



DaqPRO

Handheld 16-bit 8-channel Data Logger





DaqPRO Marketing Concept

- Handheld universal data logger
- The major market need:
 - Specially designed for customers looking for more than a one channel recorder (MicroLog) but do not need a very expensive 32-channel data logger
- The fundamental tool in corporate data logging



DaqPRO Layout

8 universal sensor inputs

USB Port

AC/DC adapter



LCD display

Operations keypads





DaqPRO Layout (cont.)

Universal Sensor inputs:

Temperature - NTC

Temperature – PT-100
(2 and 3 wires)

Temperature – TC-J, K and T

Voltage – 0-10 V, 0-50 mV

Current – 4-20 mA

Pulse/Frequency counter on
channel 8





Getting Started

- **Battery:**
 - DaqPro has a 7.2V NiMH battery
 - Charge the unit for 10 – 12 hours
 - Battery Life – Up to 24 hours
 - DaqPro also has a 3V Lithium battery to keep an internal clock and calendar running. This battery also backs up the memory, so no data will be lost, even if the main battery runs out of power

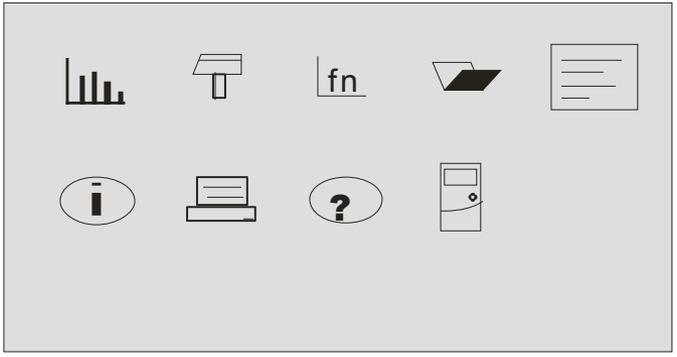


Menu Buttons

	Forward	Move to the next menu or to the next menu options
	Backward	Move to the previous menu or menu options
	Enter / Start	Enter the selected menu or select the current menu option and move to the next menu command
	Escape / Stop	Return to the main menu or stop recording



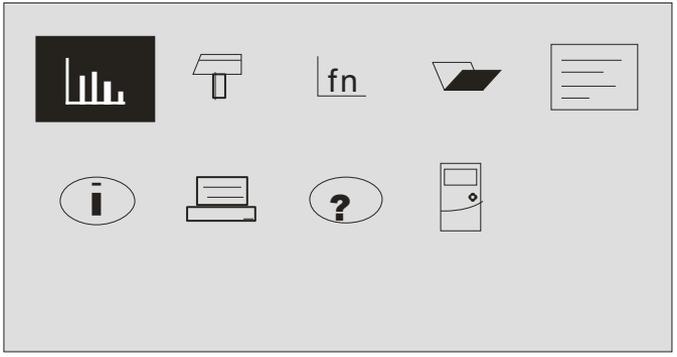
Panel & Display Menu





Panel & Display Menu

Start logging



Start recording using **Enter** button



Panel & Display Menu

Setup the logger



Setup enables you to set the data logger for the next recording:

Input – Select the relevant sensors for each input

Rate – Interval at which logger records each data reading

Sample – Number of data readings the logger records

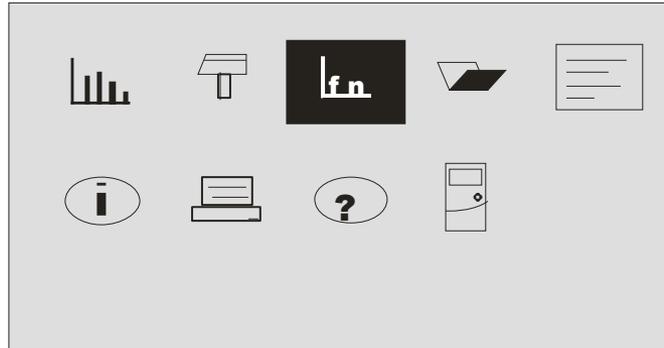
Display – Numeric, Meter, Table, Graph

Start – Press the **Forward** button to start recording



Panel & Display Menu

Functions menu



Returns statistics of the current data –
maximum, minimum and average



Panel & Display Menu

Open file



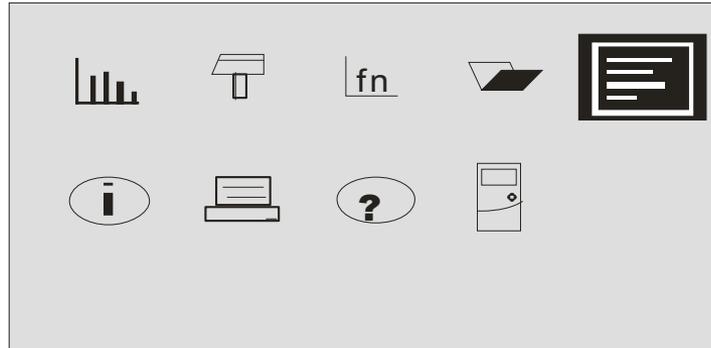
Displays

Allows users to zoom-in, zoom-out and add markers to the graph. Use the buttons to scroll, then press to open



Panel & Display Menu

Investigation notes

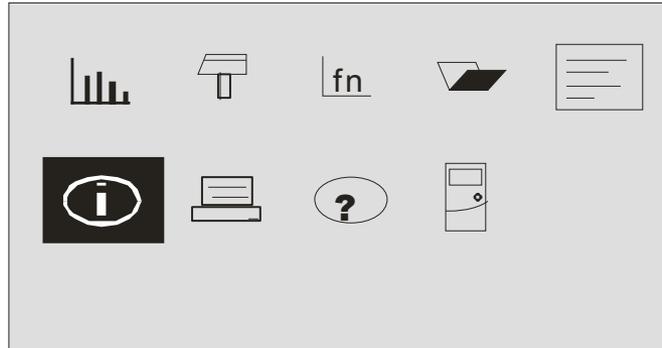


Displays recording notes. Use DaqLab software to edit the notes



Panel & Display Menu

System information

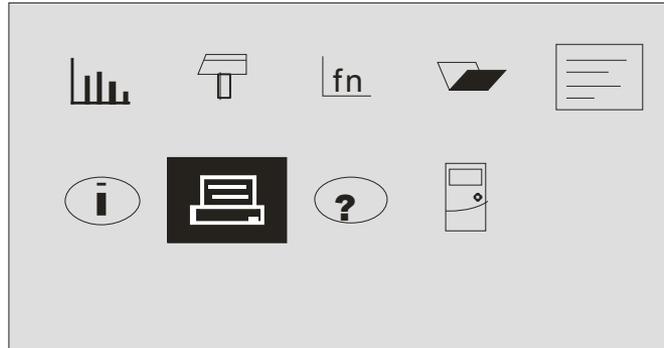


- Name of logger
- Number of investigations stored
- Memory usage
- Ambient temperature
- Current date and time



Panel & Display Menu

Printing table

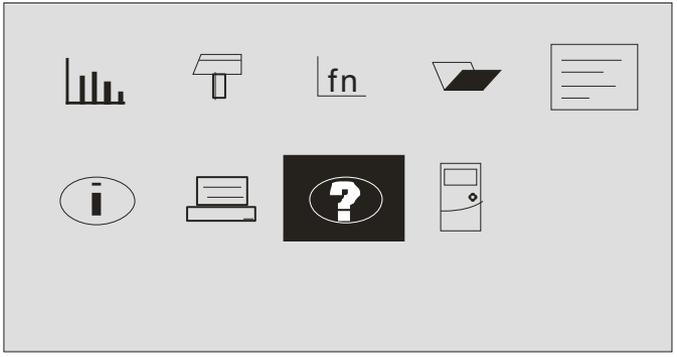


Not active



Panel & Display Menu

Help

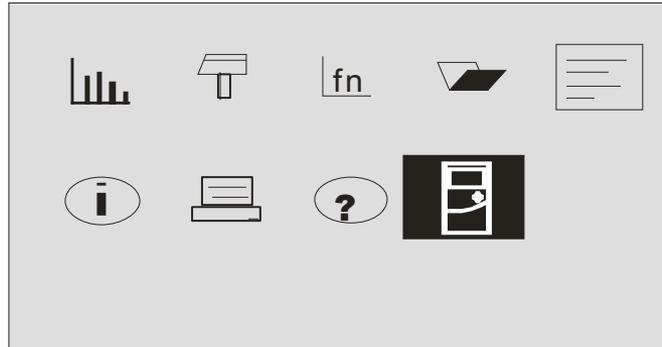


Online help



Panel & Display Menu

System configuration



Configure the logger:

Int/Ext Compensation – Set compensation for thermocouple calibration

Average samples – Set logger to take average reading from last 0 to 15 samples

Temperature units – Celsius / Fahrenheit

Clear memory – Deletes stored data files

Contrast – Use **arrow** buttons to tune screen contrast



Connecting Sensors to the Logger

Always connect primary sensor Inputs 1 - 8 **right to left**





Remote Logging



- Turn on DaqPro, and wait for unit to power up
- Plug a Temperature sensor into 1st input
- Use **Forward** button to move to **Setup the logger** menu.
- Use the **Enter** button to enter the **Setup** menu
- Select NTC on **In-1**. Click **Enter** to set the second input. Press **Escape** when finished



Recording Rate

- In the **Setup** menu, select the **sampling rate**. Use the arrow buttons to scroll through the various sampling rates
 - Make sure that rate is set to at least twice the rate of the explored phenomenon
 - Sampling at too slow a rate will give false results
 - Sampling too fast is also not useful – successive samples will detect no changes in the data
 - Manual sampling is used if measurements are not related to time



Recording Time

- Next, in the same **Setup** menu, use the **Enter** button to move down to the next item – **Number of samples**
 - To think more clearly of how many samples you want, you need to think of the time it takes for the change to occur. If you think, for example, that the recording will last in 20 – 30 minutes, then from the rate of sample, you can calculate how many samples you should take
 - Rate = Every 10 seconds
 - Samples = 200 (if you want to log for 33 minutes)



Viewing the Data

- **Viewing the data**

- DaqPRO displays the data as you log
- Real-time display is numeric for rates above 10 per second, and graphical for sampling up to this rate
- When a stored file is opened from the **Open file** menu, it is always displayed as a graph
- Use the **Forward** and **Backward** buttons to position the cursor over the desired data point and to display its values
- Press both the **Forward** and **Backward** buttons simultaneously to zoom in around the cursor

- **Applying analysis to the data**

- Open the file using the **Open file** menu
- Once the file is open, return to the **MAIN MENU** and enter the **Function** menu to display maximum, minimum and average values of the readings



DaqLab Software

Main Features:

- Graphical, analysis Windows ® based software for the DaqPRO
- Graphical display of all inputs
- Setup wizard for the DaqPRO
- Definition of up to 20 custom sensors in the DaqPro
 - Read the defined sensor's units on the logger's display
- Full calibration of the DaqPRO via DaqLab software
- Documentation and filing
- Alarm levels on graphs
- Export and import to and from spreadsheets
- More than 30 analytical functions, for professional analysis of the collected data



Main DaqLab Toolbar

	New	Start new project
	Open	Open saved project
	Save	Save project
	Print	Select print options
	Run	Start a data recording session. Click on the down-arrow to select recording mode
	Stop	Stop recording
	Download	Download the data from the most recent recording session
	Setup	Open the Setup dialog



Main DaqLab Toolbar (cont.)



Meter setup

Display Meters Setup dialog



Data map

Display the Data Map



Graph

Display the Graph window



Table

Display the Table window



Analysis

Open the Analysis wizard



Linear fit

Draw a line of linear fit of the selected data set



Derivative

Draw a line of the derivative of the selected curve



How Files are Saved

- Every time you start a new session, DaqLab automatically creates a new project file
 - All the information you collect and process for a given experiment is stored in a single project file
 - These files contain all the data sets you collect with DaqPRO, the analysis functions you've processed, specific graphs and tables you've created, and the settings for the session



Online Logging 1

- Prepare DaqPRO for online logging
 - Connect the logger to the PC
 - Turn on DaqPRO
 - Plug in any external sensors
 - Open the DaqLab software



Online Logging 2



- Set up the data logger

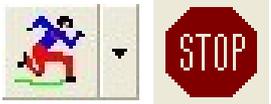
- Click Setup Wizard on the main toolbar
- Follow the instructions in the Setup Wizard
- Alternatively, you can set up the session parameters on the data logger directly from the logger
- There is a choice of three data recording options – click the downward arrow next to the  icon



- **Single measurement** – New project file for every recording session
- **Replace** – New data replaces old data in the display. Old data is still stored but not shown
- **Add** – New data sets are added to the graph in addition to the old ones



Online Logging 3



- Recording
 - **Run** begins the logging
 - **Stop** ends the recording
 - If the recording rate is 100/s or less, DaqLab automatically opens a graph window plotting the data in real-time. If the recording rate is higher than 100/s, the data will be downloaded and displayed automatically once the data recording is finished



Downloading Data

- Online Data logging
 - When DaqPRO is connected to the PC, data is automatically downloaded. Whether or not a real-time graph is displayed depends on the sampling rate
- Offline Data logging
 - To download data that was recorded offline, i.e. when DaqPRO was not connected to a PC, connect DaqPRO to the computer, run the DaqLab program and click **Download** on the toolbar
 - Once the transfer is complete, the data will be displayed automatically in the Graph window and in the Table window
 - If there are several sessions stored in the DaqPRO, the first download will bring up the most recent session; the next downloads will bring up the stored sessions successively starting from session 1
 - To download a particular session, choose **Selective Download** from the **Logger** menu, then select the session number in the dialog box
 - Click **Cancel** in the Download progress window at any time to stop downloading the data





Data Management



- **Saving Data**

- All data is saved per project or session file. The Data Map shows all the data sets you collect with DaqPRO, the analysis functions you've processed, specific graphs and tables you've created, and the settings for the session



- **Opening Files**

- DaqLab displays the first graph on the list. Use the Data Map to display the correct data set



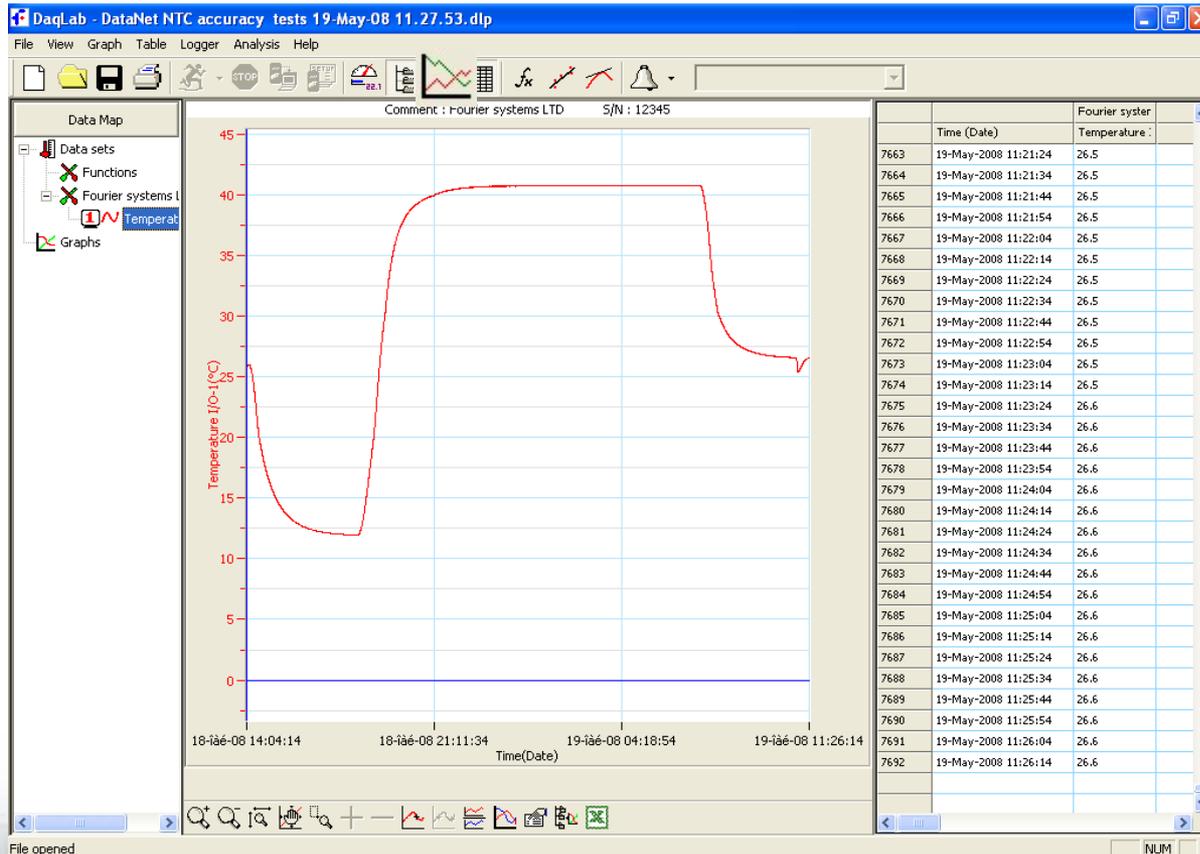
- **Creating a New Project File**

- Opening DaqLab will automatically open a new file
- When working in Single Measurement mode, clicking the **Run** button will automatically start a new file
- Click the **New** button



Graph Display

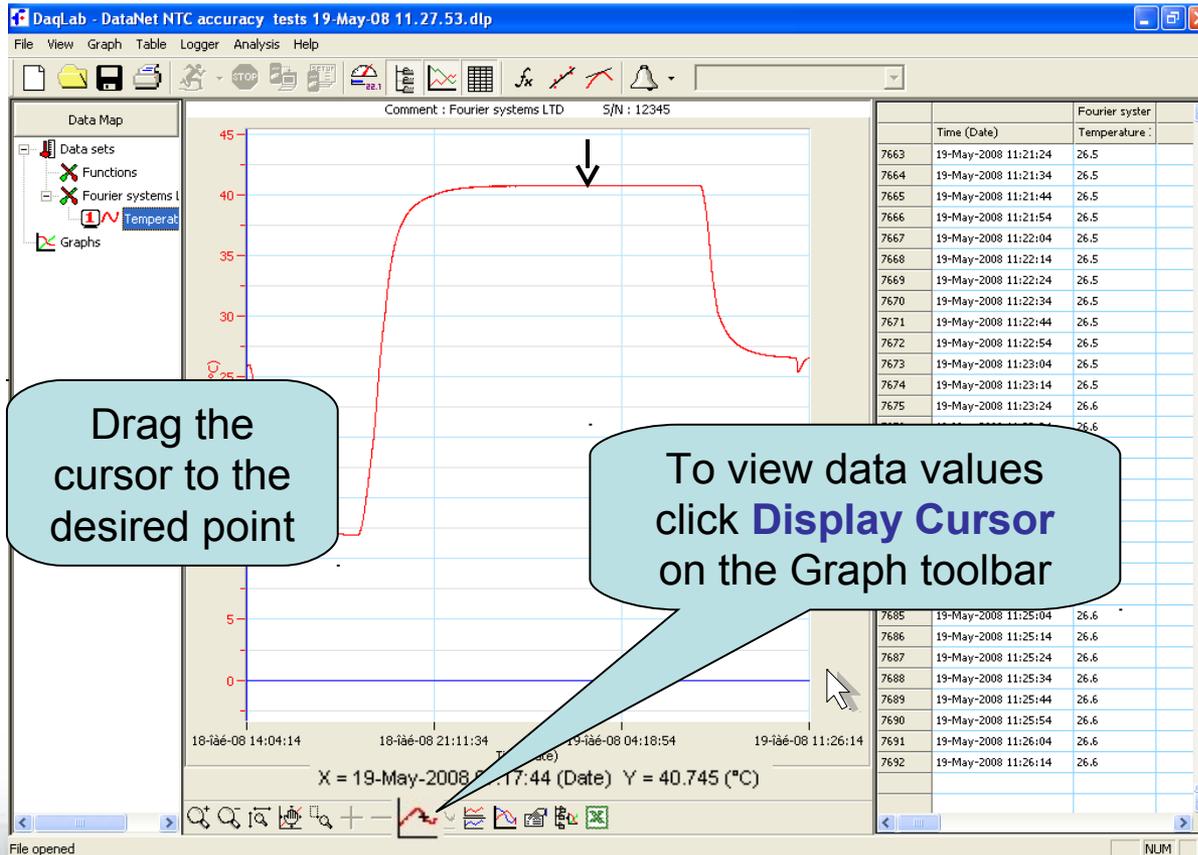
Click **Display Graph** on the main toolbar





Graph Display (cont.)

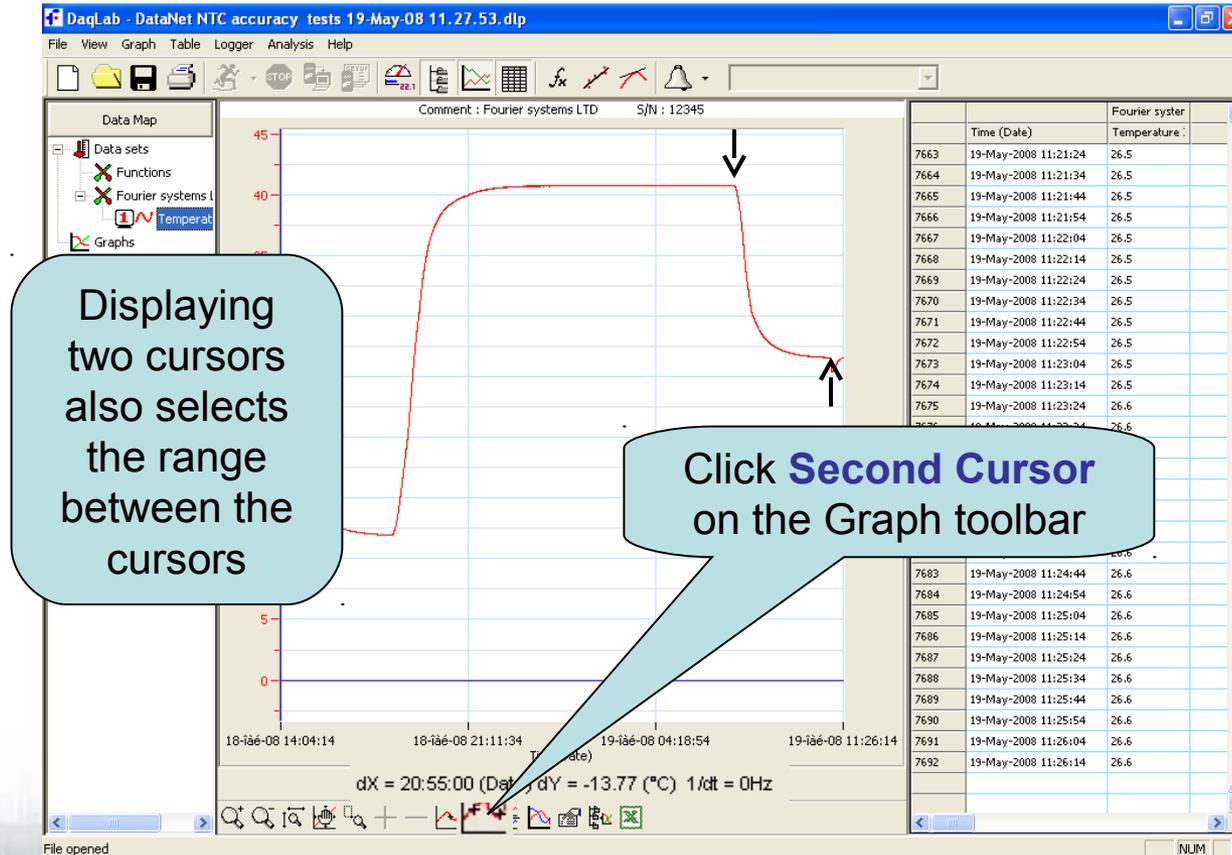
The point's values appear in the information bar





Graph Display (cont.)

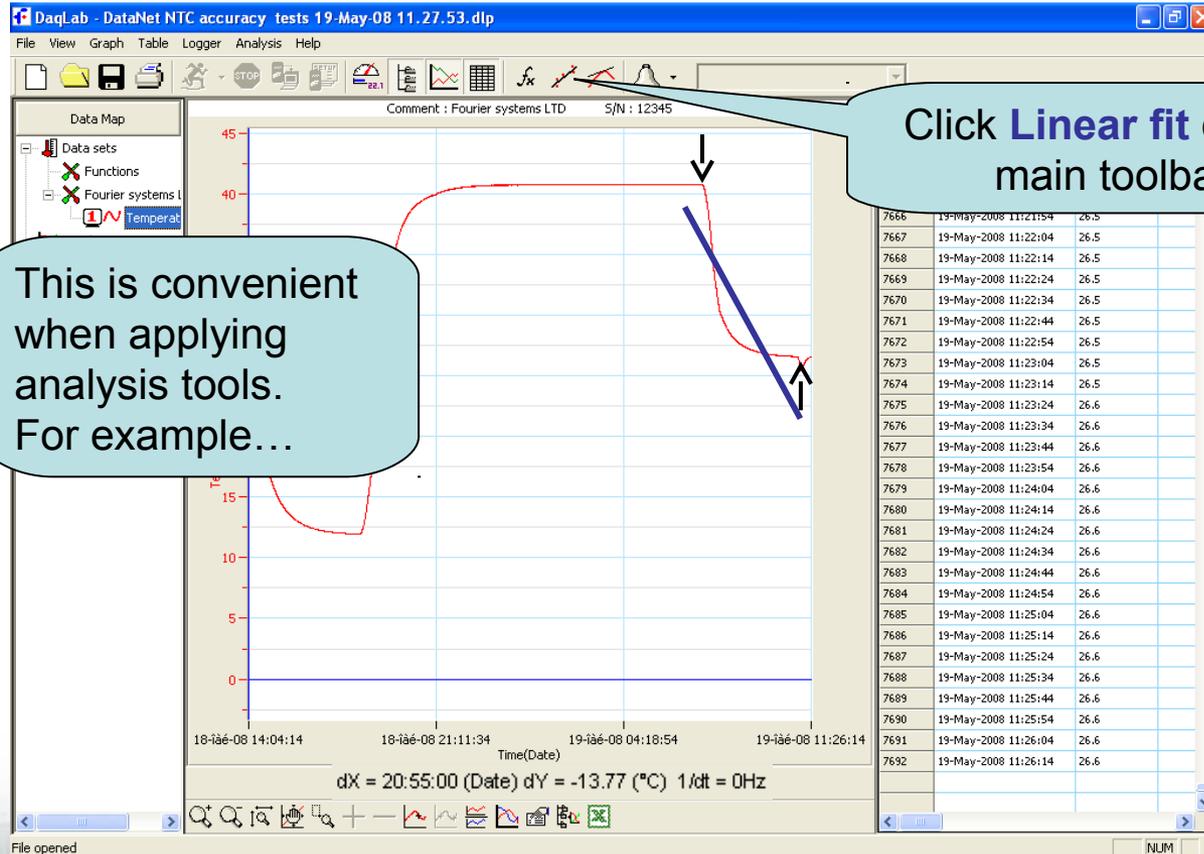
Use the second cursor to display the difference between two coordinate values





Graph Display (cont.)

The fit curve is displayed on the graph while the fit equation appears in the information bar



This is convenient when applying analysis tools. For example...

Click **Linear fit** on the main toolbar



Graph Display (cont.)

This will open a Statistics window with statistics of the selected range

The screenshot shows the DaqLab software interface. The main window displays a graph of temperature over time. A red line represents the data, and a blue horizontal line is drawn at approximately 60.80. A statistics window is open over the graph, displaying the following statistics:

Average = 60.80	Sum = 2492.60
StDev = 3.076	Area = 242.70
Min = 56	Samples = 41
Max = 65.60	Rate = 10 samples per second

A callout bubble points to the 'Analysis' menu and the 'Statistics' window, with the text: "This when analysis tools. For example...". Another callout bubble points to the 'Analysis' menu and the 'Statistics' window, with the text: "Or click Analysis, then click Statistics".

The main window also displays a table of data on the right side:

Time (Date)	Temperature :
7663 19-May-2008 11:21:24	26.5
7664 19-May-2008 11:21:34	26.5
7665 19-May-2008 11:21:44	26.5
7666 19-May-2008 11:21:54	26.5
7667 19-May-2008 11:22:04	26.5
7668 19-May-2008 11:22:14	26.5
7669 19-May-2008 11:22:24	26.5
7670 19-May-2008 11:22:34	26.5
7671 19-May-2008 11:22:44	26.5
7672 19-May-2008 11:22:54	26.5
7673 19-May-2008 11:23:04	26.5
7674 19-May-2008 11:23:14	26.5
7675 19-May-2008 11:23:24	26.6
7676 19-May-2008 11:23:34	26.6
7677 19-May-2008 11:23:44	26.6
7678 19-May-2008 11:23:54	26.6
7679 19-May-2008 11:24:04	26.6
7680 19-May-2008 11:24:14	26.6
7681 19-May-2008 11:24:24	26.6
7682 19-May-2008 11:24:34	26.6
7683 19-May-2008 11:24:44	26.6
7684 19-May-2008 11:24:54	26.6
7685 19-May-2008 11:25:04	26.6
7686 19-May-2008 11:25:14	26.6
7687 19-May-2008 11:25:24	26.6
7688 19-May-2008 11:25:34	26.6
7689 19-May-2008 11:25:44	26.6
7690 19-May-2008 11:25:54	26.6
7691 19-May-2008 11:26:04	26.6
7692 19-May-2008 11:26:14	26.6

The main window also displays a graph with the following parameters: $dX = 20:55:00$ (Date) $dY = -13.77$ ($^{\circ}C$) $1/dt = 0Hz$.



More Analysis Tools

- **Smoothing tool**

The smoothing tool is very useful in reducing random noises, especially if you want to apply any analysis functions to the data

- **Derivative tool**



Click **Derivative** on the main toolbar to construct a graph in which each point is the slope of the three consecutive points on the source graph

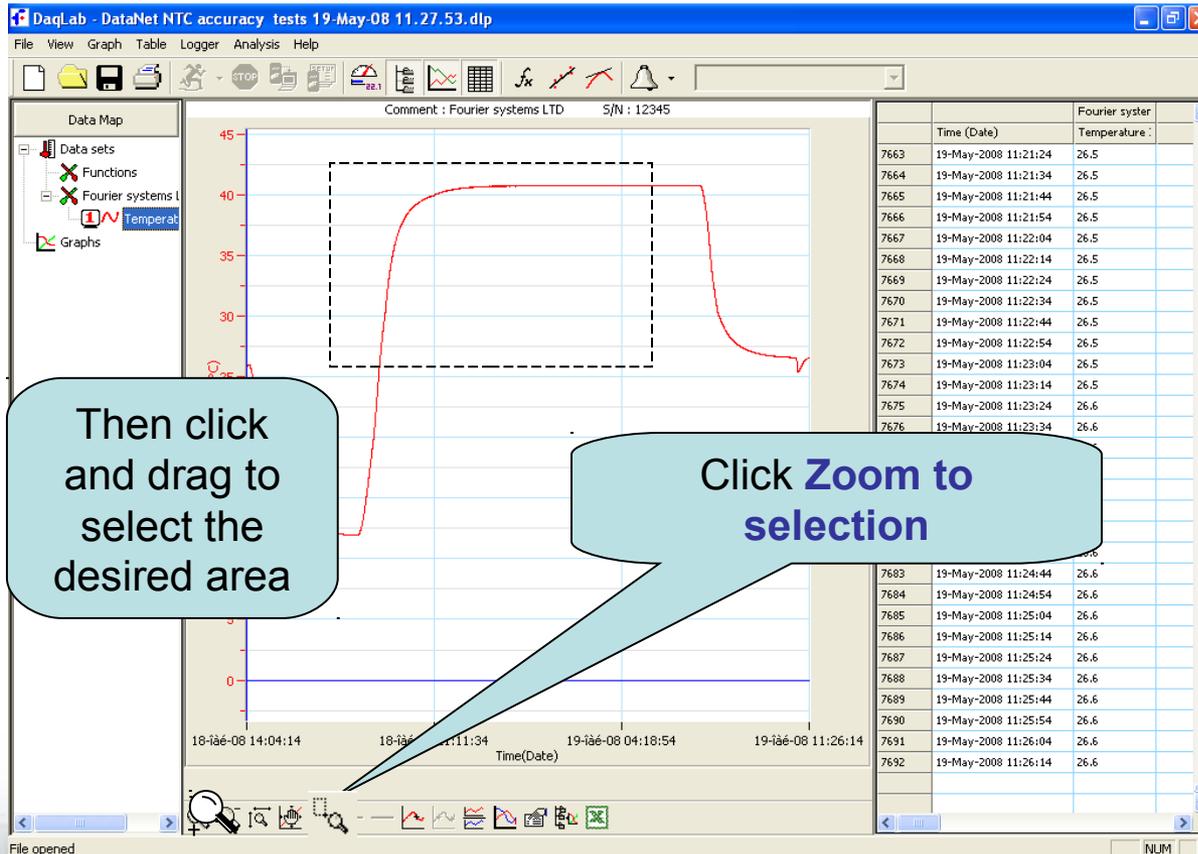
- **The Analysis Wizard**

The Analysis wizard will guide you through the various analysis functions available in DaqLab



Graph Display

Use the **Zoom tool** to zoom to any desired area





Graph Display (cont.)

Use the **Zoom tool** to zoom to any desired area

DaqLab - DataNet NTC accuracy tests 19-May-08 11.27.53.dlp

File View Graph Table Logger Analysis Help

Comment : Fourier systems LTD S/N : 12345

Data Map

- Data sets
- Functions
- Fourier systems LTD
- Temperature
- Graphs

Then click and drag to select the desired area

Click **Autoscale** to return to full view

Now you can use the **Pan** to drag the graph and to see other areas

Time (Date)	Temperature :
7663 19-May-2008 11:21:24	26.5
7664 19-May-2008 11:21:34	26.5
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7672 19-May-2008 11:22:54	26.5
7673 19-May-2008 11:23:04	26.5
7674 19-May-2008 11:23:14	26.5
7675 19-May-2008 11:23:24	26.5
7676 19-May-2008 11:23:34	26.5
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7680 19-May-2008 11:24:14	26.5
7681 19-May-2008 11:24:24	26.5
7682 19-May-2008 11:24:34	26.5
7683 19-May-2008 11:24:44	26.5
7684 19-May-2008 11:24:54	26.5
7685 19-May-2008 11:25:04	26.5
7686 19-May-2008 11:25:14	26.5
7687 19-May-2008 11:25:24	26.5
7688 19-May-2008 11:25:34	26.5
7689 19-May-2008 11:25:44	26.5
7690 19-May-2008 11:25:54	26.5
7691 19-May-2008 11:26:04	26.5
7692 19-May-2008 11:26:14	26.5

File opened NUM



More Zooming Tools



- **Zooming to the centre of the graph**

- Click **Zoom in** or **Zoom out** on the graph toolbar



- **Zooming to a specific point/range on the graph**

- Select the point or range with one or two cursors
- Click **Zoom in** or **Zoom out** on the graph toolbar

- **Manual scaling**

- Right click the desired axis to open dialog

- **Stretch/Compress**

- Move the cursor onto any one of the graph axes. The cursor icon changes to the double arrow symbol (\leftrightarrow), indicating that you can stretch or compress the axis scale. Drag the cursor to the desired location. Double click on the axis to restore auto scaling



Editing and Formatting the Graph

- **Editing**

- Use the Edit graph dialog box to select which data sets to display on the graph's Y-axis and to change the X-axis from time, to one of the data sets

- **Formatting**

- You can change the data line's color, style and width. You can also add markers that represent the data points on the graph and format their style and color
- Use the **Graph properties** dialog to format the numbers

- **Adding a graph to the project**

- Click **Add to project** on the graph toolbar.
- The graph icon will be added to the Data Map





Split Graph View

- DaqLab enables you to display your data in two separate graphs within the graph window
 -  – Click **Split graph** on the graph toolbar to split the graph window into two separate panes
 -  – Click **Edit graph** on the graph toolbar to open the **Edit graph** dialog box
 - Choose which data sets to display on each of the graphs (or use the Data Map to do so)
 - To return to the single graph display, click **Split graph** a second time



Graph Toolbar

	Zoom in	
	Zoom out	
	Autoscale	Display all the data
	Pan	Pan in all directions while in zoom mode
	Zoom to selection	Zoom in to a selected area
	More smoothing	Smooth (average) the selected curve
	Less smoothing	Reverse the most recent smoothing operation
	1st Cursor	Display or remove a cursor
	2nd Cursor	Display or remove a second cursor



Graph Toolbar (cont.)

	Split graph	Switch to a split graph view
	Edit graph	Select the data to display on the axes
	Graph properties	Graph formatting, scaling and units selection
	Add to project	Add the displayed graph to the project
	Export to Excel	Export the displayed graph to Excel



Table Display

- **Column Width**
 - Drag the boundary on the right side of the column heading until the column is the desired width
- **Row Height**
 - Drag the boundary below the row heading until the row is the desired height
- **Font and Number format**
 - Click **Table** on the main toolbar, and then click **Properties** to change the font, or the unit of measurement



Meter Display

- There are three meter types: **Analog**, **Bar** and **Digital**. The meter's scaling automatically matches the graph's scaling
- To set up the meters:
 - Click **Meter Setup** on the main toolbar: 
 - Select the meter type, and the data set to be displayed
 - Repeat this procedure for up to four meters
 - To remove the meters click **Meter Setup**, and then click **Remove all**

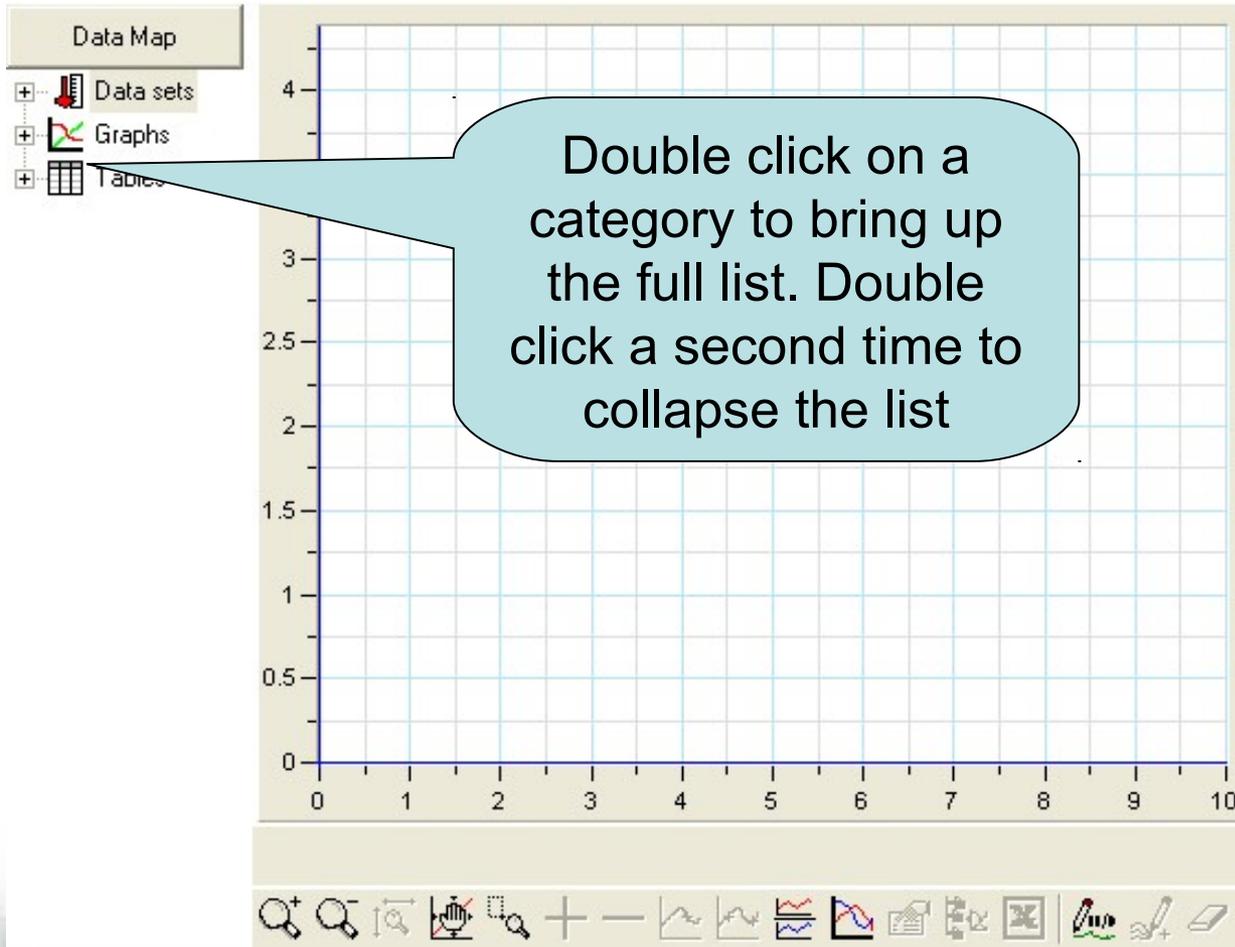


Data Map

- Click **Data Map**  on the main toolbar to display or remove the Data Map
- The Data Map is a separate window that displays the list of data sets that were recorded or downloaded in the current session, as well as the lists of all the saved graphs and tables
- Use the Data Map to navigate through the available data sets and to keep track of the data that is being displayed in the graph window

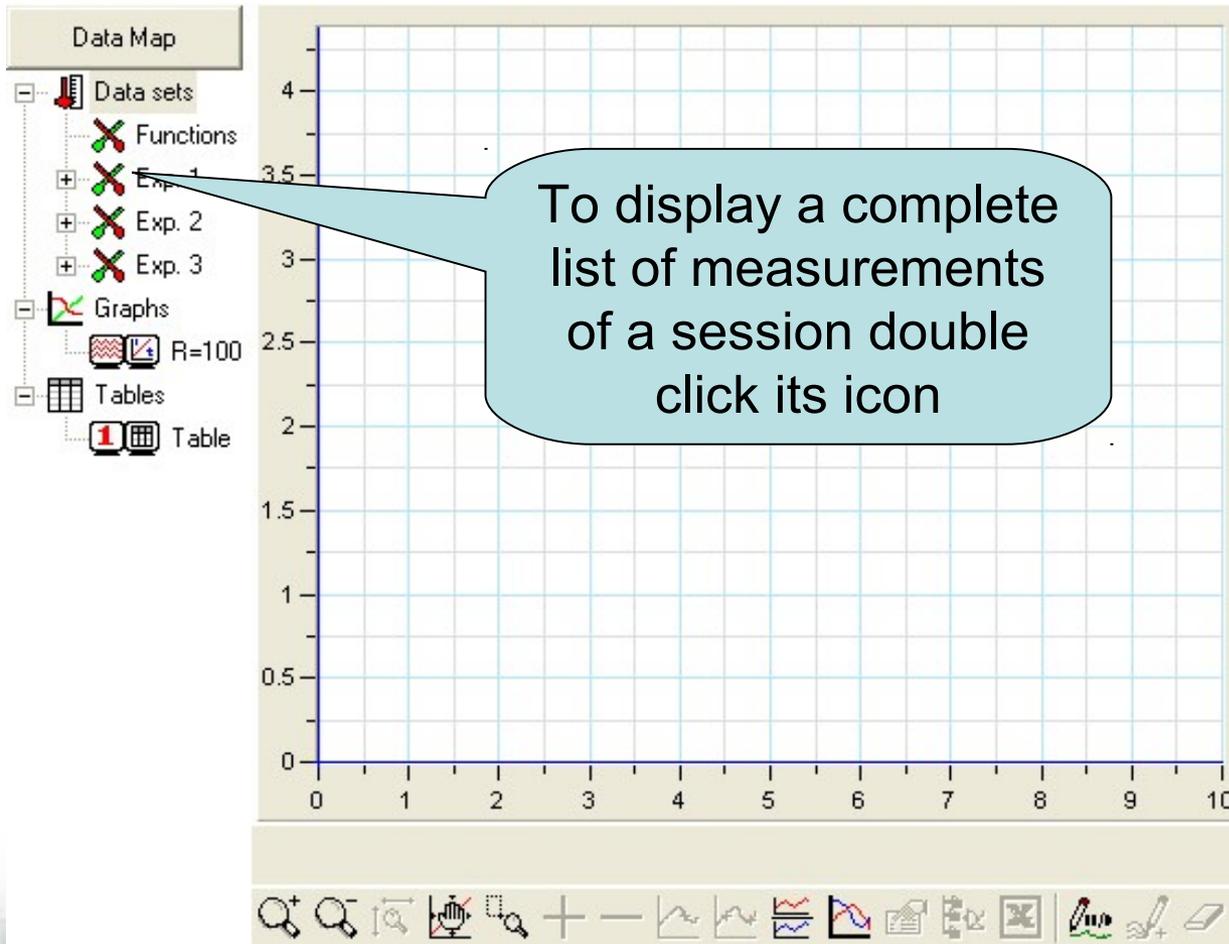


Data Map (cont.)

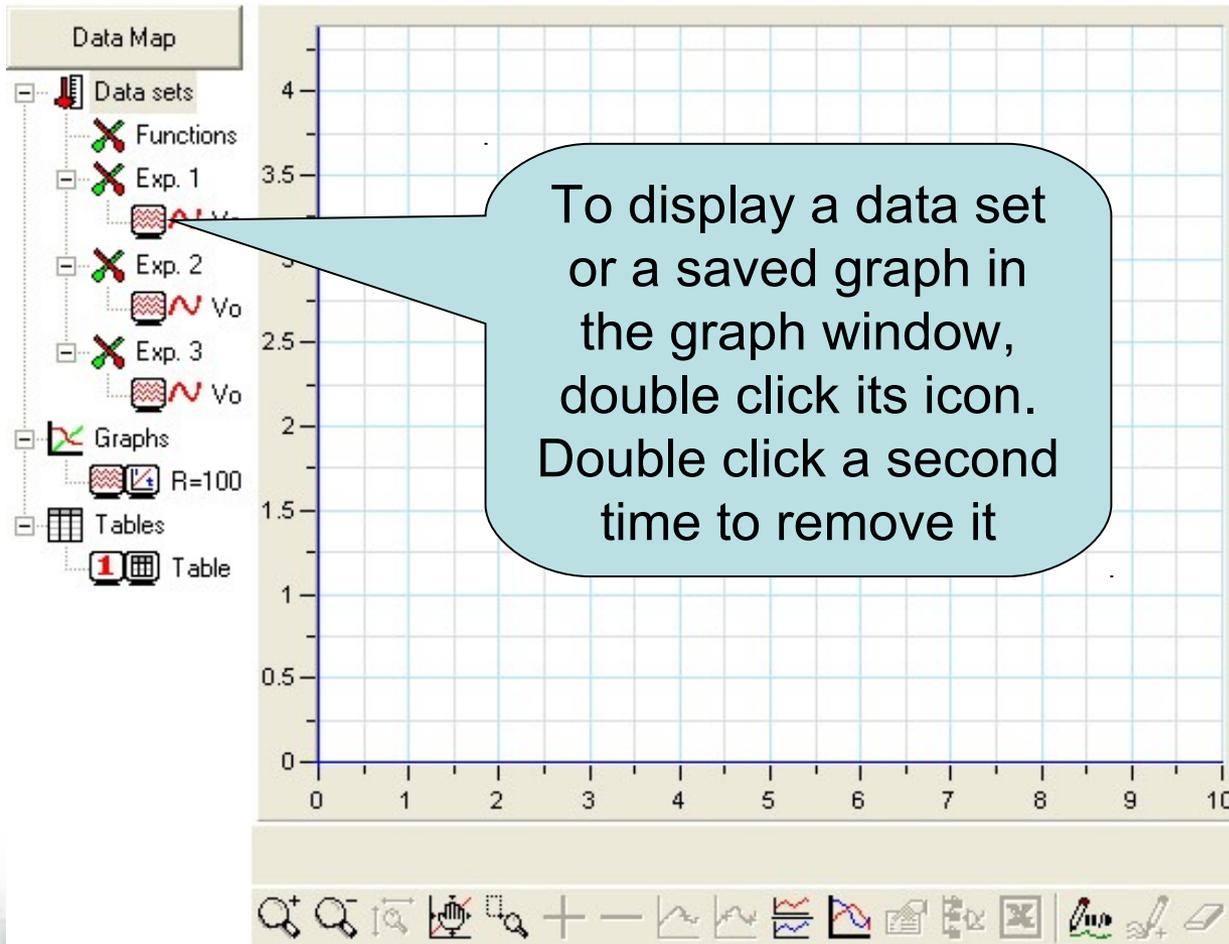




Data Map (cont.)

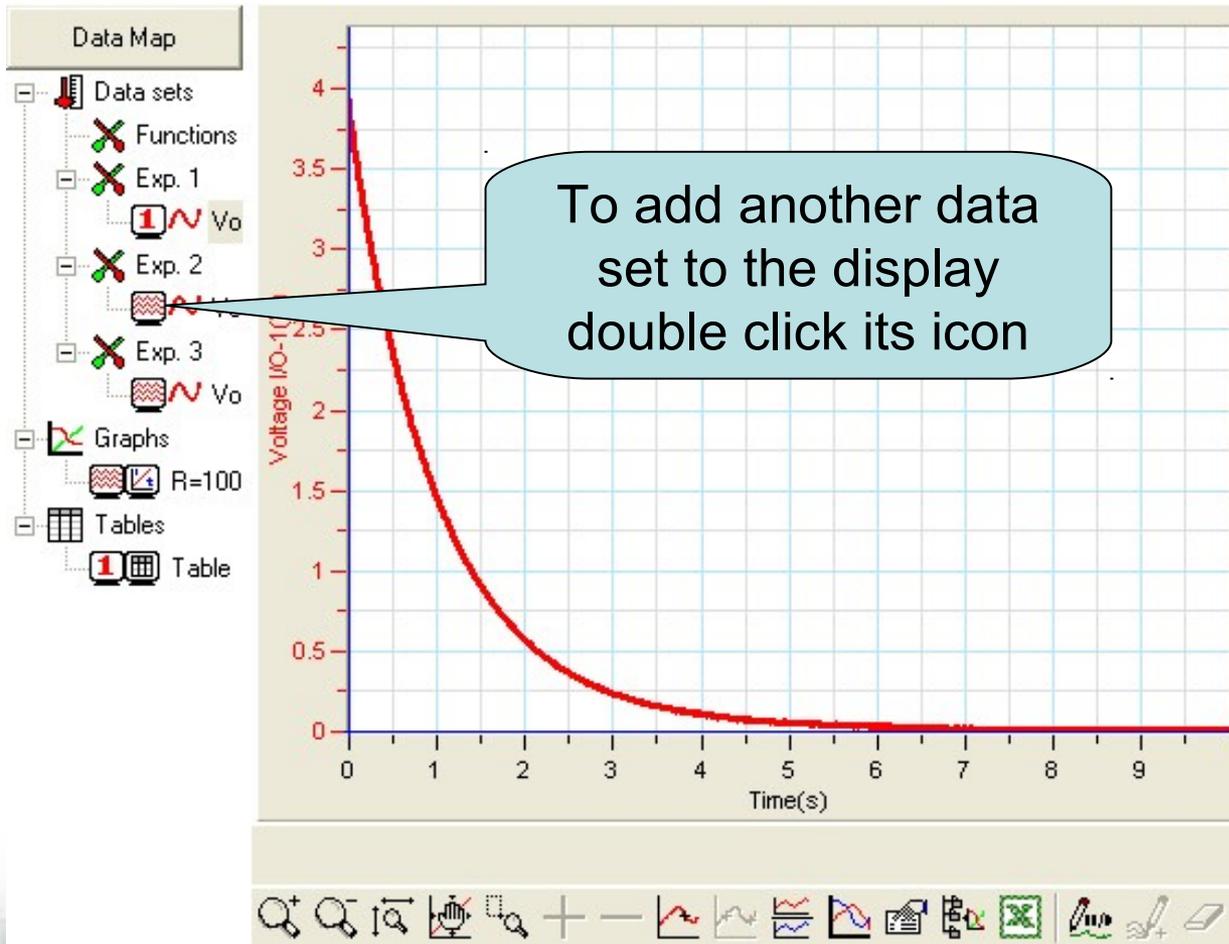


Data Map (cont.)



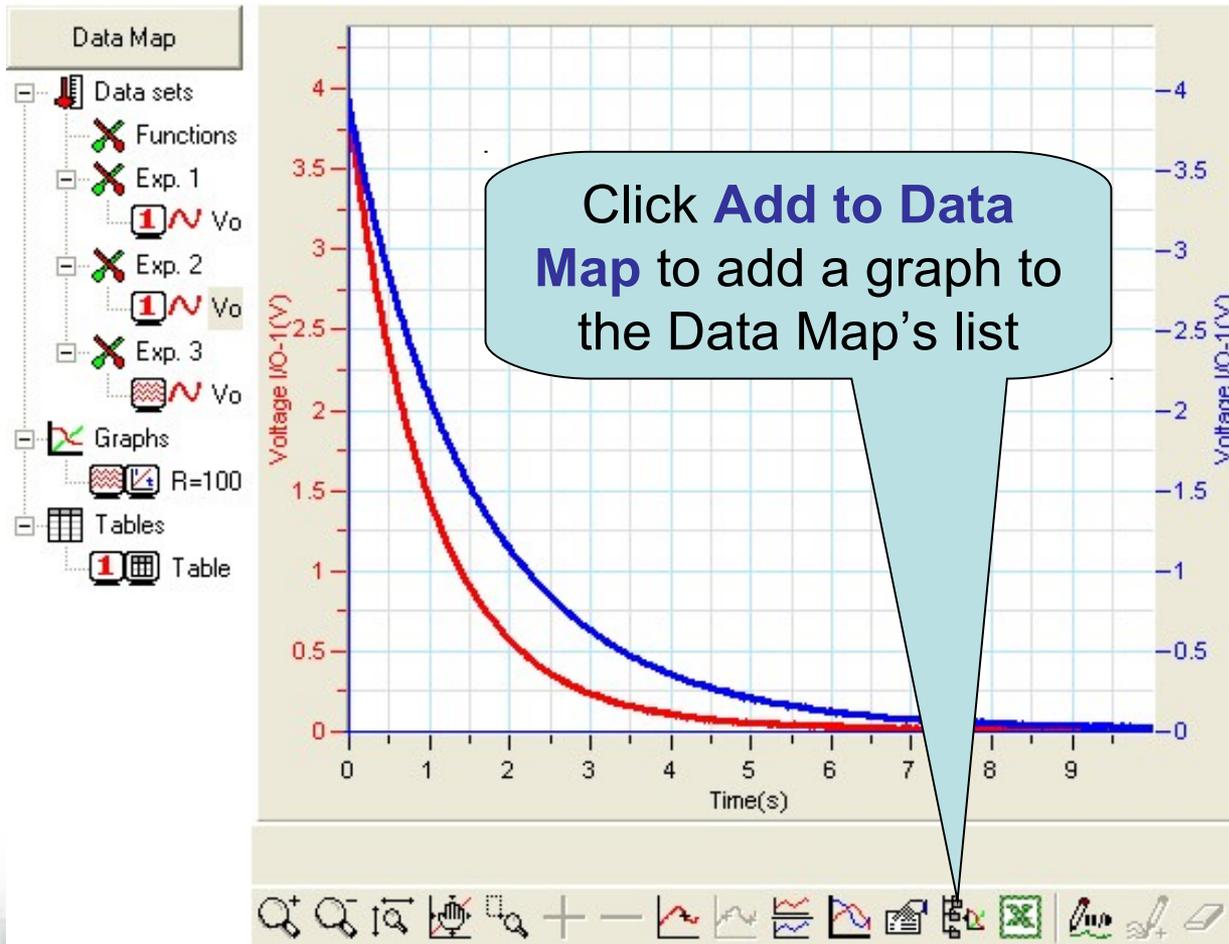


Data Map (cont.)



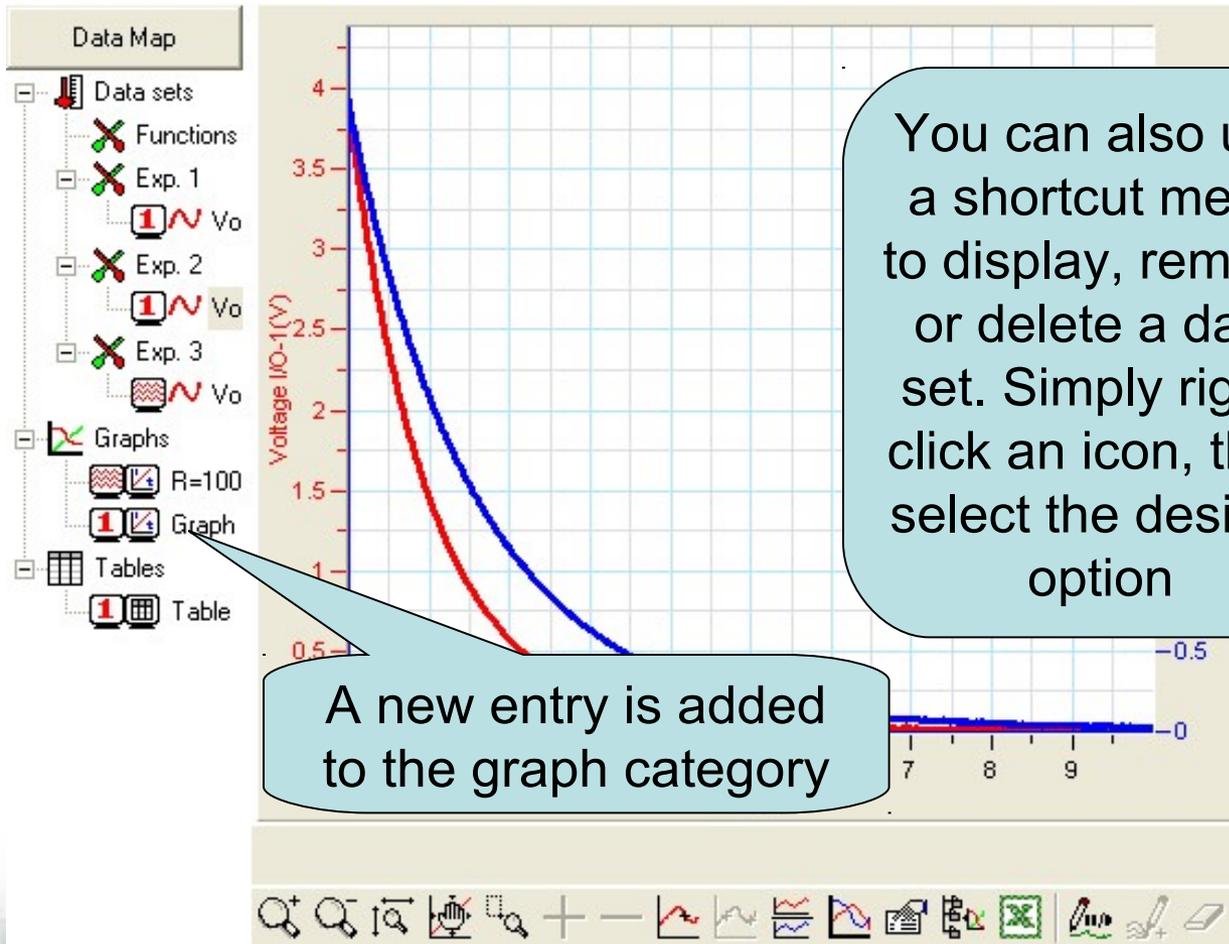


Data Map (cont.)





Data Map (cont.)



A new entry is added to the graph category

You can also use a shortcut menu to display, remove or delete a data set. Simply right-click an icon, then select the desired option



DaqPro Specifications

- Memory – 512k samples (1 MB NVRAM)
- 16-bit A/D resolution
- Rapid sampling up to 4,000 samples per second
- 8 selectable and differential inputs
- Operated on 7.2 V rechargeable battery
- Full operation from the DaqPro panel
- Totally standalone data logger with built in Setup, data collection and Analysis features
- USB communication
- Multiple logging storing up to 100 recordings
- Backup battery for up to 5 years



Input Specifications

Current:

Range: 0 to 24 mA

- Resolution: 4.76 μ A
- Accuracy: $\pm 0.5\%$ of reading
- Loop impedance: 21 Ω

Voltage

- Range: 0 to 50 mV
- Resolution: 200 μ V
- Accuracy: $\pm 0.5\%$ of reading

- Range 0 to 10V
- Resolution 200 μ V
- Accuracy $\pm 0.5\%$ of reading
- Input impedance: 125 K Ω

Internal Temperature

- Range: -25 to 70 $^{\circ}$ C
- Resolution: 0.1 $^{\circ}$ C (1 μ V)
- Accuracy: ± 0.3 $^{\circ}$ C

Temperature NTC

- NTC: 10/100 K Ω resistor
- Range: -25 to 150 $^{\circ}$ C
- Resolution: 0.05 $^{\circ}$ C
- Accuracy: $\pm 0.5\%$ of reading

Temperature PT-100

- Range: -200 to 400 $^{\circ}$ C
- Resolution: 0.1 $^{\circ}$ C (7 m Ω)
- Accuracy:
 - 200 to -50 ± 0.5 %
 - 50 to 400 ± 0.5 %
 - 50 to 50 ± 0.5 $^{\circ}$ C
- The DaqPRO supports up to 8 PT-100 2 wire channels or 4 PT-100 3 wire channels



Input Specifications (cont.)

Temperature Thermocouple J

- Range: -200 to 1200 °C
- Resolution: 0.1 °C (1 μ V)
- Accuracy:
 - 200 to -50 \pm 0.5 %
 - 50 to 1,200 \pm 0.5 %
 - 50 to 50 \pm 0.5 °C
- Cold junction compensation error: \pm 0.3 °C

Temperature Thermocouple K

- Range: -250 to 1,200 °C
- Resolution: 0.1°C (1 μ V)
- Accuracy:
 - 250 to -50 \pm 0.5 %
 - 50 to 1,200 \pm 0.5 %
 - 50 to 50 \pm 0.5 °C
- Cold junction compensation error: \pm 0.3 °C

Temperature Thermocouple T

- Range: -200 to 400 °C
- Resolution: 0.1 °C (1 μ V)
- Accuracy:
 - 200 to -50 \pm 0.5 %
 - 50 to 400 \pm 0.5 %
 - 50 to 50 \pm 0.5 °C
- Cold junction compensation error: \pm 0.3 °C

Pulse Counter (input 8 only)

- Optocoupler input
- Range: 0 to 65,000
- Input signal: 0 to 5 V
- Input impedance: 470 Ω
- Bandwidth: 0 to 25 Hz

Frequency Meter (Input 8 only)

- Optocoupler input
- Range: 20 to 4,000 Hz
- Input signal: 0 to 5 V
- Input impedance: 470 Ω

General A to D specs

- Noise: 30 μ V rms
- Internal linearity error: \pm 0.08% of FSR
- Offset error: 0.1%

Open Collector Output (Output 8)

- Maximum current sink: 50 mA (fuse protected)
- Maximum input voltage: 5 V
- Input impedance: 50 Ω



Usage Applications

- High performance universal logger
- True stand alone – fully controlled in the field
- 16-bit sampling resolution
- 8 channel inputs
- Suitable for all industrial processes
- Can interface with all kinds of transducers, 0-24 mA and 0-10 V
- Can interface with almost all types of temperature measurements



Thank you

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