

PC Thermometer V2

A method of measuring temperature using the PC Game port.

Display is via the program dialog or in the System tray. V2 supports timed FTP to a web server

Version History

V1. Single thermistor

V2.0 Dual version with FTP

V2.2.5 Added Padded Thermistor possibility

Added switchable Systray icon

Added toggle for FTP transfer to keep the File creation without FTP

V2.3.5 First version with Graphical display

V2.3.7 Tidier interface

1. Requirements

Microsoft Windows 95,98, 2000, Possibly ME. XP home, XP Pro

Active Game Port, must be enabled either on the Motherboard or on a plug in card for example a soundcard gameport.

Temperature Sensor as described.

Installed Joystick driver. Add the joystick in the Windows control panel. If you have a joystick use the calibration – this appears to help linearity of measurement – the type of joystick is probably not important.

2 Temperature Sensor

The program will run with either a plain thermistor or a thermistor padded with a resistor network for extended range.

Parts List

Two Thermistors for dual readings or a single thermistor and a 47K resistor, NTC (negative temperature co-efficient)

Disk types with a 25 deg C resistance between 10K ohm and 100Kohm, a 47K ohm one is ideal. Rod types may be used as well,

Using the simple thermistor setup, these are the approximate ranges for different values

A 10 k ohm thermistor is usable over -30 to 20°C

A 50 k ohm thermistor is usable over 0 to 60°C

A 100 k ohm thermistor is usable over 10 to 70°C

2 core wire (bell wire)

15 pin Male D-sub plug and cover

for the padded thermistor these extra components are needed

100K 5% resistor or better

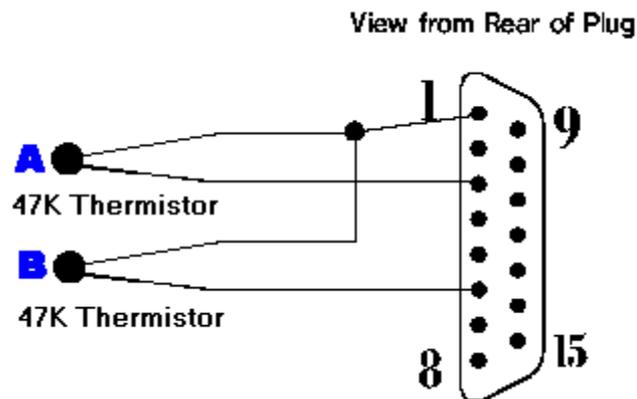
10K 5% resistor or better

Note: the game port appears to be able to measure a maximum resistance of about 120K ohm So this is the maximum value the thermistor should have at the lowest temperature to be measured. The lower limit is about 5K ohm for any accuracy so this is the lowest value for the thermistor at the highest temperature.

For the Padded thermistor the combined Series and parallel resistor must be below 120K ohm for calibration. This may not be low enough on some game ports. A value for the parallel resistor of 80 to 90K ohm may be needed

The simple thermistor probe

Wiring

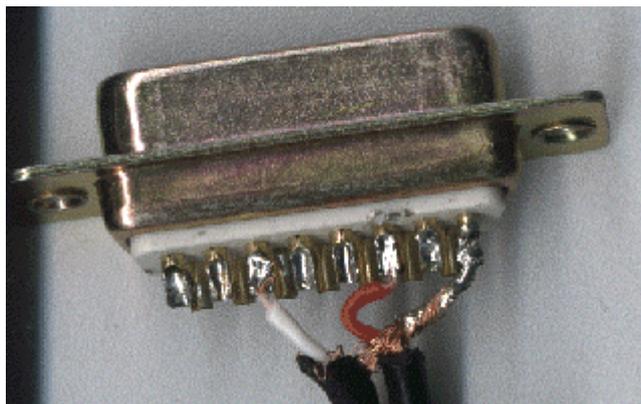


Please wire carefully Pin 1 is 5volt and must not be shorted.

Thermistor A is wired to pins 1 and 3, Thermistor B is wired to pins 1 and 6, B can be replaced with the fixed resistor of 10K to 100K ohms if a single measurement is required.

Note: there is no polarity in a thermistor. The lead length to the thermistor can be quite long up,5 metre or more with stranded bell wire.

Wired Plug



If the thermistor might get wet then cover in heat shrink sleeving or use a silicon rubber cover. Remember any covering will change the sensitivity of the probe.

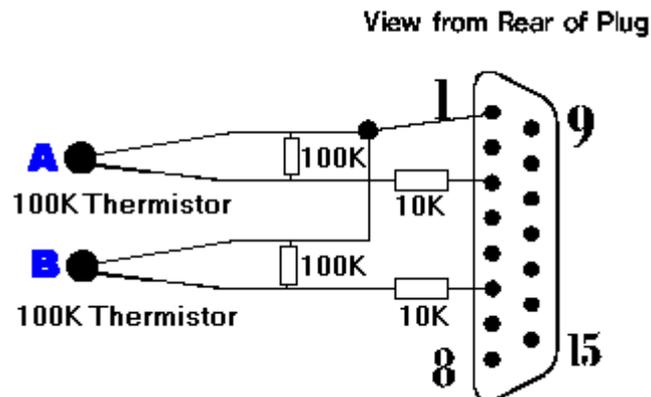
Thermistor

This is a typical Bead thermistor. Rod types can be used as well



The Padded Probe

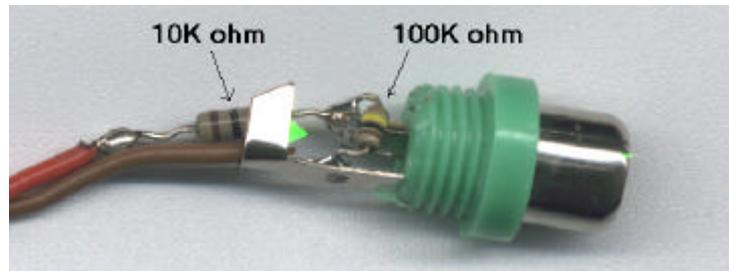
Wiring



The addition of the resistors in series and parallel constrain the values returned by the probe. This extends the useful range of temperature measurements at a cost in calibration complexity. The 10K resistors prevent the resistance falling below that value, keeping the measurement in a more accurate part of the joystick area. The 100K in parallel constrains the maximum value so allows cooler measurements.

For calibration it is necessary to disconnect the thermistor, and also to short out the thermistor connection, construction should bare this in mind. A simple method is to wire the thermistor to a phono plug, and put the resistors on a phono socket attached to the 15 pin D-Sub plug . The thermistor can then be unplugged and a shorting phono plug used when calibrating.

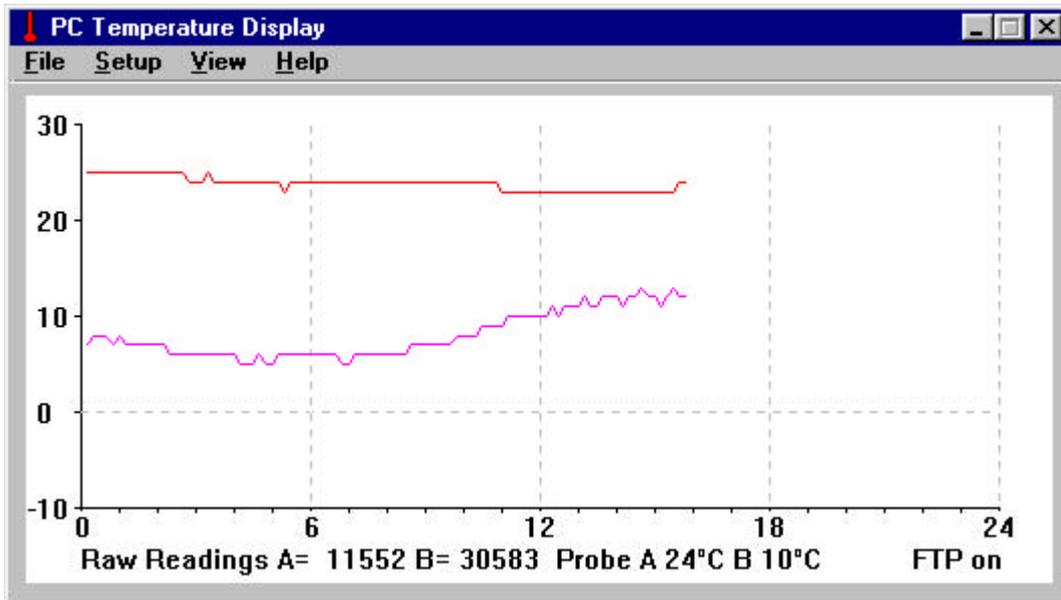
The Series and Parallel resistors fixed to a phono socket. The wire goes to the joystick port on the PC. The Thermistor is wired to a phono plug and attaches here. This sort of setup makes calibration easier.



3. Installation and Use

The program is provided in ZIP format containing 4 files, The program (pctempd.exe) a Readme.txt, a Base.html file and a dtemp.cgi file, Unzip to a directory, Then create a desktop shortcut, attach the temperature probe (thermistor) to the game port and start the program. If the probe is not connected then *Thermistor not connected* will display otherwise some values will show in the status line, this is the raw value of the joystick port read function. The program now needs Setting up and Calibrating.

Main Dialog



The options are hopefully straightforward.

File Menu

Save settings	Updates the Ini file with current settings
Ftp File on/off	Switches on or off the FTP sub-system
Quit	Closes the program

Setup Menu

Setup	General setup
Ftp Setup	Setup the Ftp system
Calibrate A	Calibrate the A probe
Calibrate B	Calibrate the B probe

View Menu

View A	Toggles the display of the A probe
View B	Toggles the display of the B probe
Graph C	Switches to degree Centigrade display
Graph F	Switches to degree Fahrenheit display
Graph Scale	Sets the Scale of the graph

Help Menu

About	About the Program and current version
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The graphical display of the days temperature is updated every 10 minutes. The view menu options control which probe is displayed or both, if the display is in Centigrade or Fahrenheit and the scale of the display. Click the menu item for the probe letter you wish to display. This is really for single probe use when only one graph is needed. The

scale is altered by selecting graph scale in the view menu then setting new max and min values in the boxes. The display will update automatically. The values are in the current units as set by the View/DegC or DegF settings. To save settings, use the File Menu/Save settings to update the ini file.

Setup menu / Setup

This sets the screen and systray update interval. The value is in seconds. for calibration it is easier to set this to 1~2 seconds.

The Systray Icon can be set to display the A or B thermometer here. The icon changes in 10 degree steps for those interested and turns blue below 10 degrees C.

It is possible to set the display to use a decimal point here. Given the accuracy of the port this is a dubious setting at best. Click the Apply button to keep the settings. To save the settings permanently, use the File Menu/Save settings to update the ini file.

Calibration

Note Calibration is in Centigrade only

You need a thermometer, a glass of Warm water and a glass of cold water. The temperature of the calibration points should be about the Coldest and Hottest temperatures to be measured. For the simple probe this also depends on the Thermistor value. Note if the Raw reading goes to 65535 then the thermistor has to high a value to measure.

With the Padded probe 0 (ice and water) and 50 deg are suitable.

Set the update interval in setup to 1~2 secs.

In the setup menu select Calibrate A (calibrating the second probe is identical.)

Reading	Actual °C
High	
Low	

This Dialog will appear. If using the simple probe, leave the Calibrate for padded Thermistor unticked.

Simple Probe Calibration

Place the thermometer in the warm water, put the thermistor in the water, If not water proofed then place in a thin plastic bag (cling film). Allow the reading to stabilise 1-2 minutes then press the upper set button, the reading will appear in the return value box. Enter the temperature from the thermometer in the Deg C box, this will accept fractional values 20.5 for example. Repeat with the cold water, when stable press the lower set and enter the temperature in the deg C box.

Now press Apply, The Main screen will appear and the Deg Celsius box will display the temperature of the thermistor, Updating every 2 seconds by default.
The Calibration will be better if it is around the area required.

To keep the calibration press the Save Settings button
Do the Same for the second thermistor if used. and save its settings. The basic Program will now display temperature.

Padded Probe Calibration

For the complex probe place a tick in the Calibrate for padded Thermistor.

The A series resistor value should be entered in the box, the default of 10000 is a suggested value. However the A and B resistor must not add to 115,000 ohms or more as this is outside the range of the joystick port.

Note: Be careful a 10% 100K resistor could be 110Kohms and this will prevent calibration.

With the thermistor disconnected, if the reading in the status on the main dialog is 65535 then the value is to high. If a 10% resistor or worse is used then a digital ohm meter can be used to get the correct value.

Enter the value of the B resistor in its box, less than 100K is OK however the readable resistance is between this value + the series resistance and the series resistance. A smaller value will restrict the range of values which can be measured.

With both values entered, short the thermistor connection. This effectively allows the program to measure the series resistance resistor A. Take the reading by pressing the Read A button.

Now undo the short, the thermistor must be disconnected and press the Read A+B button. The program will read and display the reading for the combined resistance. If the value is to high a 'range err' will appear in the value box.

The thermistor can now be connected.

Press the Calculate factor button, The program will work out a factor to allow it to calibrate the thermistor wired in parallel with the B resistor.

Calibration can now be done. Place the thermistor in the hot water (protected by cling film if required) and once stable press the high button to get the reading. Enter the actual temp in the Actual deg C box. Repeat for the cold water entering the temperature and reading the value.

Press apply and the calibration will applied and the main dialog return.
Press the save settings to keep the calibration for the thermistor.

Repeat if necessary for the second thermistor.

Calibration is finished

Thermistor A Calibration

Calibrate for Padded Thermistor

-A- Series Resistor (ohm)

-B- Parallel Resistor (ohm)

Read resistor A

Read resistor A+B

Calculate Factor

	Reading	Actual °C
High	<input type="text"/>	<input type="text"/>
Low	<input type="text"/>	<input type="text"/>

Apply Cancel

For the A resistor Short out the thermistor and series resistor. For the A+B reading the thermistor must not be attached. With both values read press Calculate and then go on the Calibrate the complete probe

Use the High or Low buttons to get the current values and enter the temperature in the °C box. do for the upper and lower calibration points

4, FTP Setup

The Program can send the readings and time to a FTP site as an HTML page or as raw text information. This FTP transfer is timed and the interval can be set in minutes, (the interval value is available for sending as well). Press the FTP setup button to enter the FTP setup dialog

Enter the FTP address or dotted quad address of the ftp site, ie ftp.mysite.com do not add ftp:// or http:// to the front of the address. This is the address you use in your normal FTP software.

Enter your user name and password. Please remember these are case sensitive.

Enter any path to the directory where the file will be uploaded to starting with /

Finally the file name to upload to the server. Remembering that servers are case sensitive. This file is the base.html file with the variables filled in, the file is then sent to the server via FTP.

All that's left is to set the upload interval in minutes and optionally, if the program should start with ftp enabled.

Click apply to keep the settings and done to exit. Finally click save settings on the main screen to update the default settings.

To use the FTP capabilities of the program a base.html file needs creating (a sample one is provided in the zip) and a web site. A simple CGI display script is included in the download but this needs a cgi-bin on the web host and not all do. A readme.txt is enclosed with details of setting up the base.html and the capabilities for display and use of the cgi script. For those without CGI uploading a html file is the simplest method. Create a HTML file with variables where you want the information to display and call it base.html, The program will substitute the variables and rename the file to what is set in the FTP file name box. Anyone visiting the site will see the current version.

It is possible to disable the FTP and just create the modified base.html file, for this check the No FTP box.

Variable List

Use these Variables in the base HTML file, any combination may be used in any order. Note: Case sensitive.

Variable	Meaning	Value
%th	Displays hour	two digits (24hr clock)
%tm	Displays minute	Two digits
%ts	Displays seconds	Two digits
%yr	Displays year	4 digits
%mn	Displays month	2 digits
%ms	Displays short form month	(Jan Feb Mar etc)
%ml	Displays long form month	(January February etc)
%dy	Displays the day of month	Two digits
%up	Displays Update interval in minutes	Two Digits
%ac	A probe temperature	Centigrade
%af	A probe temperature	Fahrenheit
%bc	B probe temperature	Centigrade
%bf	B probe temperature	Fahrenheit

Using

After setup and calibration the program can be started and left on screen to display the temperature. The File menu / FTP File on/off item switches FTP on or off (in the case of No FTP checked then just the File is created) and shows the current status.

The program may be minimised in which case it will become an icon in the system tray. Hovering the mouse over it will display the temperature, a right click will allow setting of Deg C or F for the Systray tip, and exiting the program. A normal click will show the main dialog displaying the temperature and giving access to the menus.

Files Created and used by the program

The program keeps its settings in a file called Pctemp.ini in the windows directory. Please do not edit this file.

From V2.35 onwards a file called graph.csv will be created and added to in the programs directory. This file contains the data used to plot the graph on screen, In the future it is intended to provide a subsidiary program to view this data by day, month and year. As it stands it may be copied and used with Excel or similar programs to display the data.

The data format is Date, Time, Probe A, Probe B

Date is formatted as mm-dd-yy, Time is Hour:Min in 24 hour format. Then the temperatures in centigrade

Removal.

Delete the files. The program stores its settings in an ini file in the windows directory. This is called Pctemp.ini and will need to be deleted to complete the removal process.

NOTE The PC joystick Interface is inaccurate, there is considerable jitter on the port, while attempts have been made to average out the problems the basic accuracy with good calibration is unlikely to be better than \pm one degree Celsius and may be worse.

The Program may be downloaded from www.allthingsspiny.co.uk. It is provided in ZIP format containing 4 files, The program (pctempd.exe) a Readme.txt, a Base.html and a dtemp.cgi file,

Download place in directory and unzip. Then make your own shortcuts to the desktop / menus as required.

If you find this fun or useful, or have any comments please send an Email to comments@allthingsspiny.co.uk

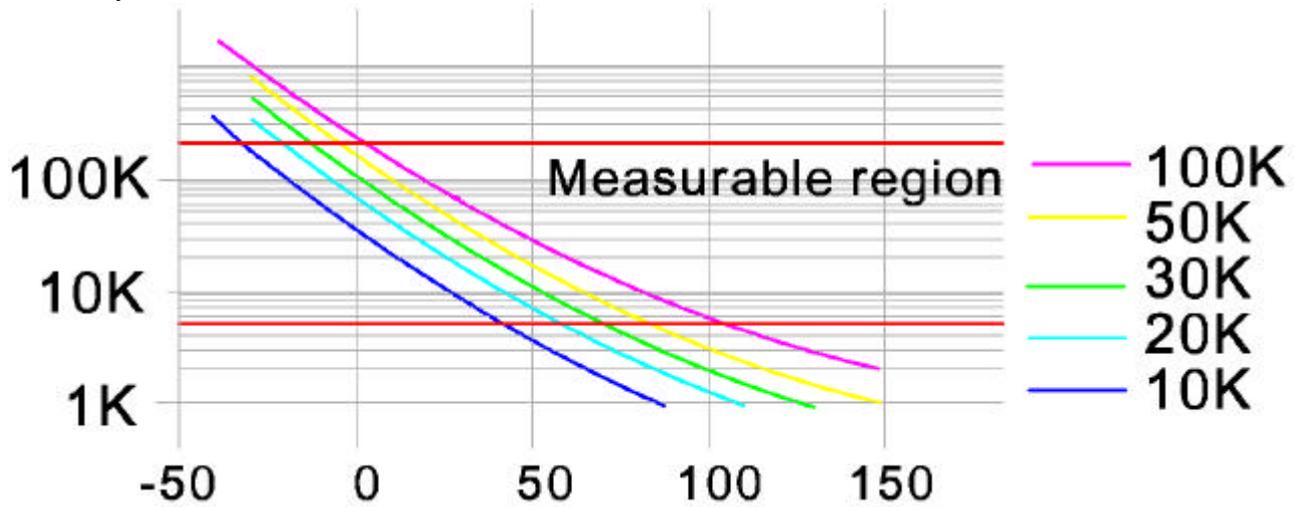
The Program and Instructions are Copyright Spiny Sept 2001 and may not be reproduced or copied without express permission. The program PCtemp.exe is supplied as is and is not warranted to be fit for any purpose. Installing and using the program is at your own risk as is making the temperature probe.

The program may not be resold for gain or used as part of a commercial product without the express written permission of the author.

Appendices

Simple Thermistor

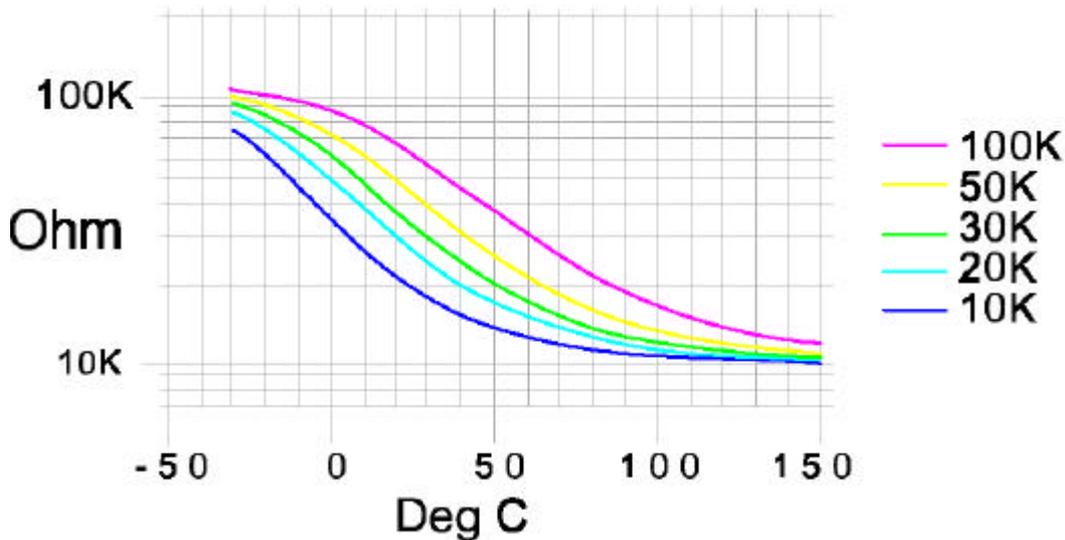
For the simple probe this graph gives some idea of the thermistor values and the temperatures covered by them.



The red lines define the values measurable with the joystick port. For a 50K thermistor (25 deg C value) the span is about -10 to 70 deg in theory, in practice a little less is probably the real span.

Padded Thermistor

For the Probe with the series and Parallel padding the temperature curves are constrained like this. This is using the 10K series and 100K parallel resistor.



The Curves are all in the range of the joystick port. The compression at the high and low temperature ends restricts the accuracy at these points. A 100 K thermistor should read from about -10 to 100 degrees and the 10 K from -25 to 50 degrees.