The Thermok is four channel, K-type thermocouple display with LCD display and serial port. It can simultaneous display all four thermocouple channels, and at the press of a button, will display the maximum and minimum observed temperatures. The uses for a Thermok are endless. It was originally developed for monitoring engine exhaust gas temperatures while tuning an ethanol powered racecar engine, but now has been used for everything from engines to baking cookies. For programmers, home brewers, and hardware hackers, the source code is available under the GNU GPL license.

Thermocouples

The Thermok uses K-type thermocouples with miniature connectors. See product website (www.aprsworld.com) for additional thermocouple information and internet links.

Power

The Thermok requires 7 to 20 volts. The power connector is 2.1mm x 5.5mm. The center terminal (tip) is positive and the outer terminal is negative. An AC adapter can be purchased from APRS World, LLC, Radio Shack, or a local electronics retailer. It is also possible to operate the Thermok from a 12-volt vehicle power system. A connector pigtail is available from APRS World, LLC for this purpose.

Displaying Minimum and Maximum Temperatures

To display the maximum and minimum measured temperatures, simply press the red button. The maximum temperatures for each channel will be displayed, followed by the minimum temperature. To clear the maximum and minimum temperatures, press the red button and hold until the Thermok display reads '*Mins and Maxs Reset.*'

Choosing Temperature Units

The Thermok will display temperatures in either Celsius or Fahrenheit. Upon startup, the Thermok will display the units currently in use. To change units, simply hold down the red button for approximately two seconds when powering up the Thermok.

Serial Interface

The serial port provides the four temperature measurement channels. The serial port communicates using RS-232 at 9600 baud, 8N1. It can be connected to a computer with a standard USB to serial adapter or by using a straight through serial cable. The specifications for the serial interface can be found on our website.

Upgrading Firmware

The Thermok incorporates a serial boot loader that allows its firmware to be upgraded via its built in serial port. Check the Thermok website for new firmware versions, upgrades, and instructions.

Adjusting Display Contrast

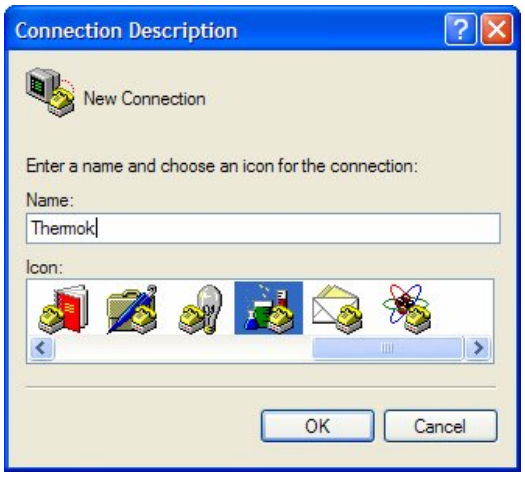
The LCD display contrast can be adjusted by using a small flat screwdriver to adjust the potentiometer inside the Thermok. The adjustment location is a 1/8" hole on the bottom of the case.

Connecting to the Computer

To download data recorded by the Thermok, connect the Thermok to the serial port on your computer. The Thermok kit includes a DE-9 male to DE-9 female extension cable (serial port). Use this cable to connect the Thermok to the serial port on the computer. You may also use a USB to serial adaptor.

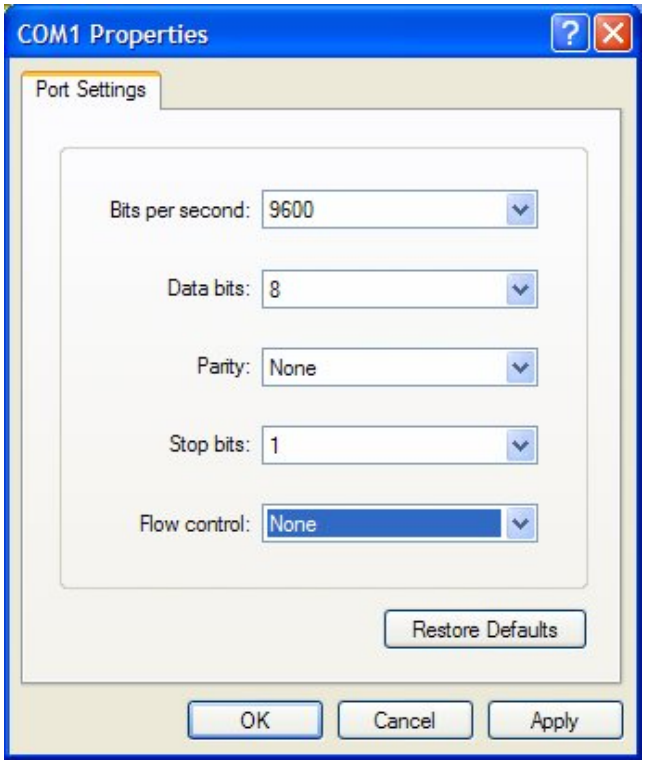
Setup for Collecting Data

If using Microsoft Windows, go to Start, All Programs, Accessories, Communications, and open the program 'Hyper Terminal.' The program will prompt you to give a description for the Thermok connection. Once the connection is described, click 'OK.'

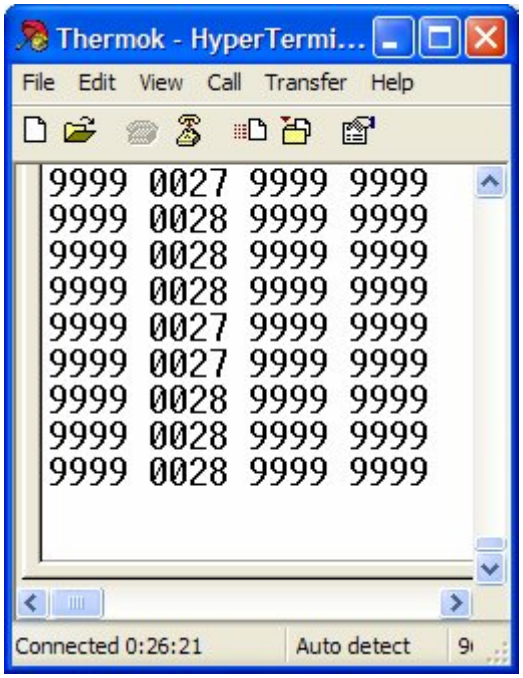


Hyper Terminal will then prompt you to connect to an external port. Click on the pull-down arrow of the 'Connect using' section and, if the Thermok is connected to serial port 1 of your computer, select 'COM1.' Click 'OK.'

You will next be prompted to change the port settings for the serial port you are connected to. Using the pull down menus, change the 'Bits per second' to '9600' and change the 'Flow control' to 'None.' Click 'OK.'

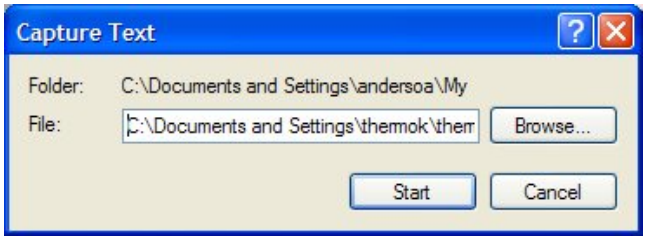


Hyper Terminal should now be recording data from the Thermok. Only the channels with thermocouples connected will display readings. Channels not in use will display '9999.'



To capture your data in a format that can be used with graphing software, go to 'Transfer' and click on 'Capture Text.' Choose the directory to save the data, being sure to add the extension '.txt' to specify that you are writing to a text file. Example:

C:\DocumentsandSettings\thermok\thermok.TXT

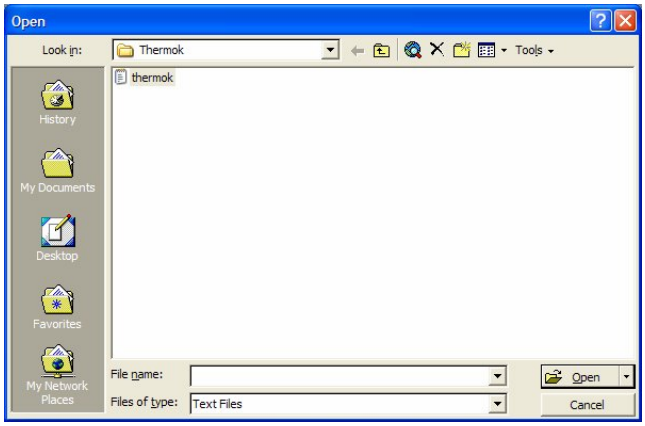


Click 'Start.' Data is now being captured and written to the specified file. When enough data has been captured, go to 'Transfer,' 'Capture Text' and click 'Stop.'

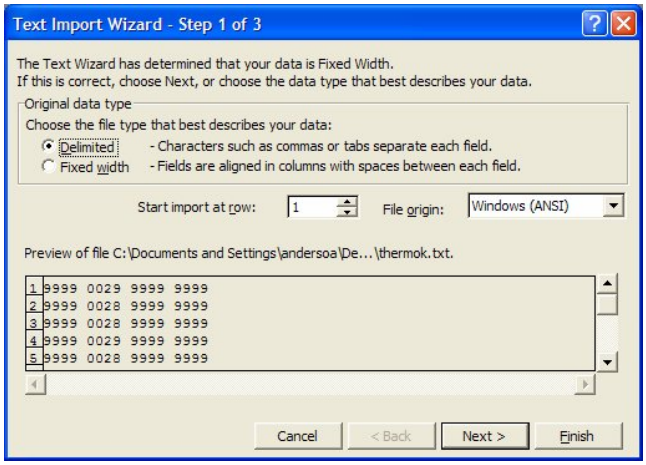
Importing the data into Microsoft Excel

The data can be imported into Microsoft Excel or any other spreadsheet. If you don't have spreadsheet software on your computer, we recommend downloading the superb free software from OpenOffice.org. If you mention it at the time of your order, we are more than happy to include a free OpenOffice.org CD with your order.

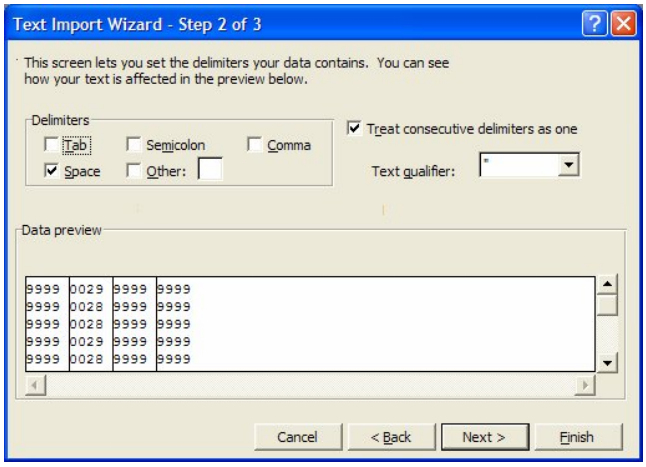
To open the data in Excel, go to 'Open' and find the directory where the Thermok data was stored. Click on the file you wish to use, and click 'Open.'



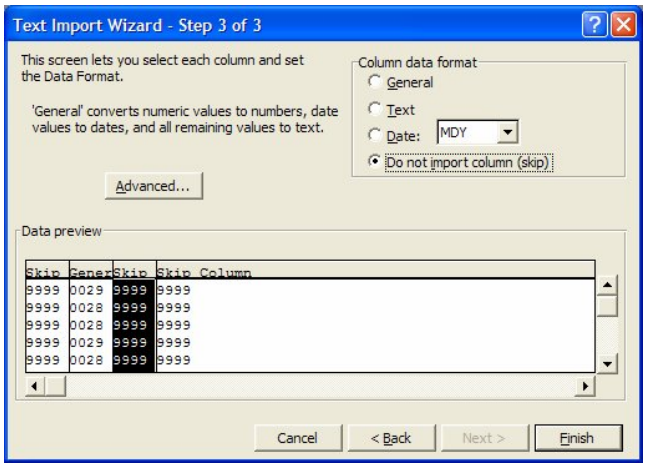
Since the data is saved as a text file, you will have to go through a series of steps to import the data. In the first step, select the option 'Delimited' and click 'Next.'



In step two, select 'Space' as the delimiter and click 'Next.'

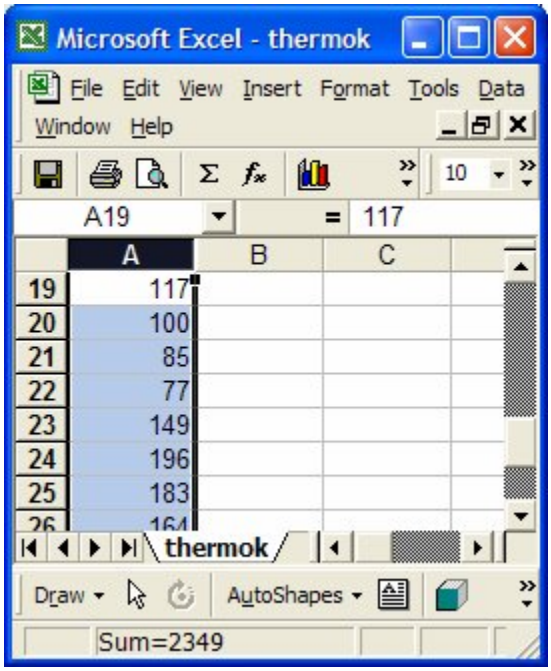


In the last step, you are able to choose which sensors you would like to use to graph data. If you would like data from all sensors, simply click 'Finish.' If there are sensors that you do not want to include in the Excel spreadsheet, highlight that column in the 'Data preview' window, and then select 'Do not import column (skip)' in the 'Column data format box. Click 'Finish.' The data should now appear in spreadsheet form.

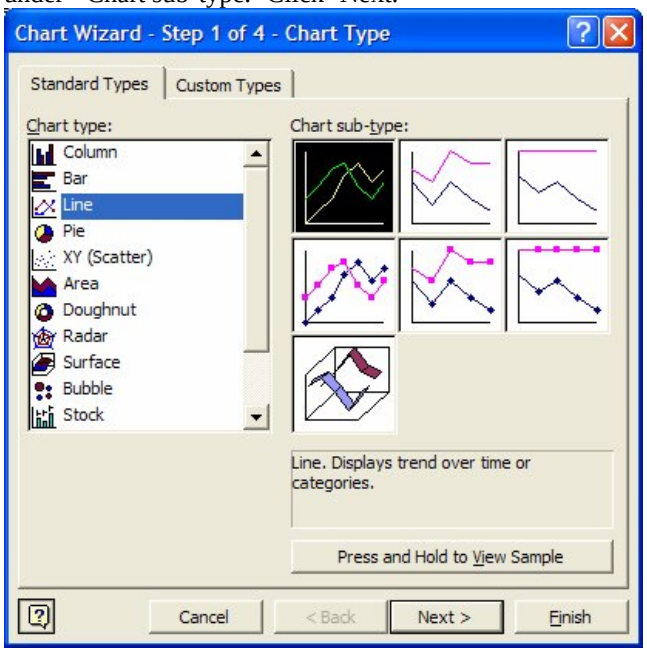


Graphing Data in Microsoft Excel

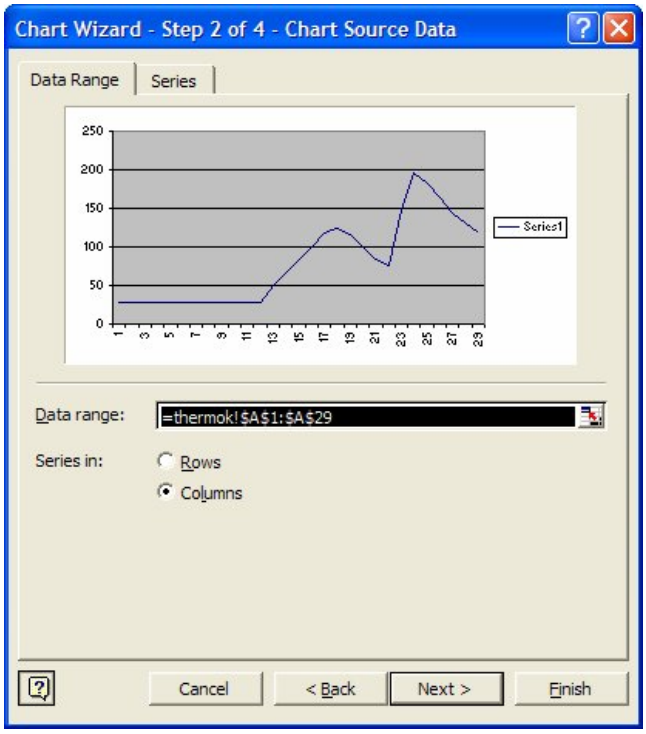
To graph the data, highlight the column(s) you are interested in by clicking on the column heading(s) (i.e. 'A'). If you are interested in graphing multiple columns of data, click and drag the mouse to select all columns of interest. Graph the data by going to 'Insert' and then clicking on 'Chart.'



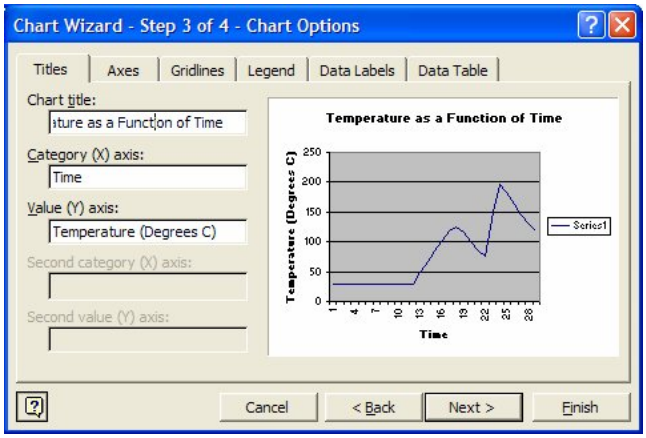
A series of 'Chart Wizard' windows will pop up. In the firs window, select the 'Line' chart type. Select the first option under 'Chart sub-type.' Click 'Next.'



In the next window, choose to arrange the series in 'Columns.'



The next window allows you to title the chart and axes. It also displays an example of how the final product will look. Click 'Next' again and choose whether the chart should be displayed as a 'New sheet' or as an 'Object in' the original table. Finally, click 'Finish' to view our finished data chart.



Specifications

Sensors:
- 4 Thermocouple input channels
- Thermocouple type is K-type (Chromel (+) Alumel (-))
- 4 miniature-sized thermocouple connectors
- 0°C to 1024°C (32° to 1875°F) temperature range
- 1° display resolution
- ±4°C (8°F) measurement accuracy

Interfaces:
- 16 characters by 2 lines LCD display; Positive transflective LED edge backlit
- E1A/T1A-232 voltage levels; DE-9 Female; DCE; Compatible with all serial ports
- 9600 baud. 8 bits, no stop bit, 1 parity bit (8N1); ASCII based protocol

Physical dimensions and materials:
- Weight: 190g (6.7 oz)
- Overall Dimensions: 139.7mm wide, 101.6mm long, 36.83mm deep (5.5 x 4.0 x 1.5 in)
- Case Material: Flame retardant ABS plastic; UL's best flame rating of 9405VA (case only)

Power:
- 7 to 20 volt DC
- DB9-Female. Pin 5 ground, Pin 9 positive; 7.7 to 20 volts
- 2.1 x 5.5mm power jack

- 39mA current consumption

Further Information

Further information can be found on our website. Including the device schematic, embedded software source code, programming instructions, thermocouple suggestions, and sample applications.

Notice

This device is sold as "Test Equipment" for industrial and commercial applications. It is intended to be used for maintenance, research, evaluation, simulation and other analytical and scientific applications.

Warranty

APRS World's support policy is simple; we want you to be happy! If you have a problem, please feel free to contact us and we will do our best to get you up and running as soon as possible.

The Thermok has a one-year limited warranty. We will repair or replace your Thermok if you encounter any problems within one year of purchase. We reserve the right to charge a reasonable fee for repairing units with user-inflicted damage. It is your responsibility to ship the defective unit back to APRS World, LLC. We will pay for shipping the replacement to you. We reserve the right to upgrade your equipment to an equivalent or better model. This warranty does not cover the accuracy of the sensors connected to the Thermok or the accuracy of the data collected by the Thermok.

APRS World, LLC prints on post-consumer recycled paper products.