome box, click OK to continue. Then click the large button to begin the software setup and the Setup Program will begin copying files onto the hard drive.

If an error message is shown saying an access violation occurred while copying or registering a file, click Ignore and Yes.

When the Setup Program shows RHTPlus CalComm was completed successfully, click OK.

To start the rht+ RHTPlus CalComm software, click on Start, Programs and RHTPlus CalComm

3. OPERATION

3.1 Calibration Technique

In order to perform a good Relative Humidity calibration, you will need the following items:

1. rht+ RHTPlus probe
2. rht+ RHTPlus CalComm unit
3. For models SKH 2065 & 2067 with PT100 temperature sensors and SKH 2070 & 2072 with thermistor temperature sensors a multimeter is required to read the temperature output
4. PC running the rht+ RHTPlus CalComm software
5. A temperature controlled system, e.g. an environmental chamber or water bath
6. A method of generating reference atmospheres of RH, e.g. Skye Instruments RH calibration kit (part number SKH 1092) which provides two RH point references, 75%RH (high) and 1% (low).

Recalibration of rht+ RHTPlus probes is recommended at least annually. If the probe is installed in a constant high humidity environment, it is advised to make the first calibration 6 months after installation, and then every 12 months thereafter.

Prepare the reference RH atmospheres as instructed, and allow to stabilise in the controlled temperature environment. (In the case of the Skye calibration kit, make up the 2 flasks of molecular sieve drying agent (1%RH) and saturated sodium chloride solution (75%RH) and allow to stabilise for 2-3 days at around 25°C, according to the temperature controller.)

The sensitive tip of the rht+ RHTPlus probe must be exposed to first the low and then the high reference RH atmospheres in turn, allowed to equilibrate, and the calibration points entered using the rht+ RHTPlus CalComm software.

A calibration check of the temperature sensor is also advised, by comparing the Current Reading of the rht+ RHTPlus probe against a calibrated temperature device which has also been allowed to stabilise with in the temperature controlled environment.

Full details are given in the following sections for RH calibrations using the Skye calibration kit (part number SKH 1092), and also for making the temperature calibration check.

3.2 RH calibration

3.2.1 Making a Low Reference RH Calibration Point

It is important the Low RH calibration reference point is done before the High point.

Fit the tip of the rht+ RHTPlus probe through the hole in a spare black flask screw top and place the black rubber O ring seal in position so that the probe protrudes just far enough to see the head of the grub screw.

Unscrew the top off the stabilised, temperature equilibrated, sealed flask of molecular sieve drying agent and quickly replace with the rht+ RHTPlus probe in its screw top. Adjust the height of the probe within the flask as you tighten the seal, making sure that none of the probe can come into contact with the molecular sieve drying agent.

Attach the 8 pin connector from the rht+ RHTPlus CalComm unit to the rht+ RHTPlus probe. Leave to equilibrate for 6-8 hours.

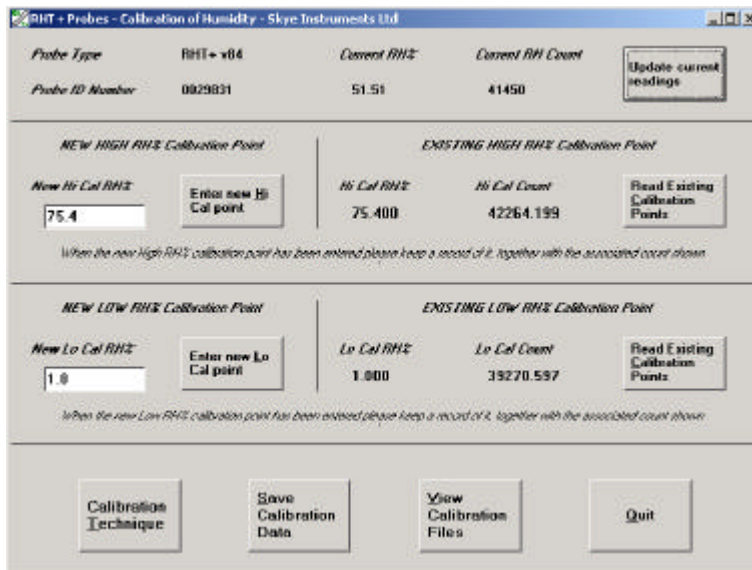
After the equilibration time, press the button on the rht+ RHTPlus CalComm unit to activate, you should see the

.....rht+ *RHTPlus CalComm*.....

red LED flash at regular intervals. If the LED does not flash, replace the PP3 battery in the rht+ RHTPlus CalComm unit.

Move the switch on the rht+ RHTPlus CalComm unit to the PC position.

Connect the 9 pin D connector of the rht+ RHTPlus CalComm unit to the PC. Start the rht+ RHTPlus CalComm software. Click proceed so that the software auto detects the rht+ RHTPlus probe.



In the Main Menu screen (see Chapter 4.2), click the Calibrate RH% button to reveal the calibration screen below:

In the box provided, enter the Low 1%RH reference calibration point as 1.0 and click on the button ‘Enter New Lo Cal Point’.

Click Quit and Quit to exit the program. Disconnect the rht+ RHTPlus CalComm unit cable from rht+ RHTPlus probe.

Remove the rht+ RHTPlus probe with its screw top from the Low RH reference flask and quickly replace with the blank seal top. This flask can be reused for many calibrations if kept in good condition.

3.2.2 Making a High Reference RH Calibration Point

It is important the Low RH calibration reference point is done before the High point.

Unscrew the top off the stabilised, temperature equilibrated, sealed flask of saturated sodium chloride solution and quickly replace with the rht+ RHTPlus probe in its screw top. Take great care not to splash any solution around the inside of the flask or onto the probe tip. Adjust the height of the probe within the flask as you tighten the seal, making sure that none of the probe can come into contact with the solution.

Attach the 8 pin connector from the rht+ RHTPlus CalComm unit to the rht+ RHTPlus probe. Leave to equilibrate for 6-8 hours.

Note the temperature of the controlled environment. The absolute reference RH% of a saturated sodium chloride solution varies with temperature. Note the reference RH% value for your calibration temperature.

.....rht+ *RHTPlus CalComm*.....

E.g. 76.0 %RH at 10°C, or 75.5 %RH at 20°C, or 75.0 %RH at 25°C

After the equilibration time, press the button on the rht+ RHTPlus CalComm unit to activate, you should see the red LED flash at regular intervals. If the LED does not flash, replace the PP3 battery in the rht+ RHTPlus CalComm unit.

Move the switch on the rht+ RHTPlus CalComm unit to the PC position.

Connect the 9 pin D connector of the rht+ RHTPlus CalComm unit to the PC. Start the rht+ RHTPlus CalComm software. Click proceed so that the software auto detects the rht+ RHTPlus probe.

In the Main Menu screen (see Chapter 4.2), click the Calibrate RH% button to reveal the calibration screen as before.

In the box provided, enter the High 75%RH reference calibration point (e.g. enter 75.5 if calibrating at 20°C) and click on the button 'Enter New Hi Cal Point'.

Click the button at the bottom of the screen 'Save Calibration Data', the filename for the stored data will be shown and confirmed. You may view this data by clicking the 'View Calibration Files' button if wished. (This data may be used to re-enter the calibration values should the probe lose its configuration for any reason, without the need for going through the full calibration procedure.)

Click Quit and Quit to exit the program. Disconnect the rht+ RHTPlusCalComm unit cable from rht+ RHTPlus probe.

Remove the rht+ RHTPlus probe with its screw top from the High RH reference flask carefully and quickly replace with the blank seal top. This flask can be reused for many calibrations if kept in good condition.

The RH element in the rht+ RHTPlus probe is now calibrated and ready for use.

3.3 Temperature Calibration Check

No calibration adjustment is possible for the temperature sensors, but a check against a reference temperature sensor is advisable.

Place the rht+ RHTPlus probe next to the temperature reference in the temperature stable environment. Attach the 8 pin connector from the rht+ RHTPlus CalComm unit to the rht+ RHTPlus probe and leave to equilibrate for 6-8 hours.

3.3.1 Digital Temperature Sensor

This section applies to rht+ RHTPlus model SKH 2060.

After the equilibration time, press the button on the rht+ RHTPlus CalComm unit to activate, you should see the red LED flash at regular intervals. If the LED does not flash, replace the PP3 battery in the rht+ RHTPlus CalComm unit.

Move the switch on the rht+ RHTPlus CalComm unit to the PC position.

Connect the 9 pin D connector of the rht+ RHTPlus CalComm unit to the PC. Start the rht+ RHTPlus CalComm software. Click proceed so that the software auto detects the rht+ RHTPlus probe.

.....rht+ *RHTPlus CalComm*.....

In the Main Menu screen (see Chapter 4.2) the top right hand section shows the current RH% and Temperature reading. If no readings are displayed click the Refresh button.

Make a note of the temperature readings from both the rht+ RHTPlus probe and the temperature reference and the difference, if any, between them.

This procedure can be repeated at several temperature if required.

3.3.2 PT100 and Thermistor Temperature Sensors

This section applies to rht+ RHTPlus models SKH 2065, 2067, 2070 and 2072.

After the equilibration time, press the button on the rht+ RHTPlus CalComm unit to activate, you should see the red LED flash at regular intervals. If the LED does not flash, replace the PP3 battery in the rht+ RHTPlus CalComm unit.

The PC and software are not required to take readings from these temperature sensors. For a PT100 sensor (models SKH 2065 and 2067) the analogue output is between zero and 1 volt so a millivolt meter is required. For a thermistor sensor (models SKH 2070 and 2072) the analogue output is between zero and 100 kohms so an ohm meter is required.

The rht+ RHTPlus CalComm unit has a small round jack socket on the front labeled Analogue Temperature. Connect the matching jack plug which has 2 coloured wires attached - yellow and grey.

Move the switch on the rht+ RHTPlus CalComm unit to the "Temp" position and connect the meter ground to the grey wire and positive to the yellow wire.

Use the tables in Appendix 1 and 2 to convert the millivolts or kohm readings into temperature. Make a note of the temperature readings from both the rht+ RHTPlus probe and the temperature reference and the difference, if any, between them.

This procedure can be repeated at several temperature if required.

4. SOFTWARE MENUS OVERVIEW

4.1 Introduction

The rht+ RHTPlus CalComm software contains features to setup and calibrate the rht+ RHTPlus probe. The user can enter a unique ID for the probe, calibrate the sensors or re-enter previous calibration factors as required.

The software will auto detect the rht+ RHTPlus probe once connected to the PC, eliminated the need to set up for a specific communications port.

To start the rht+ RHTPlus CalComm software, click on Start, Programs and rht+ RHTPlus CalComm. The first screen displayed is shown blow:



By clicking Proceed the software will test all the available communication ports to locate the rht+ RHTPlus probe, and then display the Main Menu screen.

4.2 Main Menu Screen

The Main Menu screen, shown below, shows the status of the currently attached rht+ RHTPlus probe on the right hand side, and a choice of sub-menu buttons on the left hand side.

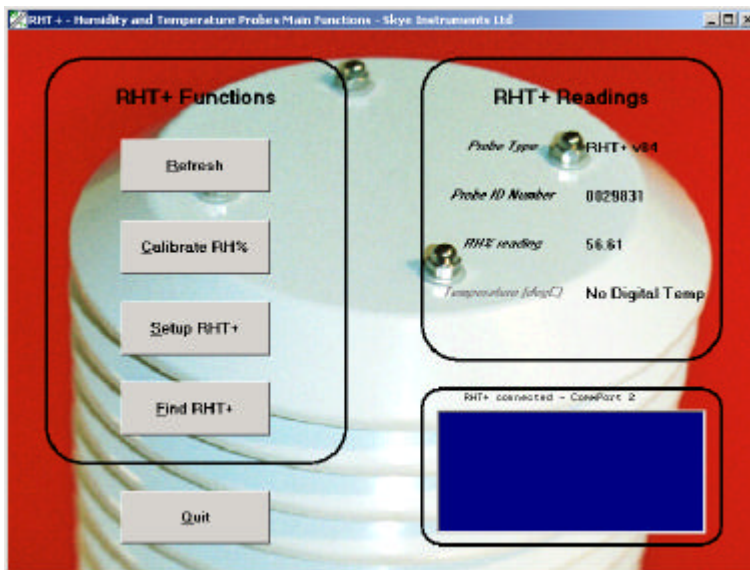
If there is no rht+ RHTPlus probe current connected, the status windows will say 'RHT+ not found'.

Connect your rht+ RHTPlus probe and click on the 'Find RHT' button to view its status.

Click on the 'Refresh' button to refresh the display contents at any time.

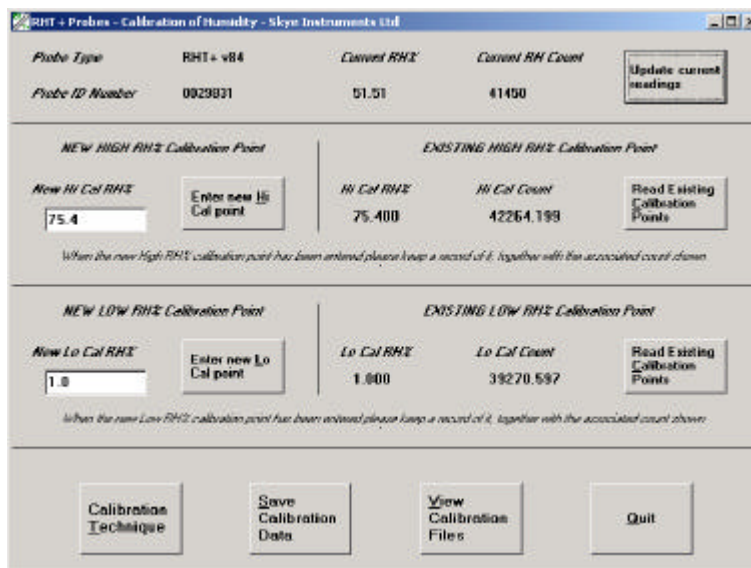
Click the Quit button to exit the program.

.....rht+ *RHTPlus CalComm*.....



4.3 Calibrate RH% Menu

Clicking on the button 'Calibration RH%' leads to another display, as shown below:



Click on the button 'Update the current readings' to display the actual RH% value as currently measured by the rht+ RHTPlus probe.

The user can check the calibration data currently held in the rht+ RHTPlus probe by clicking on the 'Read Existing Calibration Points' button.

During the calibration procedure, a new high or low calibration point can be entered by entering the new value in the box and clicking on the 'Enter New Hi Cal Point' or 'Enter New Lo Cal Point' as necessary. (Please see Chapter 3 for the method of calibration). Tips on the calibration method and technique can be seen by clicking on the 'Calibration Technique' button - see also Chapter 3.1.

.....rht+ *RHTPlus CalComm*.....

The current calibration data can be saved to file using the ‘Save Calibration Data’ button. The data is automatically stored in a text file on the PC hard drive in the folder C:\RHTplusCalFiles. The file is named using the rht+ RHTPlus probe’s ID, e.g. 12345.txt if the probe’s ID is 12345.

E.g. of a typical calibration file:

Skye Instruments Ltd. RHT+ series - Calibration and setup File

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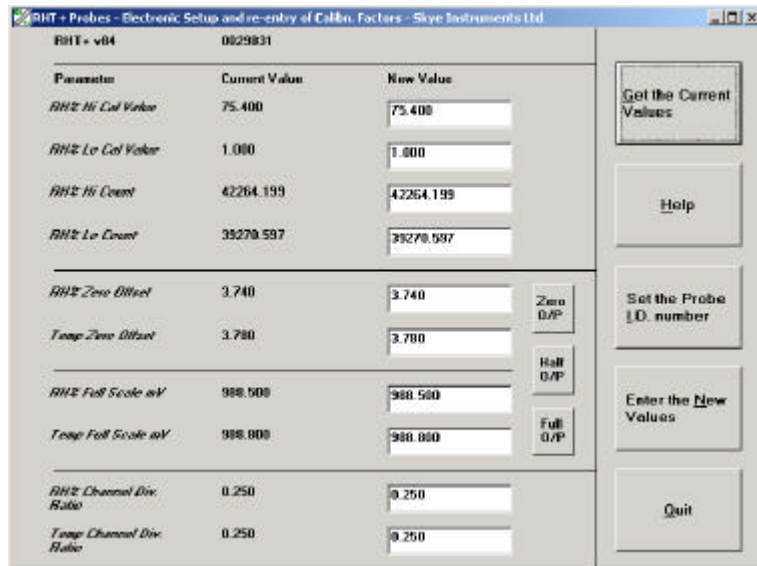
Manufacturer -      Skye
Probe type -       RHT+ v84
Serial Number -    0029831
Software version - v84
Temperature -      Analogue or non functional
Default Flag -     0.000 0
Hi Cal RH% -       75.400 0
Hi Cal Count -     42264.199 0
Lo Cal RH% -       1.000 0
Lo Cal Count -     39270.597 0
RH Channel Zero o/s - 3.740 0
Temp Channel Zero o/s - 3.780 0
RH Channel Full Scale - 988.500 0
Temp Channel Full Scale - 988.800 0
RH Division Factor - 0.250 0
Temp Division Factor - 0.250 0
Date and Time stored - 21/07/2003 18:49:21
end of data
  
```

Subsequent calibration data for the same probe is automatically appended to the same text file, with the date.

Click the Quit button to return to the Main Menu screen.

4.4 Setup RHT+ Menu

The menu shown below is accessed by clicking on the ‘Setup RHT+’ button from the Main Menu screen.



.....rht+ *RHTPlus CalComm*.....

Click the 'Get Current values' button to check the calibration data currently held in the rht+RHTPlusprobe.

Click on the 'Help' button to view tips on setting up the rht+ RHTPlus probe and re-entering calibration values.

To give the rht+ RHTPlus probe a new ID number, click on the button 'Set the Probe ID Number', enter up to 7 numerical digits and click OK. The software will confirm if the probe has been successfully programmed, or will display an error message if unsuccessful.

If the rht+ RHTPlus probe has lost its current calibration data for some reason, but has been calibrated quite recently, it is easy to simply re-enter the calibration data rather than perform a complete calibration again. Find the previous calibration data stored in the C:\RHTplusCalFiles folder, (see Chapter 4.3) enter the values in the boxes provides and click on the 'Enter the New values' button.

The buttons 'Zero O/P', 'Half O/P' and 'Full O/P' are for factory calibration of the D/A convertor and are not for use by the general user. Clicking these buttons will have no effect.

Click the Quit button to return to the Main Menu screen.

FIGURE 1 - CalComm Connections



**APPENDIX 1 - Table of millivolts v temperature
for PT100 sensors**

| Temperature Deg C | Output mV | Temperature Deg C | Output mV |
|----------------------|--------------|----------------------|--------------|
| -40.00 | 0.00 | 10.00 | 500.00 |
| -39.00 | 10.00 | 11.00 | 510.00 |
| -38.00 | 20.00 | 12.00 | 520.00 |
| -37.00 | 30.00 | 13.00 | 530.00 |
| -36.00 | 40.00 | 14.00 | 540.00 |
| -35.00 | 50.00 | 15.00 | 550.00 |
| -34.00 | 60.00 | 16.00 | 560.00 |
| -33.00 | 70.00 | 17.00 | 570.00 |
| -32.00 | 80.00 | 18.00 | 580.00 |
| -31.00 | 90.00 | 19.00 | 590.00 |
| -30.00 | 100.00 | 20.00 | 600.00 |
| -29.00 | 110.00 | 21.00 | 610.00 |
| -28.00 | 120.00 | 22.00 | 620.00 |
| -27.00 | 130.00 | 23.00 | 630.00 |
| -26.00 | 140.00 | 24.00 | 640.00 |
| -25.00 | 150.00 | 25.00 | 650.00 |
| -24.00 | 160.00 | 26.00 | 660.00 |
| -23.00 | 170.00 | 27.00 | 670.00 |
| -22.00 | 180.00 | 28.00 | 680.00 |
| -21.00 | 190.00 | 29.00 | 690.00 |
| -20.00 | 200.00 | 30.00 | 700.00 |
| -19.00 | 210.00 | 31.00 | 710.00 |
| -18.00 | 220.00 | 32.00 | 720.00 |
| -17.00 | 230.00 | 33.00 | 730.00 |
| -16.00 | 240.00 | 34.00 | 740.00 |
| -15.00 | 250.00 | 35.00 | 750.00 |
| -14.00 | 260.00 | 36.00 | 760.00 |
| -13.00 | 270.00 | 37.00 | 770.00 |
| -12.00 | 280.00 | 38.00 | 780.00 |
| -11.00 | 290.00 | 39.00 | 790.00 |
| -10.00 | 300.00 | 40.00 | 800.00 |
| -9.00 | 310.00 | 41.00 | 810.00 |
| -8.00 | 320.00 | 42.00 | 820.00 |
| -7.00 | 330.00 | 43.00 | 830.00 |
| -6.00 | 340.00 | 44.00 | 840.00 |
| -5.00 | 350.00 | 45.00 | 850.00 |
| -4.00 | 360.00 | 46.00 | 860.00 |
| -3.00 | 370.00 | 47.00 | 870.00 |
| -2.00 | 380.00 | 48.00 | 880.00 |
| -1.00 | 390.00 | 49.00 | 890.00 |
| 0.00 | 400.00 | 50.00 | 900.00 |
| 1.00 | 410.00 | 51.00 | 910.00 |
| 2.00 | 420.00 | 52.00 | 920.00 |
| 3.00 | 430.00 | 53.00 | 930.00 |
| 4.00 | 440.00 | 54.00 | 940.00 |
| 5.00 | 450.00 | 55.00 | 950.00 |
| 6.00 | 460.00 | 56.00 | 960.00 |
| 7.00 | 470.00 | 57.00 | 970.00 |
| 8.00 | 480.00 | 58.00 | 980.00 |
| 9.00 | 490.00 | 59.00 | 990.00 |
| 10.00 | 500.00 | 60.00 | 1000.00 |

APPENDIX 2 - Table of kohms v temperature for thermistor sensors - 1 °C resolution

| Thermistor Temperature Deg C | Thermistor Value (kohms) | Thermistor Temperature Deg C | Thermistor Value (kohms) |
|------------------------------|--------------------------|------------------------------|--------------------------|
| -40.00 | 336.50 | 10.00 | 19.90 |
| -39.00 | | 11.00 | 18.97 |
| -38.00 | | 12.00 | 18.09 |
| -37.00 | | 13.00 | 17.25 |
| -36.00 | | 14.00 | 16.46 |
| -35.00 | 234.10 | 15.00 | 15.71 |
| -34.00 | | 16.00 | 15.00 |
| -33.00 | | 17.00 | 14.32 |
| -32.00 | | 18.00 | 13.68 |
| -31.00 | | 19.00 | 13.07 |
| -30.00 | 177.00 | 20.00 | 12.49 |
| -29.00 | | 21.00 | 11.94 |
| -28.00 | | 22.00 | 11.42 |
| -27.00 | | 23.00 | 10.92 |
| -26.00 | | 24.00 | 10.45 |
| -25.00 | 126.90 | 25.00 | 10.00 |
| -24.00 | | 26.00 | 9.57 |
| -23.00 | | 27.00 | 9.17 |
| -22.00 | | 28.00 | 8.78 |
| -21.00 | | 29.00 | 8.41 |
| -20.00 | 97.08 | 30.00 | 8.06 |
| -19.00 | 91.62 | 31.00 | 7.72 |
| -18.00 | 86.50 | 32.00 | 7.40 |
| -17.00 | 81.70 | 33.00 | 7.10 |
| -16.00 | 77.19 | 34.00 | 6.81 |
| -15.00 | 72.96 | 35.00 | 6.53 |
| -14.00 | 68.98 | 36.00 | 6.27 |
| -13.00 | 65.25 | 37.00 | 6.02 |
| -12.00 | 61.73 | 38.00 | 5.78 |
| -11.00 | 58.43 | 39.00 | 5.55 |
| -10.00 | 55.33 | 40.00 | 5.33 |
| -9.00 | 52.41 | 41.00 | 5.12 |
| -8.00 | 49.66 | 42.00 | 4.92 |
| -7.00 | 47.07 | 43.00 | 4.73 |
| -6.00 | 44.63 | 44.00 | 4.54 |
| -5.00 | 42.33 | 45.00 | 4.37 |
| -4.00 | 40.16 | 46.00 | 4.20 |
| -3.00 | 38.12 | 47.00 | 4.04 |
| -2.00 | 36.19 | 48.00 | 3.89 |
| -1.00 | 34.37 | 49.00 | 3.74 |
| 0.00 | 32.65 | 50.00 | 3.60 |
| 1.00 | 31.03 | 51.00 | 3.47 |
| 2.00 | 29.50 | 52.00 | 3.34 |
| 3.00 | 28.05 | 53.00 | 3.22 |
| 4.00 | 26.68 | 54.00 | 3.10 |
| 5.00 | 25.39 | 55.00 | 2.99 |
| 6.00 | 24.17 | 56.00 | 2.88 |
| 7.00 | 23.01 | 57.00 | 2.77 |
| 8.00 | 21.92 | 58.00 | 2.68 |
| 9.00 | 20.88 | 59.00 | 2.58 |
| 10.00 | 19.90 | 60.00 | 2.49 |

**APPENDIX 3 - Table of kohms v temperature
for thermistor sensors - 0.1 °C resolution**

| Temperature Deg. C | Resistance Kohms |
|-----------------------|---------------------|
| 25.0 | 10000.00 |
| 25.1 | 9957.20 |
| 25.2 | 9914.40 |
| 25.3 | 9871.60 |
| 25.4 | 9828.80 |
| 25.5 | 9786.00 |
| 25.6 | 9743.20 |
| 25.7 | 9700.40 |
| 25.8 | 9657.60 |
| 25.9 | 9614.80 |
| 26.0 | 9572.00 |
| 26.1 | 9531.30 |
| 26.2 | 9490.60 |
| 26.3 | 9449.90 |
| 26.4 | 9409.20 |
| 26.5 | 9368.50 |
| 26.6 | 9327.80 |
| 26.7 | 9287.10 |
| 26.8 | 9246.40 |
| 26.9 | 9205.70 |
| 27.0 | 9165.00 |
| 27.1 | 9126.30 |
| 27.2 | 9087.60 |
| 27.3 | 9048.90 |
| 27.4 | 9010.20 |
| 27.5 | 8971.50 |
| 27.6 | 8932.80 |
| 27.7 | 8894.10 |
| 27.8 | 8855.40 |
| 27.9 | 8816.70 |
| 28.0 | 8778.00 |
| 28.1 | 8741.10 |
| 28.2 | 8704.20 |
| 28.3 | 8667.30 |
| 28.4 | 8630.40 |
| 28.5 | 8593.50 |
| 28.6 | 8556.60 |
| 28.7 | 8519.70 |
| 28.8 | 8482.80 |
| 28.9 | 8445.90 |
| 29.0 | 8409.00 |