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# 1 Introduction

**OMEX DATA2000** is a data analysis package designed to be used in conjunction with **OMEX** ECUs. **DATA2000** offers many advanced analysis features including overlays, histograms, XY plots, maths channels, lap analysis, and channel alarms. **DATA2000** runs on most PCs under all major releases of Windows, Win95 onwards.

## 1.1 Documentation

Throughout this guide, procedures in **DATA2000** are referred to using the menu commands separated by a | symbol. Thus **File | Open** means select the **Open** command from the **File** menu.

## 2 Installing DATA2000

**DATA2000** is an optional installation when installing **MAP4000**.

### **3 Creating Log Files for use with DATA2000**

DATA2000 is the software with which log files are read. These log files can be created by PC based logging, where a laptop computer is connected to the ECU, or by ECU based logging using the ECUs internal memory (only currently available on the 700 and 710 series ECUs). Please refer to the ECU manual for instructions on how to create these files.

## 4 Menu Commands

The following section gives a brief overview of the menu commands and their use. If a tool bar button or a keyboard shortcut can be used to perform the same function, it is shown in the left hand margin.

### File Menu

The File Menu contains all the commands used for file management:



**Open** - Use the open command to open a log file.

**Reopen** - Allows a file to be selected from the most recently opened log files. The down arrow next to the open button can also be used to reopen files.

**Export** - Exports data in an ASCII format suitable for use in other applications such as word processors or spreadsheets.

**Abstract** - Copies selected channels into a new data file.

**Notes** - Displays notes about the current data file and allows new notes to be added.

**Exit** - Quits DATA2000.

### Graph Menu

The Graph Menu contains commands used for displaying and printing graphs.

**Graph** - Invokes the graph options editor where the number of lines, overlays and lap markers can be specified.

**Overlays** - Allows the graph overlays to be set.

**Setup - Edit** edits the setup of the currently active graph. (Note that this is different from the currently active setup). **Update Log File** saves any changes made to the data file.

**Shift Overlays** - Allows the x axis of any overlaid *Files* to be moved relative to the base graph x axis by dragging the plot. When in shift mode, the cursor will change to a . Click on the graph and drag the overlaid plots to a new position.

**Zoom** - Allows zooming in or out on the x and y axes.

- **In** Zooms in the x axis.
- **Out** Zooms out the x axis.
- **Expand** Zooms in the y axis.
- **Contract** Zooms out the y axis.
- **Normal** Resets all zooms.

**Plot Types** –

- **Time or Distance:** Plots the graph against time or distance (if recorded).
- **Real or A-D:** Plot the graph using real (engineering) units or using raw 8 or 16 bit data.
- **Standard Plot or Lap Plot:** Allows the lap plot facility to be switched on.



**Tape Measure** - Displays the Tape Measure window. This allows the difference between two points on a graph to be measured.

**Insert Marker** - Inserts a Custom Marker at the current position.

## Analysis Menu

The Analysis Menu contains commands for examining the data in more detail than possible via a simple graph.



**Lap Times** - Use to display lap markers, split, total lap times and average lap speed.



**Statistics** - Displays minimum, maximum and average values of channels. Double clicking on a minimum or maximum value will automatically zoom the graph around that point.



**Histogram** - Shows the frequency of occurrence of values in a channel as a percentage of the current zoom range time or distance.



**XY Plot** - XY plots allow one channel to be plotted against another thus allowing the relationship between the two channels to be explored.

## Alarms Menu

Channel alarms can be used to alert users if data in a channel exceeds a predefined limit. Alarms can also be set to be conditional on two channels exceeding their limits. A maximum of 100 alarms can be set. A setup file must be loaded before Alarms can be edited.

**Create** - Creates a new alarm file.

**Open** - Opens an existing alarm file.

**Edit** - Edits the current alarms list.

**Save** - Saves the current alarm list.

**Show for Current** - Displays any activated alarms for the currently loaded log file

**Active On Read** - When checked, any activated alarms will be displayed when a card is read.

**Active On Open** - When checked, any activated alarms will be displayed when a log file is opened.

## Templates Menu

Graph templates allow frequently used graph plots, graph types and window positions to be saved. These can then be recalled at any time by running the template from the menu or by assigning a button on the toolbar to the template and clicking on the button

**Save** - Saves the current screen layout and graph options as a template.

**Run** - Prompts for a template file name and then runs the specified template.

**Configure** - Configures toolbar buttons for use with saved templates.

## Config Menu

**Logger** - Specifies the type of logger DATA2000 is being used with. The logger type affects certain areas of the setup editor.

**Options** - Allows options such as graph colours to be set.

**Tool Bars** - Some or all of the tool bars can be turned off if desired.

**Close On Read** - When checked, all existing data files will be closed when a new file is read from a card. This can be useful during a logging session that may result in the potentially confusing situation of many windows being open at once. Opening files will not force other windows to close. When not checked, existing files remain open when a new file is read from a card.

**Notes On Read** - When checked, the user will be prompted to enter notes about the data file whenever a new file is read from a card.

## Window Menu

**Tile Vertically** - Arranges windows vertically with all windows visible if possible.

**Tile Horizontally** - Arranges windows horizontally with all windows visible if possible

**Cascade** - Arranges windows in a cascaded format with each window on top of the previous one.

**Minimise All** - Minimises all windows.

**Arrange** - Arranges iconized windows.

**Close** - Closes the active window.

The numbered list at the foot of the Window menu can be used to make the desired window active.

Cascaded windows appear on the screen diagonally, from upper left to lower right, overlapping so that the title bar of each window remains visible.

Tiled windows are distributed to each corner of the screen, so that each window is visible and none overlap.

Icons (or reduced windows) appear at the bottom of the DATA2000 main window. Each icon remains visible. Double-click an icon to make that window active.

## Help Menu

**Help Topics** - Display the Help Topics dialog box:

**About** - Display program version and serial number information.

### To find a topic in Help:

- Click the Contents tab to browse through topics by category.
- Click the Index tab to see a list of index entries: either type the word you're looking for or scroll through the list.
- Click the Find tab to search for words or phrases that may be contained in a Help topic.

Context sensitive help can be obtained by pressing the **F1** key.

Help can also be obtained in dialog boxes by clicking on the **?** in the top right of the dialog box and then clicking on the item for which you require help.

## 5 Analysing Data



Once a data file has been opened, data can be viewed and analysed by several means in DATA2000, each of which will be considered in detail below.

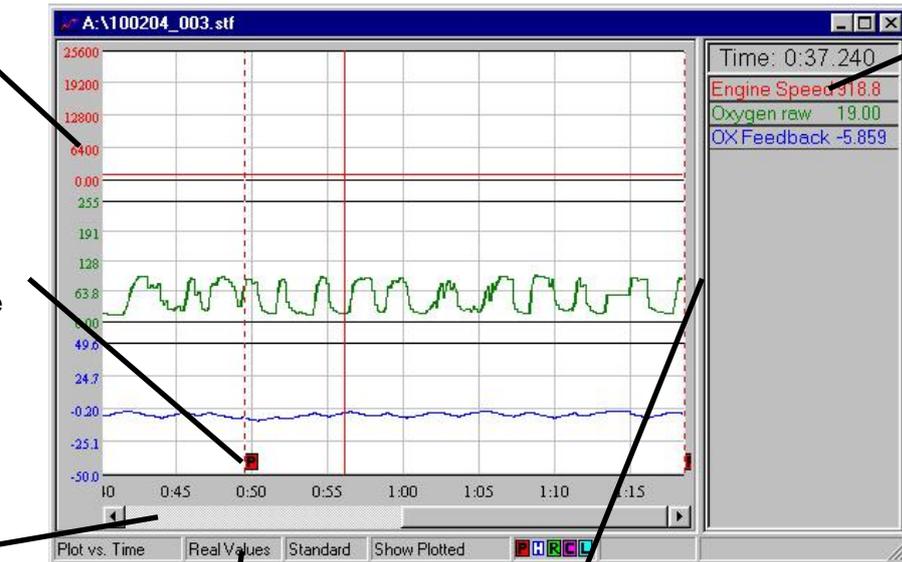
### 5.1 Simple Graphs

The simple graph allows channel data to be plotted against time or distance (if recorded). A typical graph screen is shown below:

If the graph is in overlay mode, clicking on the y axis cycles through all the axes scales for that plot

Placing the mouse over a marker will show the time and date when the marker occurred

Allows scrolling through a zoomed in graph



Shows values of each channel at current cursor position

Shows current graph settings

Moving this bar changes the size of the values are and changes the font size as necessary

To alter the graph settings, commands from the graph menu are used. Many of these commands are reproduced in the graph popup menu. To view this menu, right click on the graph itself.

To change the lines plotted, choose **Graph | Graph** and the graph setup editor will be shown:



Overlays can also be added from here by clicking the overlay button. Overlaid channels can be from either the existing file or from additional external files. Up to four external files can be added; when plotted, overlaid channels from external files are preceded with a number corresponding to the file number in the overlay list.

Overlays from external files can be shifted relative to the base graph by selecting **Graph | Shift Overlays**. This allows starting points of data to be easily synchronised.

To zoom in on the graph to view the data in more detail:  
Keypad +

- Select **Graph | Zoom | In**. The cursor will change into a  showing that you are in x axes zoom mode.
- Click on the area of the graph where you want the zoom to start.
- Click on the area of the graph where you want the zoom to end. The graph will be redrawn with the new zoom range.
- The selected zoom range is bounded by red vertical lines at the start and end. Using the scroll bar at the bottom of the graph, data outside this zoom range can be viewed.
- If there is data outside the scrollable region, a  or  will be shown at the edge of the scrollable area. These will shift the zoom area to the left or right respectively.
- To zoom out to the previous zoom level, select **Graph | Zoom | Out**. (Keypad -)
- The y axis can be zoomed in a similar manner by selecting **Graph | Zoom | Expand** which will change the cursor to  to show that you are in y axis zoom mode. (Ctrl Keypad +)
- To contract the y axis to the previous level, select **Graph | Zoom | Contract**. (Ctrl Keypad -)

The right hand side of the graph shows the values at the current position (shown on the graph by a vertical black line). This position marker can be moved by clicking the left mouse button on the graph and dragging the bar whilst still holding the mouse button down. Alternatively, the left and right cursor keys can be used (holding the shift key down whilst pressing the cursor keys will move the bar ten times as fast).

Clicking the right mouse button on the values area of the graph will show a menu allowing line colours, style and y axis limits to be changed. This menu can also be used to add boundary lines for highlighting ranges on the graph.

The y axis labels of the graph show the real or raw ranges of the graph. If a particular plot has overlays, the axis limits will show the current percentage range. By clicking on the y axis, the y axis labels will cycle through all actual channel limits for that plot.

The functions available from the Analysis menu will now be considered.

## 5.2 Statistics



The statistics screen displays the minimum, maximum and average values of all channels in the base graph over the current zoom range and the times at which these occur. Double clicking the mouse on the time at which a minimum or maximum value occurs will zoom the graph in around this point. An example statistics screen is shown below:

Channel	Minimum	Time at Min	Maximum	Time at Max	Average
Coolant		1:18.5	82	1:02.56	80.955
Engine Speed	897.66	0:00.76	988.28	0:44.86	934.24
Idle Spark	-7.207	0:00	0	0:00.22	-5.4479
LOAD	0	1:18.52	1.25	0:00	1.249
OX Feedback	-10.156	0:05.22	7.0313	1:18.56	-5.6229
Oxygen History	0	0:00	255	0:02.2	132.34
Oxygen raw	10	0:07.7	97	0:20.06	51.609

## 5.3 Histograms



Histogram shows the frequency of occurrence of values in a channel as a percentage of the current zoom range time or distance. Choose **Analysis | Histogram** to show the histogram setup editor:

Channel for which the histogram is to be calculated

Number of bars the histogram is to be split over

Set whether the bar ranges are to be calculated automatically or specified manually

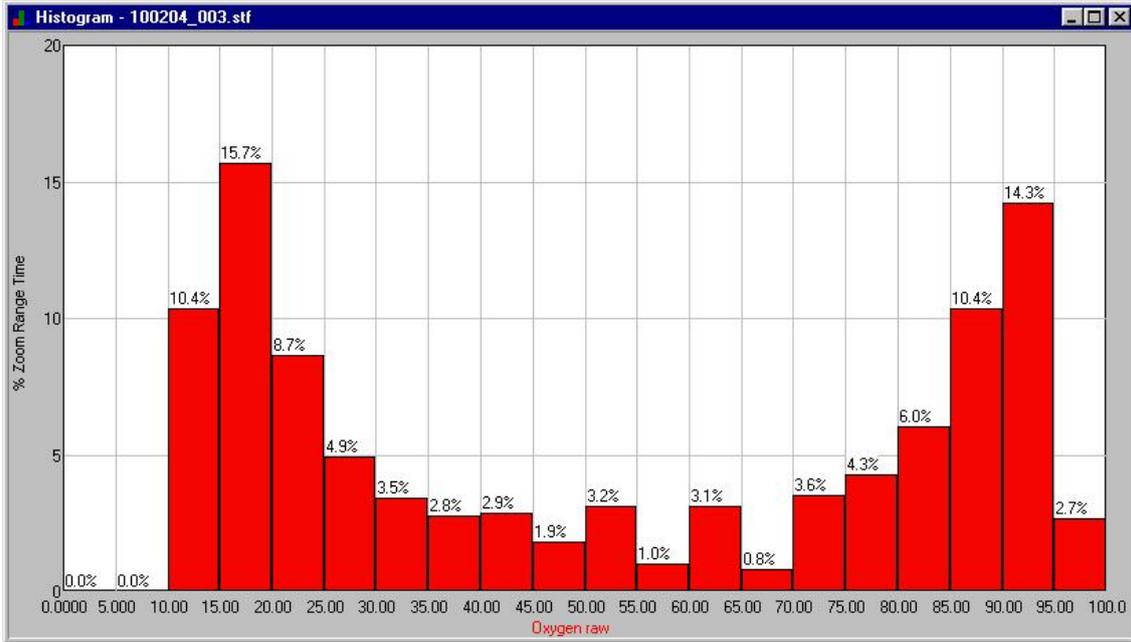
Condition which must be met for a value to be added to the histogram

Additional conditions

Sets the start and end bar ranges if in auto range mode

Set channel to the channel for which the histogram is to be calculated. Conditions can then be applied to the histogram to limit the amount of data included by checking the When box and entering the condition desired. Up to three conditions can be specified and are combined with the logical operators AND, OR, NOT. Only values that meet the specified criteria will be included in the histogram. The number of bars to plot and the bar ranges can now be specified.

Once the setup is complete, click OK and the histogram will be drawn:



Once a histogram is drawn, the histogram editor can be re-entered by right clicking on the histogram. Once a histogram setup has been created it can be saved to a histogram template by clicking the Save button in the histogram editor. Histogram templates can be assigned to buttons in the histogram editor by selecting **Config | Options** and entering the filename in the histogram buttons page.

### 5.4 XY Plots



XY plots allow one channel to be plotted against another thus allowing the relationship between the two channels to be explored. To create an XY plot, choose **Analysis | XY Plot**; the XY plot editor will be shown:

**XY Options**

Plot Options

- X Channel: Coolant
- Y Axis Type:
  - Single
  - Overlays

Y Channel Setup

- YChannel: Engine Speed
- when: Coolant > 0
- NONE: Coolant > 0
- Point Size: 2

Plot Colour

- Black
- Point Density
- Use Channel: Coolant

Annotations:

- Channel to be used for the X axis (points to X Channel dropdown)
- Channel to be used for the Y axis (points to YChannel dropdown)
- Channel conditions (points to 'when' and 'NONE' dropdowns)

Set the X and Y channels for which the XY plot is to be draw. Conditions can then be applied to the plot to limit the amount of data included by checking the **When** box and entering the condition desired. Up to two conditions can be specified and are combined with the logical operators AND, OR, NOT. Only values that meet the specified criteria will be included in the XY plot.

The point size changes the size of the plotted points. On plots using a large amount of data, a small point size should be used. However, when the data set used is small, a larger point size helps to show any trends in the data

Once the setup is complete, click OK and the XY plot will be drawn.

By clicking and holding the left mouse button on the graph, the mouse can move the cross hairs on the plot. The X and Y values at the current cross hair position are shown in the status bar at the foot of the graph.

Once an XY plot is drawn, the XY plot editor can be re-entered by right clicking on the plot. XY plot settings can be saved in an XY plot template by clicking the Save button in the editor. XY templates can be assigned to buttons in the editor by selecting **Config | Options** and entering the filename in the XY plot buttons page.

## 6 Channel Alarms

Channel alarms can be used to alert users if data in a channel exceeds a predefined limit. Alarms can also be set to be conditional on two channels exceeding their limits. A maximum of 100 alarms can be set. A setup file must be loaded before Alarms can be edited.

### 6.1 Creating/Editing Channel Alarms

To create/edit channel alarms:



- Choose **Alarms | Create** to create a new alarm list or **Alarms | Edit** to edit the current alarms list. The Alarms editor will be invoked. Enter the desired alarm parameters in the relevant columns:
- Alarm Name - A 12 character name for the alarm.
- Channel - The channel to which this alarm will apply. The channel names are obtained from the currently loaded setup.
- <> - If > is specified, the alarm is activated if the Limit is exceeded. If < is specified, the alarm is activated if the channel value falls below the Limit.
- Limit - The numerical value of the limit.
- With - Specifies if another channel limit has to be exceeded to activate the alarm. If NONE is specified, the alarm is based on the preceding parameters only. If AND, NOT or OR are specified, the first *Channel <> Limit* sequence is combined with the second *Channel <> Limit* sequence with the specified logical operator.
- Click the Add button or Insert key to add a new alarm.
- Click the Remove button or Delete key to remove the currently selected alarm. The arrow keys can be used to navigate around the alarms grid. When the desired item is highlighted, pressing the space bar allows it to be edited. Pressing the Enter key returns to navigate mode.
- When the alarms have been created as desired, save them using **Alarms | Save**.

Example

Alarm	Meaning
Water Temp > 110	Activated if the water temperature exceeds 110

### 6.2 Using Channel Alarms

Once the channel alarms have been created as desired, they can be used as follows:

- Select when to show any alarms:
- If **Alarms | Active On Read** is checked, any alarms activated will be shown when a card is read.
- If **Alarms | Active On Open** is checked, any alarms activated will be shown when a log file is opened.
- **Alarms | Show for Current** can be used to show alarms for the currently active data file.

The last loaded alarm file will automatically be loaded on starting **DATA2000**. A newly created set of alarms must be saved before it can be used as the default alarm list.

If any alarm limits are activated, the alarm report will be shown. This shows the alarm activated, the time at which it was initially activated and the duration for which it was activated. The minimum and maximum values of the main alarm channel over the alarms' duration will also be shown. By double clicking on the alarm, the graph will be automatically zoomed in around the initial alarm occurrence point.