

# DOCTOR

***plus Reporter***

## ***Step-by-Step Guide for Doctor Portable Analysis Software***

***Revision 5.4  
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









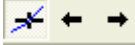
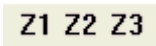





Button Functions

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### Button Functions

-  New database.
  -  Open an existing database or convert previous version database or archive.
  -  Close the active screen (e.g. if looking at Traces, this will take you back to the database tree).
  -  Download tests from the Doctor instrument.
  -  Toggles showing the Database Tree while in Traces, Tables or Bar Graphs.
  -  View Traces of selected results. The type(s) of graphs displayed are the same as the last used selection.
  -  View Table of selected results.
  -  View Bar Graphs of selected results.
  -  Show Pressure versus Angle graphs for selected results. (Graph Mode only)
  -  Show Pressure versus Volume graphs for selected results. (Graph Mode only)
  -  Show Rate of Change of Pressure versus Angle graphs for selected results. (Graph Mode only)
  -  Show Fuel Pressure or Vibration versus Angle graphs for selected results. (Graph Mode only)
  -  Open the Traces selection tool.
  -  Opens a tool to modify the selection and settings of the scalars.
  -  Display a Cursor on the active traces. (Graph Mode only)
  -  Z1 Z2 Z3 Favourite Zoom buttons. (Graph Mode only)
  -  Open the Trace Identification tool. Allows point and click to highlight a trace. (Graph Mode only)
  -  Notebook tool for recording notes.
  -  Reporter tool for generating reports automatically.
  -  Print the current screen. Traces are WYSIWYG, Tables and Bar Graphs allow print preview and adjustment of settings.
  -  Displays information about the program and the registered user.
-

### New Features in Version 5.10 Software

- Reporter Module added - allows basic reports to be printed or created as pdf.
- Diagnostic Analysis available - a licence is required to activate this feature.
- Default password protection for new databases extended.
- Extended range of pre-programmed user values added.
- Compatible with Vista and Windows 7 (XP Compatibility mode).
- Results for Dual Pickups when used on engines with prime number, or prime number multiples improved. See Release Note below.

#### Release note:

The program has now been optimised to produce enhanced results for engines with dual pickups, and teeth numbering a prime number or prime number multiple (e.g. 68, 117 etc.). Old results may be updated by re-calculation, however in some cases (where a 180° shift had been introduced to the offset) this will result in less accurate results. In these cases, the old results should be left untouched. New results may require a 180° shift if an automatic 180° shift had been applied by an earlier version of the program. If you have any questions regarding this, or wish us to review your data, please send an archive to [doctor@iconresearch.co.uk](mailto:doctor@iconresearch.co.uk).

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




## CHAPTER 1 - Installation and Quick Start Guide

### 1.1 Installing Doctor Software

**IMPORTANT:** Your computer must have Microsoft® Windows XP™, Windows Vista™ or Windows 7™ installed in order to run DOCTOR Analysis Software.

1. If you have an earlier version of the Doctor analysis software on your PC, it is best to uninstall this before installing the new version. To do this, use *Windows Explorer* to locate *C:\Program Files\Doctor32*. In this folder you will find the file *UNWISE.EXE*. Double click on the file to uninstall the earlier version.
2. Insert the Doctor installation CD, click on **Software** followed by **Install Doctor Analysis Software**, and follow the on-screen instructions. (If the CD does not launch automatically, click on *setup.exe* in the CD root folder).
3. Run the program by clicking on the *Doctor Portable* shortcut icon that will appear on your desktop. Alternatively use **Start ... All Programs ... Doctor ... Doctor Portable**.
4. To enable the Reporter to produce pdf files, you will need a pdf writer application such as Adobe Acrobat™ installed on your PC. If you don't have this, you can install CutePDF Writer™ which is on the CD. To install CutePDF Writer, insert the Doctor installation CD, click on **Software** followed by **Install PDF Writer**. Click on the **Install CutePDF Writer** button. (Click **No** when asked if you want to install PS2PDF from the web during the installation). Then install **Ghostscript Converter**™ which is in the same location on the CD.
5. If you purchased the Database Setup Service, the database for your engines will be on a separate CD. Copy the file to the location on your PC where you wish to keep your data. This can be in any convenient location, but we suggest that you put it in the *C:\Doctor\Doctor Portable* folder. Double click on the file to open it in the Doctor program. The Doctor program will automatically open the file the next time you use the program. Remember to archive your initial results and send them to [doctor@iconresearch.co.uk](mailto:doctor@iconresearch.co.uk) for correction.

### 1.2 Getting Started

1. The first time the program runs, the *Samples* database will open. If you have purchased the Database Setup Service, copy the file from the supplied CD or memory stick to the location where you wish to keep your data. Double-clicking on the database file will open it automatically. Note that a database cannot be opened directly from a CD. On subsequent runs, the program opens up the last used database with the last used engine highlighted.
2. If you already have a database, use File... Open and browse to find your database. Do not use the Samples database for your results – this database is intended only for demonstration purposes.
3. To start looking at results, select an engine or select a test or range of tests in the right hand pane. The data tree can be expanded or collapsed in the same manner as Windows Explorer by double clicking in the  or  boxes next to the words. Then click on the **Graph Mode** button .
4. The **Graph Mode** selection box on the graph allows you to choose the test or the cylinder you want to see.
5. To select compatible engines from the same ship or from other ships, click on the **Database Tree**  button. You will see the database hierarchy, the available tests and the traces in separate panes. As you choose tests, they will be shown on the graph. To return to a full screen graph, click the  button again.
6. You can zoom in on a graph by clicking and dragging. The graph types can be selected using the buttons at the top. A cursor can also be selected.
7. In the graphs, you can get back to the original trace size by double clicking in the graph area.
8. You can also look at results in the **Tabular Mode** and **Bar Graphs Mode**. The buttons for these are  and .
9. To print or make a pdf report from your results, highlight the test you wish to make a report for and click on the  button on the toolbar to start the procedure. You may need to select CuteWriter or Adobe in order to make a pdf. Note that the results must have been correctly set relative to TDC to produce valid reports.



### 1.3 Some Tips

All the usual Windows screen sizing and iconising commands are available.

Use the cursors to display the actual values in numbers or the comparative values as a bar graph at any point on a set of traces. Use the left and right arrow keys on the keypad to move the cursor.

You can look at the results from any individual trace. Click on the **ID** button then point and click on the trace you want to see the results for. The up/down arrows on the keyboard let you change the selection.



# CHAPTER 2 - Starting Off

## 2.1 Making a Database

If you received a database with your system, refer to section 1.1 for installation and running.

If you did not purchase the database set-up service, you will need to make a database for your results. To do this, you need information about your engine or engines as follows:

Item	Req'd	Comment
Engine type and designation	Y	
Number of engines	Y	
Engine Configuration	Y	In-Line or V
Number of Cylinders	Y	For V engines enter number per bank
Bore	Y	
Stroke	Y	
Length of con rod between centres	Y	Needed to calculate volume from crank angle
Max continuous rated power in kW	N	Add about 7% for 2-strokes and 10% for 4-stroke auxiliaries to give Max Indicated Power
Firing Order	Y	For V engines, only 1 bank required
Valve timing and spill port timing	N	
V angle	Y	V engines only
Engine rotation direction	Y	V engines only. The choice is <b>From A to B</b> or <b>From B to A</b> .
Cylinder number format	N	V engines only (A1 to B12 etc.)
Injection Snap pressure	N	For Fuel Pressure measurement systems to be used as injection start and finish pressure

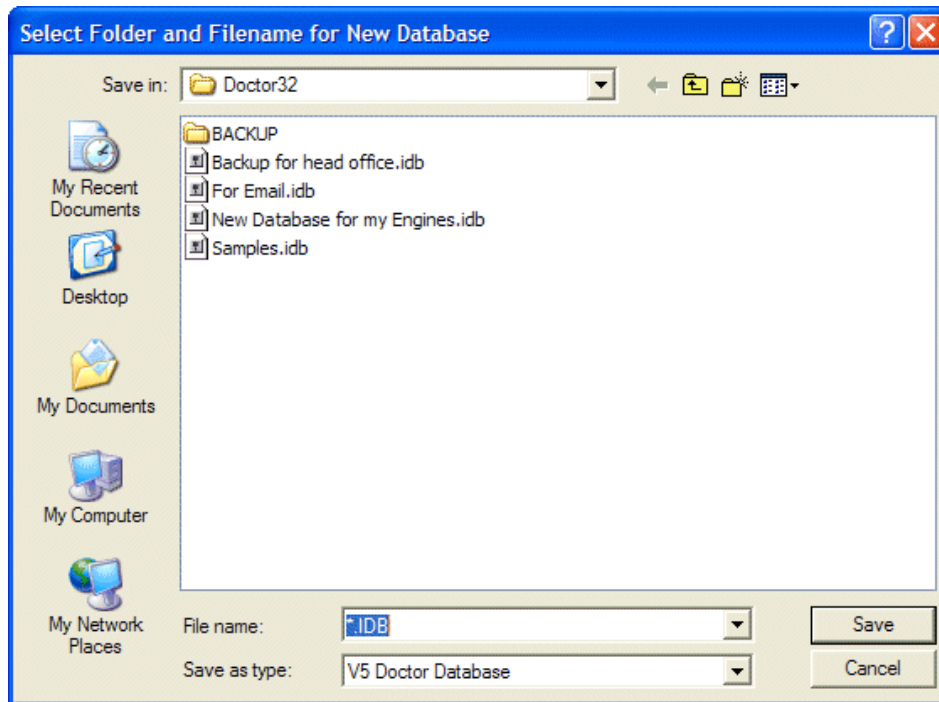
The items with a Y (yes) in the Req'd (required) column are essential.

With this information to hand, use the **File.... New** command from the drop down menus, or use the New Database button  .

Fill in a name for your new database. You can select where you want to keep your database, including on another network drive from the dialogue box below. In this example, it is being kept in the same folder as the program itself.

## Chapter 2 – Starting Off

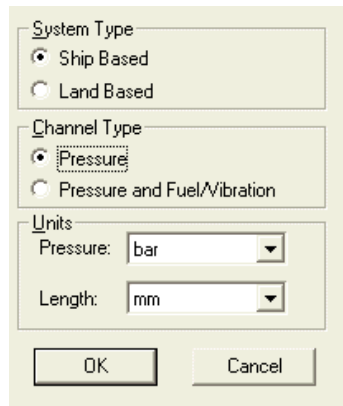
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Click on **Save** and your database has been created.

### 2.2 System Preferences

Your database is ready to have details entered; however first, the System Preferences should be entered. The window that appears allows selection of location (ship or land), the type of instrument you have (with or without fuel pressure / vibration) and the units you prefer to use – metric or imperial.



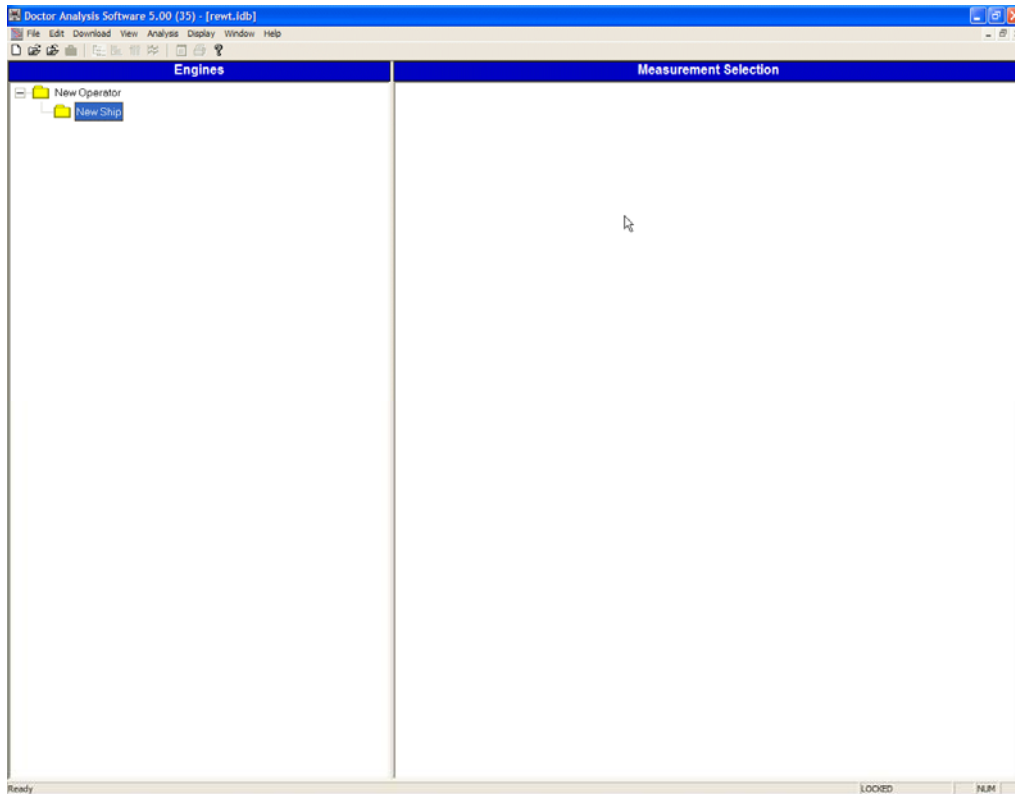
The screenshot shows a 'System Preferences' dialog box with a light beige background. It contains three main sections: 'System Type' with radio buttons for 'Ship Based' (selected) and 'Land Based'; 'Channel Type' with radio buttons for 'Pressure' (selected) and 'Pressure and Fuel/Vibration'; and 'Units' with two dropdown menus, 'Pressure:' set to 'bar' and 'Length:' set to 'mm'. At the bottom are 'OK' and 'Cancel' buttons.

Note that throughout this guide the selection for **Ship Based** systems has been used. For **Land Based** systems, key words are replaced. An example of this is that **Ship** is replaced with **Plant**.

You may go back and change your System Preferences for a database at any time using the **File... System Preferences** command.

### 2.3 Filling in Database Details

Initially it will show the operator and ship levels.



To edit the operator name, use **Edit... Operator**.

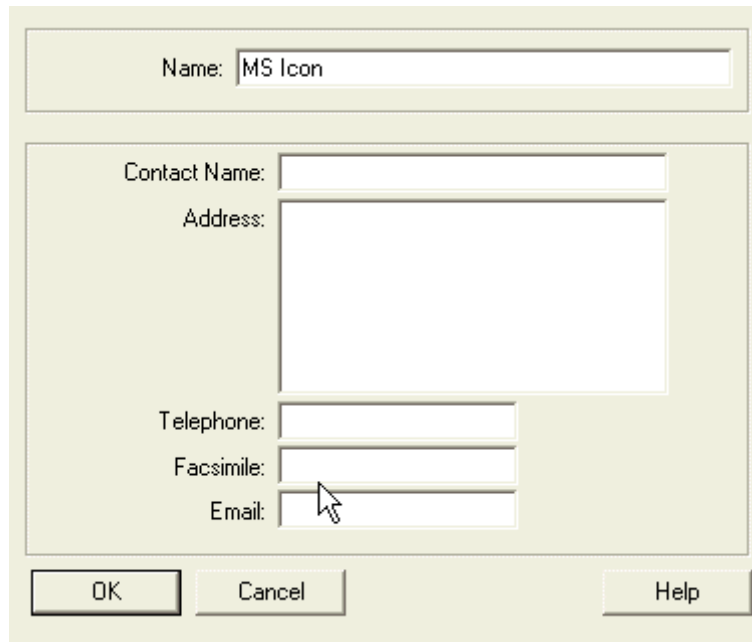
A screenshot of the 'Edit... Operator' dialog box. The dialog box has a light beige background. At the top, there is a 'Name:' label followed by a text input field containing 'New Operator'. Below this is a larger section containing several labels and input fields: 'Contact Name:' followed by a text input field, 'Address:' followed by a larger text input area, 'Telephone:' followed by a text input field, 'Facsimile:' followed by a text input field, and 'Email:' followed by a text input field. At the bottom of the dialog box, there are three buttons: 'OK', 'Cancel', and 'Help'.

Enter the name of your company, along with contact details and click **OK**

Next, select **Edit... Ship**.

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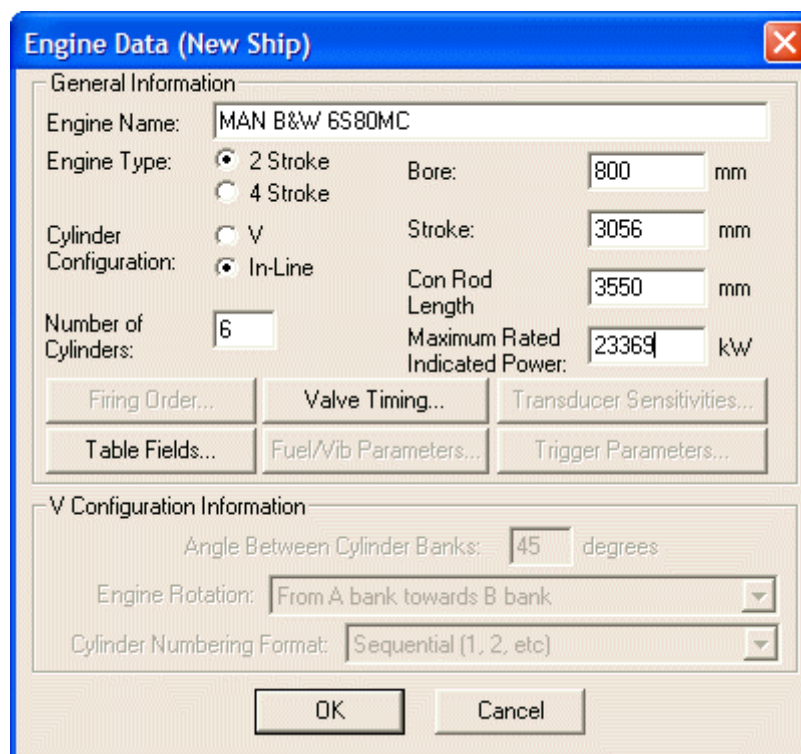
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A dialog box for entering contact information. It has a title bar with a close button. The fields are: Name (text box with 'MS Icon'), Contact Name (text box), Address (text box), Telephone (text box), Facsimile (text box), and Email (text box). At the bottom are OK, Cancel, and Help buttons.

Enter the name of the ship along with contact details and click on **OK**.

Next, use **Edit... Add Engine**.



A dialog box titled 'Engine Data (New Ship)' with a close button. It has two sections: 'General Information' and 'V Configuration Information'. The 'General Information' section contains: Engine Name (text box with 'MAN B&W 6S80MC'), Engine Type (radio buttons for 2 Stroke and 4 Stroke, with 2 Stroke selected), Bore (text box with '800' mm), Cylinder Configuration (radio buttons for V and In-Line, with In-Line selected), Stroke (text box with '3056' mm), Con Rod Length (text box with '3550' mm), Number of Cylinders (text box with '6'), and Maximum Rated Indicated Power (text box with '23369' kW). Below these are buttons for Firing Order..., Valve Timing..., Transducer Sensitivities..., Table Fields..., Fuel/Vib Parameters..., and Trigger Parameters.... The 'V Configuration Information' section contains: Angle Between Cylinder Banks (text box with '45' degrees), Engine Rotation (dropdown menu with 'From A bank towards B bank'), and Cylinder Numbering Format (dropdown menu with 'Sequential (1, 2, etc)'). At the bottom are OK and Cancel buttons.

This is where you fill in all the data you found earlier. When you have completed the fields, as shown above, click on **OK**. Note that you can enter valve timing details at this time, as well as Table Fields. These can be added later without problem and are explained later in this manual.

On clicking **OK**, the next item is to fill in the firing order.

## Chapter 2 – Starting Off

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Firing Order

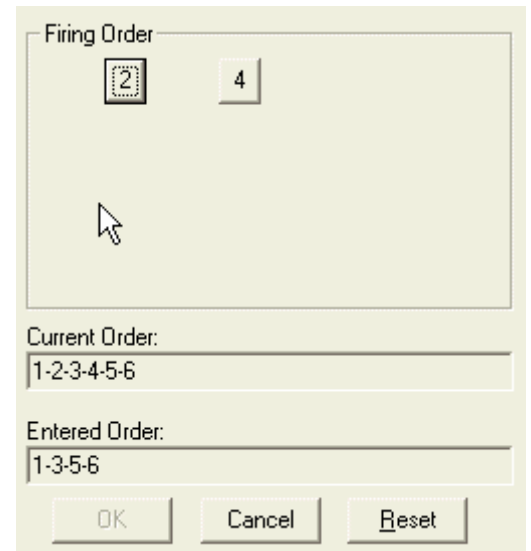
1 2 3 4 5 6

Current Order:  
1-2-3-4-5-6

Entered Order:

OK Cancel Reset

The firing order is entered by clicking on the buttons in the top field in turn. Start with 1 and enter the order. The result will appear in the *Entered Order* field at the foot of the dialogue box. The picture below shows the firing order partly entered.



Firing Order

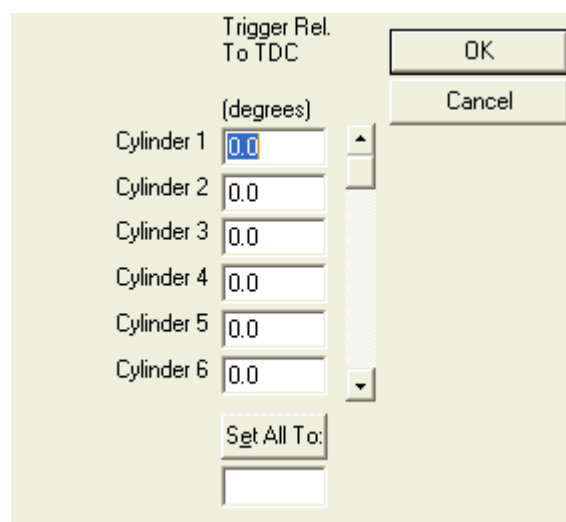
2 4

Current Order:  
1-2-3-4-5-6

Entered Order:  
1-3-5-6

OK Cancel Reset

When complete, click **OK** and the next item will be to set the TDC Trigger Reference angle. It is unlikely that this will be known at this stage, so just press **OK** to proceed.



Trigger Rel.  
To TDC

(degrees)

Cylinder 1 0.0

Cylinder 2 0.0

Cylinder 3 0.0

Cylinder 4 0.0

Cylinder 5 0.0

Cylinder 6 0.0

Set All To:

OK Cancel

The next step is to enter the sensitivity for the pressure sensor. Sensors are supplied with a calibration certificate which states the sensitivity at 4 different conditions – low pressure with low temperature, high pressure with low temperature, low pressure with high temperature and high pressure with high temperature. Since measurements are normally made with the pressure sensor at elevated temperature and pressure, it is best to take the high temperature, high pressure figure.



## Chapter 2 – Starting Off

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Transducer Sensitivity:

(mV/bar)

Cylinder 1	20.00
Cylinder 2	20.00
Cylinder 3	20.00
Cylinder 4	20.00
Cylinder 5	20.00
Cylinder 6	20.00

Set All To:

OK

Cancel

Note that it is possible to enter a sensitivity for each cylinder on the engine. This option is for on-line systems where a sensor is fitted to each cylinder. For portable or installed systems, enter the sensitivity in the box under **Set All To**, press the **Set All To** button and the same sensitivity will be entered for all cylinders.

After the *Transducer Sensitivity* window, and if you have a system with fuel pressure or vibration capability, a window will appear allowing the sensitivity for the fuel pressure sensor or for the accelerometer to be entered. Again, set the same value for each cylinder using the **Set All To** buttons. This window allows for entry of the offset angles as well, but again, these probably won't be known until after initial tests have been made.

	Fuel Pressure Sensitivity (mV/bar)	Angular Offset From Main Trace (degrees)	Vibration Sensitivity (mV/g)	Angular Offset From Main Trace (degrees)
Cylinder 1	2.50	0.0	100.00	0.0
Cylinder 2	2.50	0.0	100.00	0.0
Cylinder 3	2.50	0.0	100.00	0.0
Cylinder 4	2.50	0.0	100.00	0.0
Cylinder 5	2.50	0.0	100.00	0.0
Cylinder 6	2.50	0.0	100.00	0.0

Set All To: Set All To: Set All To: Set All To:

OK

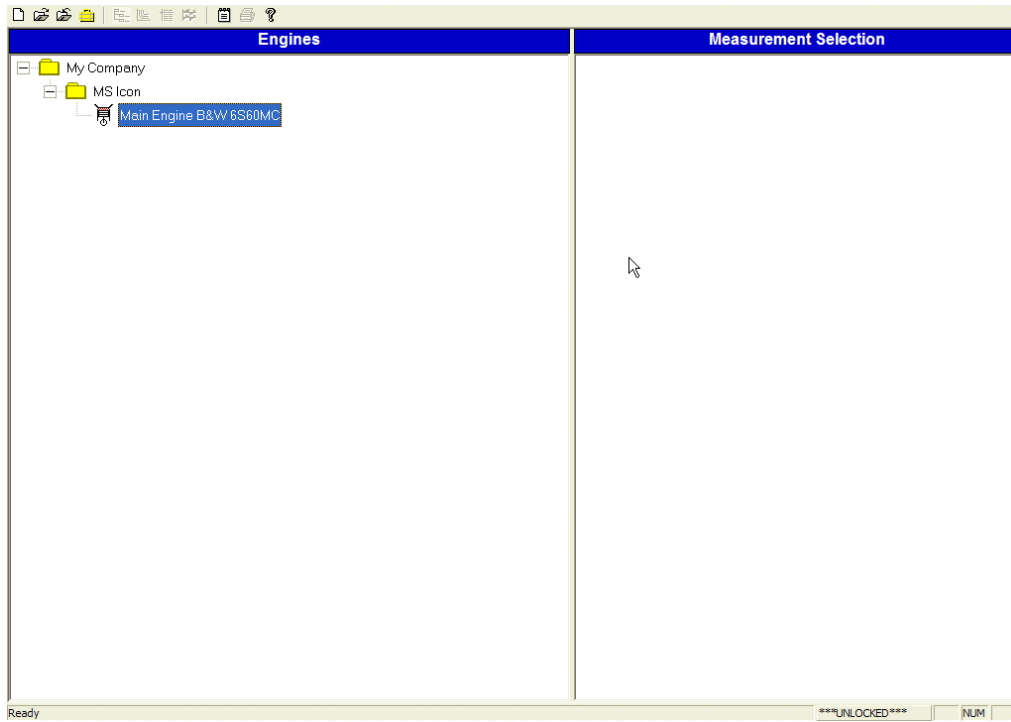
Cancel

Once all these parameters have been entered, and the last **OK** button pressed, the engine will be created in the database.

Your database should now look something like the example below.

## Chapter 2 – Starting Off


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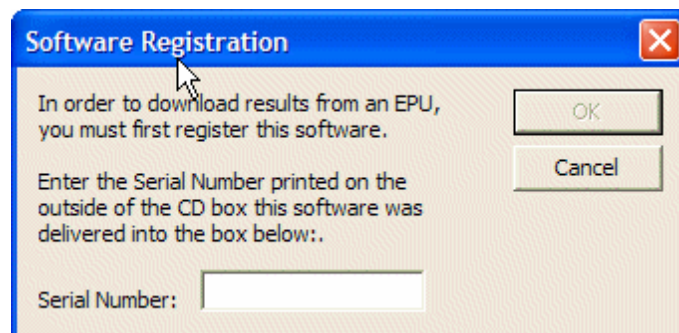
You can add further engines, ships and operators to your database as required.

### 2.4 Downloading Data

Once the database is set up, data from the instrument can be downloaded into it. Connect the EPU (Engine Processor Unit) to your PC with the serial cable provided. If you do not have a serial port on your PC, it can be connected to a USB port using the USB to Serial adapter supplied with all new systems. Note that the driver for the adapter must be installed before connecting the adapter to your computer.

First, highlight the engine for which you wish to download results then click on the  button.

**Note:** you will only be able to download data using a fully licensed copy of the Doctor software. The first time you download, the following window appears. Enter your serial number to continue.



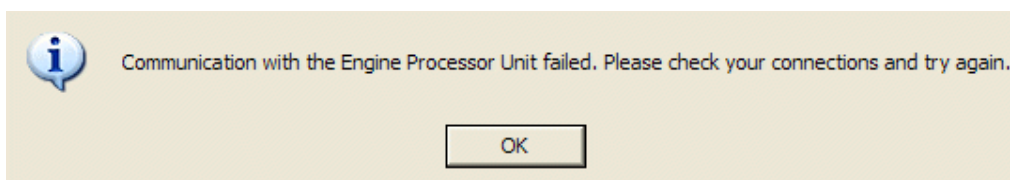
### 2.5 COM Settings

The COM port that is selected by default is COM 1. If this is not the one you are using, it is possible to change the port. If you know the COM port number for the socket you have used, you can enter it, however if you don't know, you can keep trying until one works.

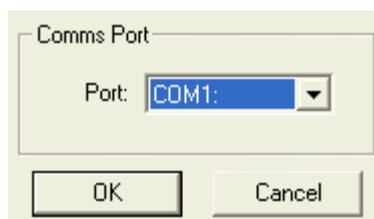
There are 8 COM port selections to choose from. Note that if you are using a USB to serial adapter, you will always need to change from the default setting of COM 1.


If you are using a USB to Serial adapter, you can use **Control Panel... System... Hardware... Device Manager** and locate the COM port that has been allocated to your USB adapter.

If connection is unsuccessful, you will see the following window.



From the drop down menus, select **Download... Coms Setup** and choose the COM port you need. Click **OK** and try downloading again.

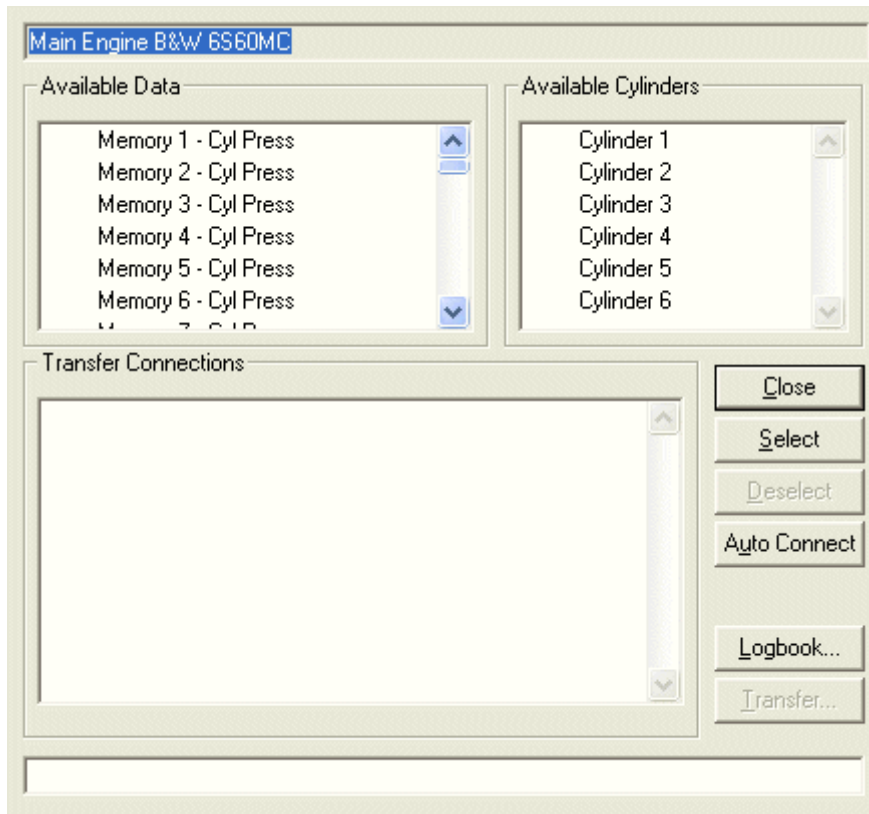


Click on the  button after the correct COM port has been selected.

If there is data in the instrument, a window like the one below will appear, showing the available data and the cylinders in the selected engine.

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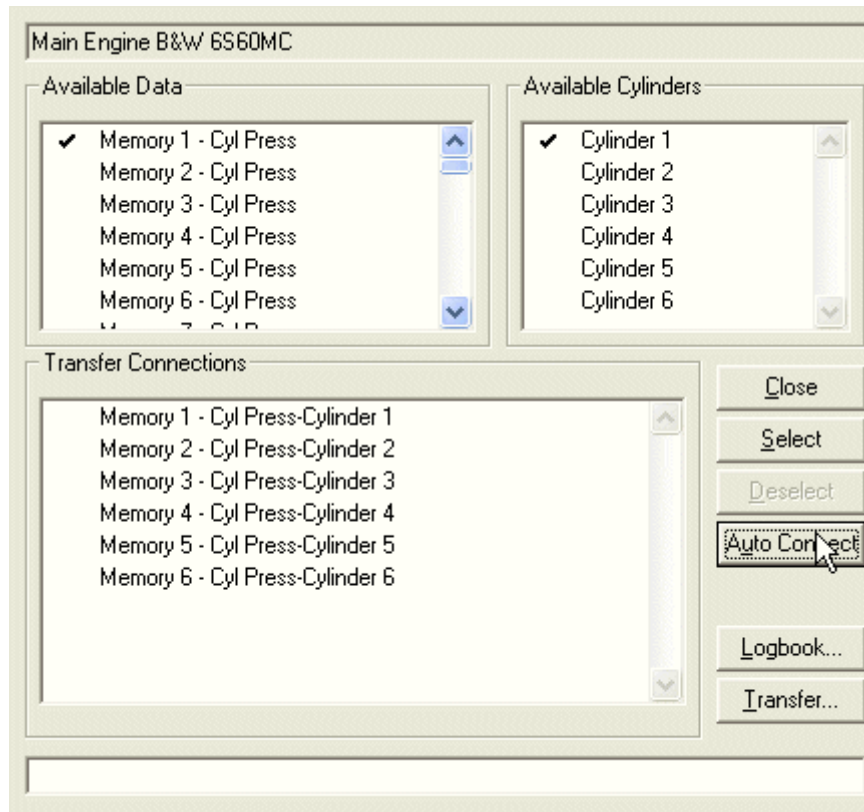
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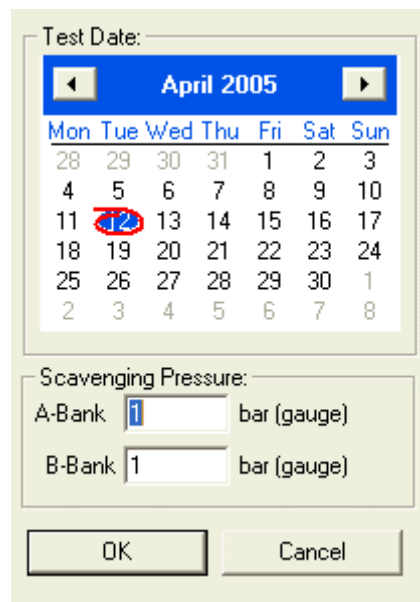
Select the first store for the test on the target engine by clicking next to it and select Cylinder 1 in the same manner. There is now a choice of buttons. **Logbook** accesses the notebook for the engine and any notes about the engine that may be useful can be entered at this time.

The **Select** button will couple the selected data with the selected cylinder. The **Auto Connect** button will connect each available cylinder to a data set from the EPU. So long as data was taken in order, this is the quickest option to use. The select option is normally only used for special tests where individual cylinder readings have been taken for some reason.

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Click on **Transfer**, and you will need to enter the scavenge pressure (boost pressure). For in-line engines, just enter one value in the top section and for V engines, enter a value for each bank. This dialogue box also lets you enter the date of the test as the day you are downloading may not be the same day the test took place.




Click **OK** and your results will be transferred into the database. During transfer of data, a tick mark will progress from one result to the next until all results have been transferred. It is advisable to wait until the process is complete before doing anything else on the PC.

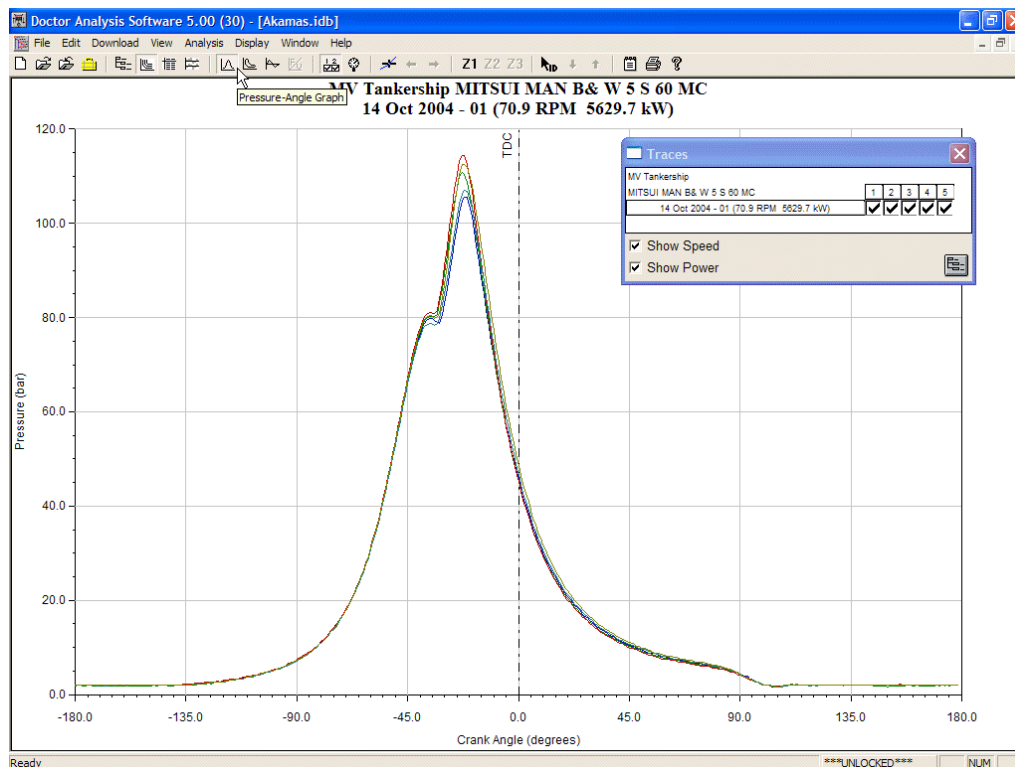
### 2.6 Setting the TDC position for the results


Icon will set the TDC position for you if you send an archive of your initial readings to [doctor@iconresearch.co.uk](mailto:doctor@iconresearch.co.uk). This is part of the service offered when you purchase a Doctor system. It has the benefit of a backup database being kept at Icon and will be sure to start you off with the right offset and accurate power figures for your engines.

The following section explains how this is done and allows system operators, and particularly those who use the Doctor on multiple engines, to set the TDC position themselves.

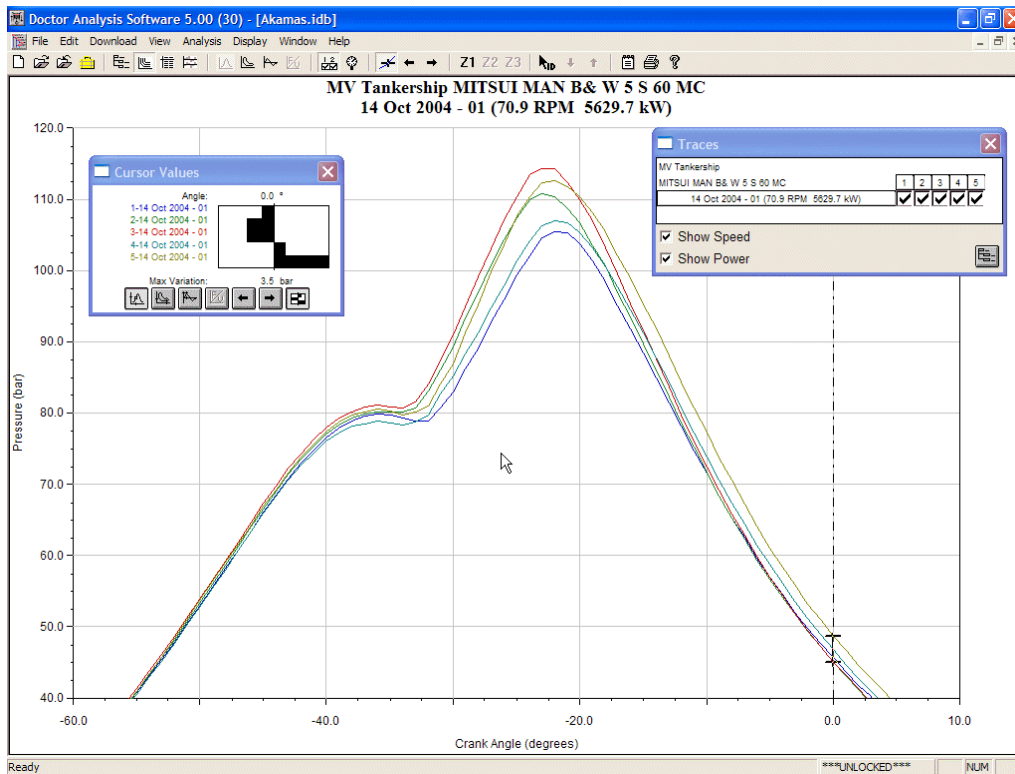
Before your results will be meaningful and report power for the cylinders correctly, it is essential to set the TDC position. The position your traces appear in initially is the result of where the master marker was placed on the engine's flywheel. It doesn't really matter where this position is, as an offset is almost always needed.

To start, you first need to view your results. After downloading, the engine will already be highlighted. Click on the  button and the traces of your results will appear.

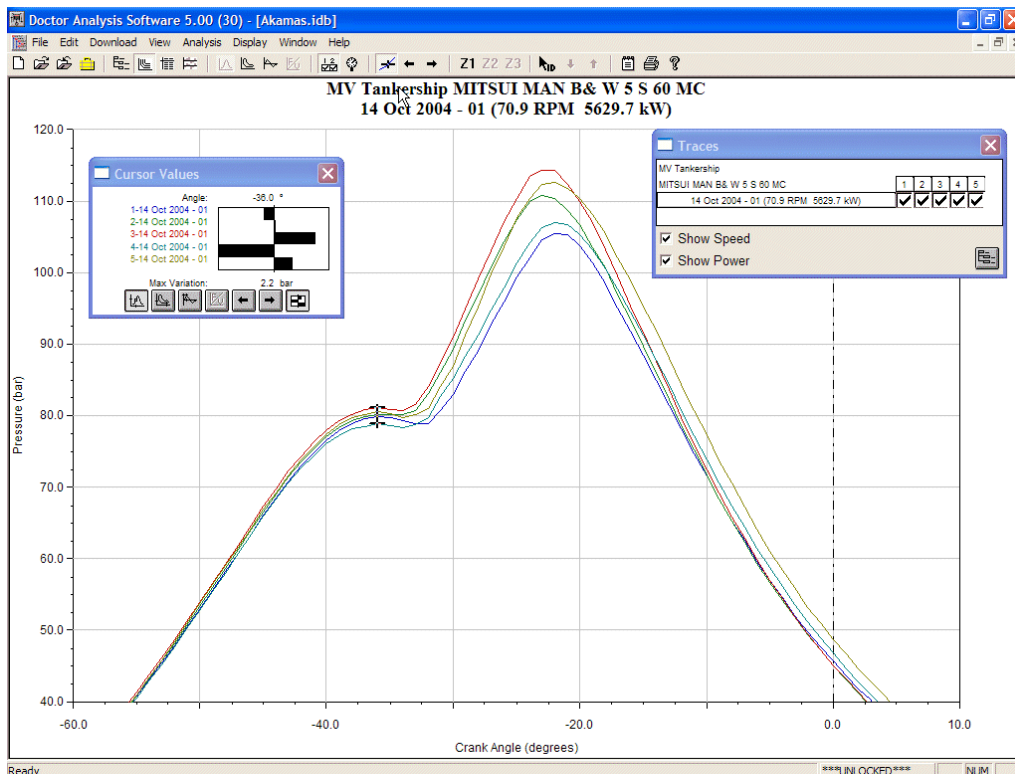


The traces here are obviously out of position, and it is a simple job to get these correct. First, zoom in on the traces by clicking and dragging a rubber band box around the section of the traces with elevated pressure. Then select the cursor tool, using the  button on the toolbar. The screen should then look something like the one below.

## Chapter 2 – Starting Off



Now move the cursor using the left and right arrows on your keyboard until it is at the correct TDC position. On this engine this is easily identified as the smooth hump just before the ignition points for the cylinders at about  $-36^{\circ}$ . The cursor window confirms the position.





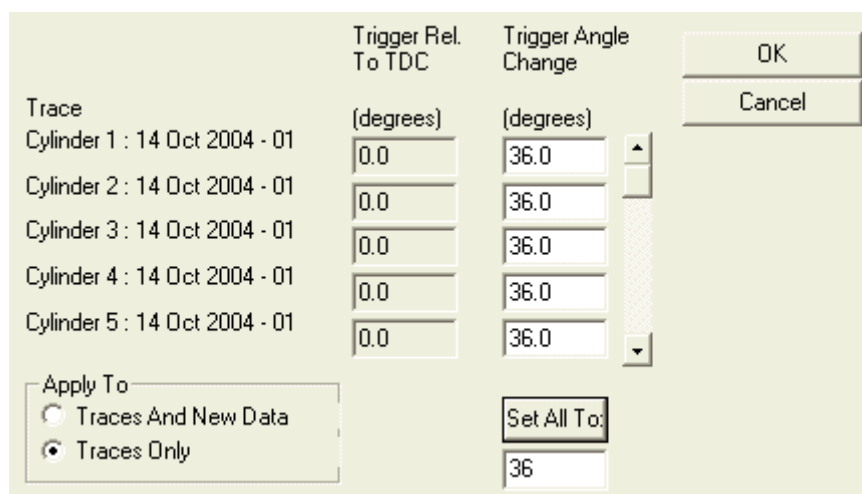
## Chapter 2 – Starting Off

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From the drop down menus, choose **Analysis... Adjust Trigger Rel To TDC**. This function is protected by a password by default. The password is “doctor” in lower case letters as the initial setting, but this may be changed if required.



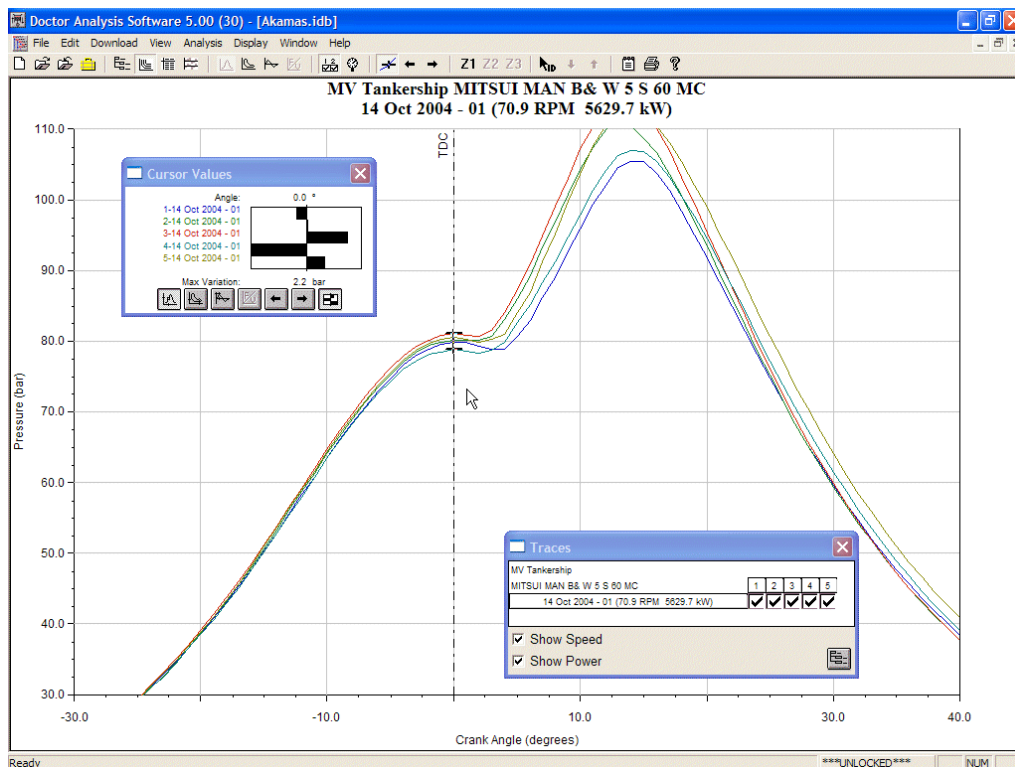
Enter the password and you will be able to continue.

A dialog box titled "Adjust Trigger Rel To TDC" with "OK" and "Cancel" buttons. It contains a table with two columns: "Trace" and "Trigger Rel. To TDC (degrees)". The "Trace" column lists five cylinders with their respective dates. The "Trigger Rel. To TDC" column has input fields, all of which are currently set to 0.0. To the right of the table is a vertical slider with up and down arrows. Below the table is a section labeled "Apply To" with two radio buttons: "Traces And New Data" and "Traces Only". To the right of this section is a "Set All To" button and a text input field containing the value 36.

The value to enter in this case is 36. The cursor was at  $-36^\circ$  when it was on the correct position for true TDC, and so we need to make this position zero. Adding  $36^\circ$  to  $-36^\circ$  gives zero. In general, the value to enter is the cursor value but positive if the cursor is at a negative angle and negative if it is at a positive one.

The end result should be as below with the TDC line passing through the compression peak of the traces. Here the picture has been re-zoomed to show TDC, and the cursor has been re-positioned to TDC.

## Chapter 2 – Starting Off



**Note that the same offset should be applied to all cylinders except in exceptional circumstances.**

Not all engines are as easy to adjust and the following sections give guidance in how to cope with these situations.

### Adjusting by Setup of TDC Pickup

For this method, the best starting position will be obtained if the marker is opposite the sensor when the engine is positioned at No.1 cylinder TDC. This gives a nominal offset of 0°.

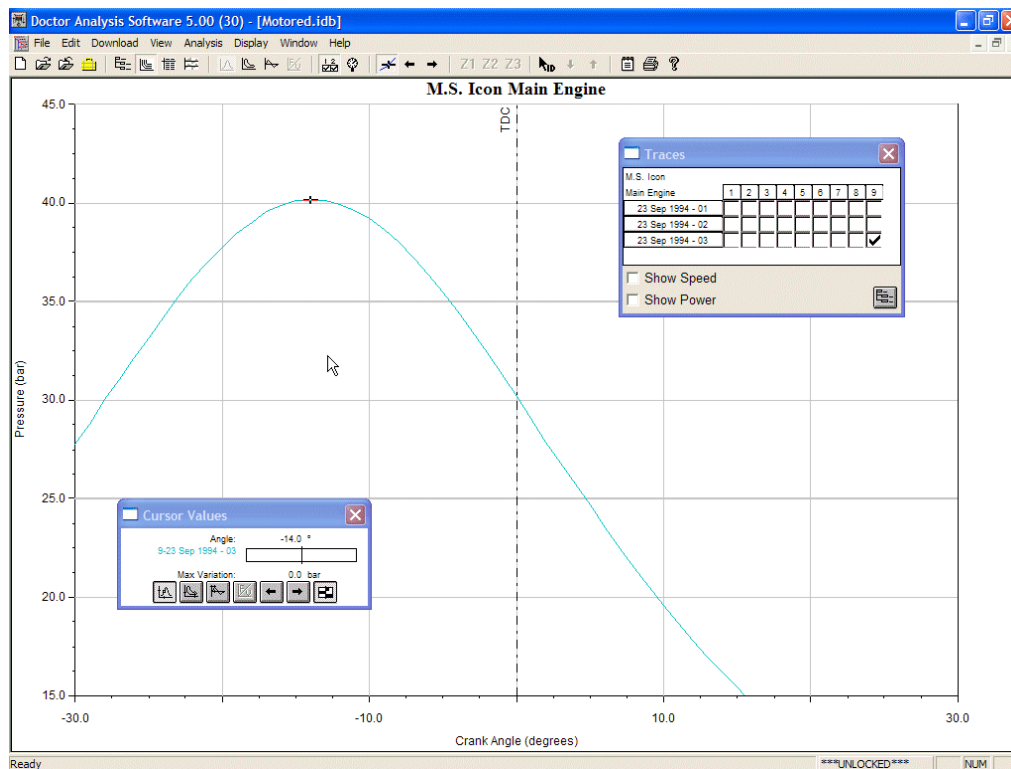
There will normally be a correction to make to the angle offset, even if everything is aligned perfectly during setup. This is because the pressure wave from the cylinder takes a small but significant time to travel along the passageway to the indicator cock and pressure sensor. It is possible to estimate the delay in degrees and the following formula provides a reasonable correction.

Delay in Degrees = Distance from inside of cylinder head to pressure sensor (in meters) x RPM divided by 100.

Since the actual delay depends on the temperature of the gas in the passageways this is only approximate. The pressure wave will travel faster in hotter gas and causes less delay. The geometry of the passageways also has an effect and this is difficult to predict.

### Adjustment by Taking Motored Readings

In practice, the surest way to determine the best angle to use as an offset is to take a motored reading from one healthy cylinder when the engine is hot and running at its normal speed and if possible, power. Note that a cylinder with leakage will not give a true indication of TDC. Transfer this reading into the analysis software and look at the shape of the trace. Zooming in at the top of the trace in the *Pressure versus Angle* trace and using a cursor will help here. Position the cursor at the peak of the trace, slightly to the left if there is a choice of maximum values.



In this case, a zero offset on a motored reading produced a trace which is in an incorrect position. The peak of the trace should coincide with the TDC line and the current setting would show a fairly large value for the power in the cylinder.

The angle at the cursor position is the required amount of offset but the entered value should have the opposite sign. For example, if the cursor is at  $-14^{\circ}$ , then  $14^{\circ}$  will need to be added to put the zero line (TDC) in this position.

In order to change protected values a password is required:

UnLock

Lock

Cancel

Password:

To correct the position, from the **Analysis...** menus select **Adjust Trigger Position Relative to TDC...** and the following dialogue box will appear. You will need to enter a password and the default one is "doctor" and should be changed once you are

happy with your setup. See the section on Password Protection for details.

## Chapter 2 – Starting Off

Entering a positive angle will move the trace to the right and a negative angle will move it to the left. The power produced by a motored cylinder can be either positive or negative depending on engine conditions. The power value in either case should be small. The trace will now appear as shown after 14° adjustment.

Trigger Rel. To TDC (degrees) 37.0

Trigger Angle Change (degrees) 14

Trace Cylinder 9 : 23 Sep 1994 - 03

Apply To

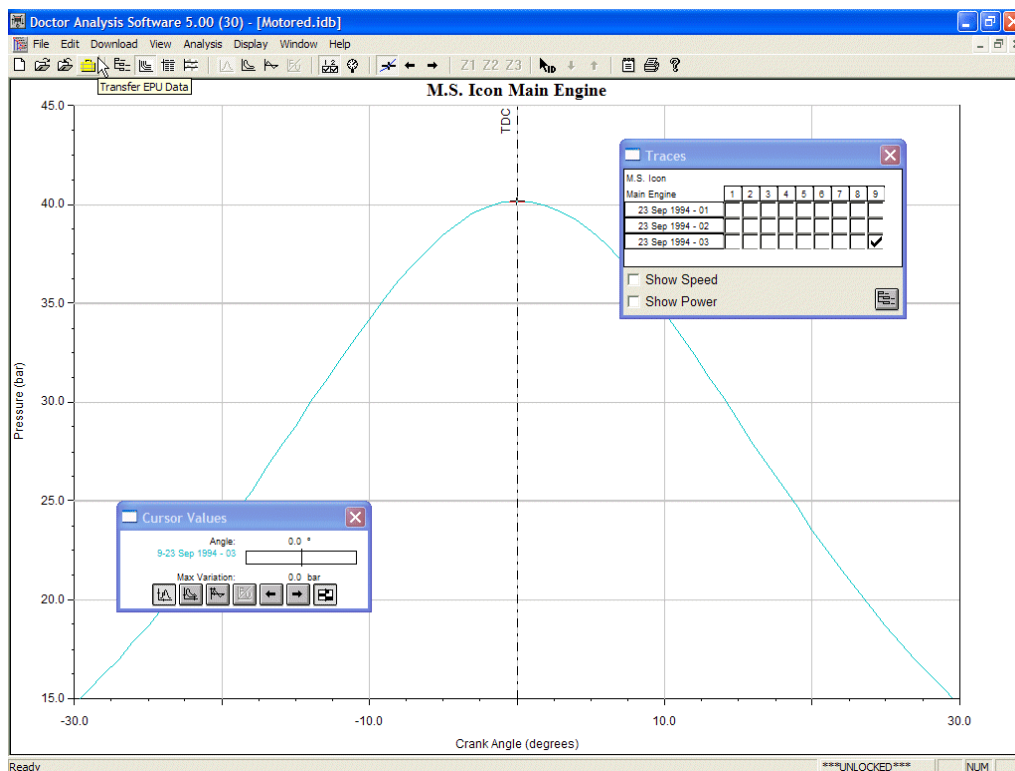
☐ Traces And New Data

☒ Traces Only

Set All To:

OK

Cancel



As the graph shows, the peak has now been moved to correspond with the TDC line and the calculated power is reduced to almost zero. A small amount of power may be shown even when TDC is in the correct position and this can be either positive or negative.

In most cases, it is more convenient to adjust all the cylinders at the same time. This is done by starting with a graph showing all cylinders and using the **Set All To** button to apply the same change to all the cylinders. Clicking on the **Traces And New Data** button will adjust your database settings so that the traces will always be in the correct position for future readings. You can check the **Engine Details** dialogue box to ensure your change has been registered.

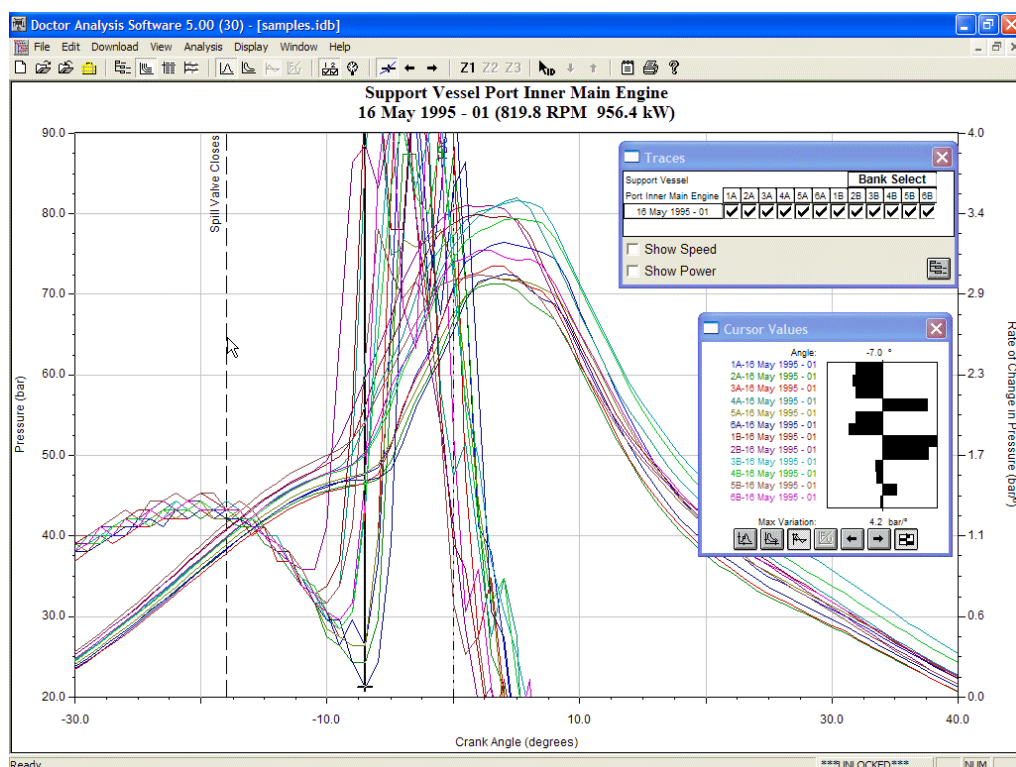
In this case of an individual trace, it was easy to identify the correct position for TDC since this was a motored reading and TDC should be at the peak pressure. In many engines it is not possible to take a motored reading as the turbocharger could surge, or in many cases it is difficult to pull off the fuel from an individual cylinder. In cases such as this, the *Derivative* or *Rate of Change of Pressure* trace can be used.

## Chapter 2 – Starting Off

### Adjusting TDC Position Using the Derivative Trace

If it is not possible to take a motored reading, the *Derivative* or *Rate of Change of Pressure* trace can be used as a guide. On a motored reading, the *Pressure versus Angle* trace is flat at TDC so the rate of change of pressure is zero. This means that the *Derivative* trace value will be zero at TDC. On a reading taken under load, the *Derivative* trace will be descending towards zero and will rise steeply at the firing point. If the descending part of the trace is extrapolated, the point at which it would cross zero can be estimated and the TDC position determined.

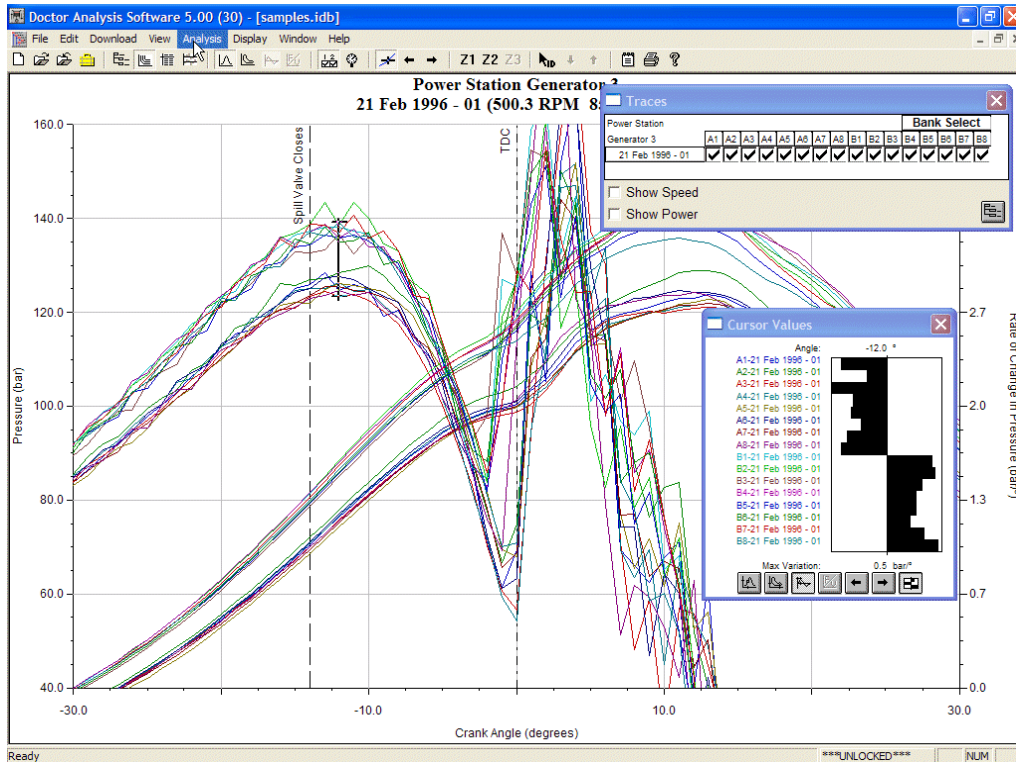
In the example below, the *Derivative* trace has been used to highlight the position of TDC. Note that the *Derivative* traces in this example do not cross the zero axis of the derivative value but some cylinders approach it closely. The bottom of the graph was set to give a value of 0 bar/° to make the visual extrapolation easier.



In this case, an offset of 7° applied to all cylinders would bring the traces to their correct positions. Use the **Set All To** button in the dialogue box to move a group of traces. Note that the dialogue box will also allow you to enter a different offset for each cylinder. This is required in some engines where the crankshaft has deliberate offsets between cylinders and on damaged engines where the crank has been twisted (e.g. after the engine has been turned with water in one of the cylinders).

## Chapter 2 – Starting Off

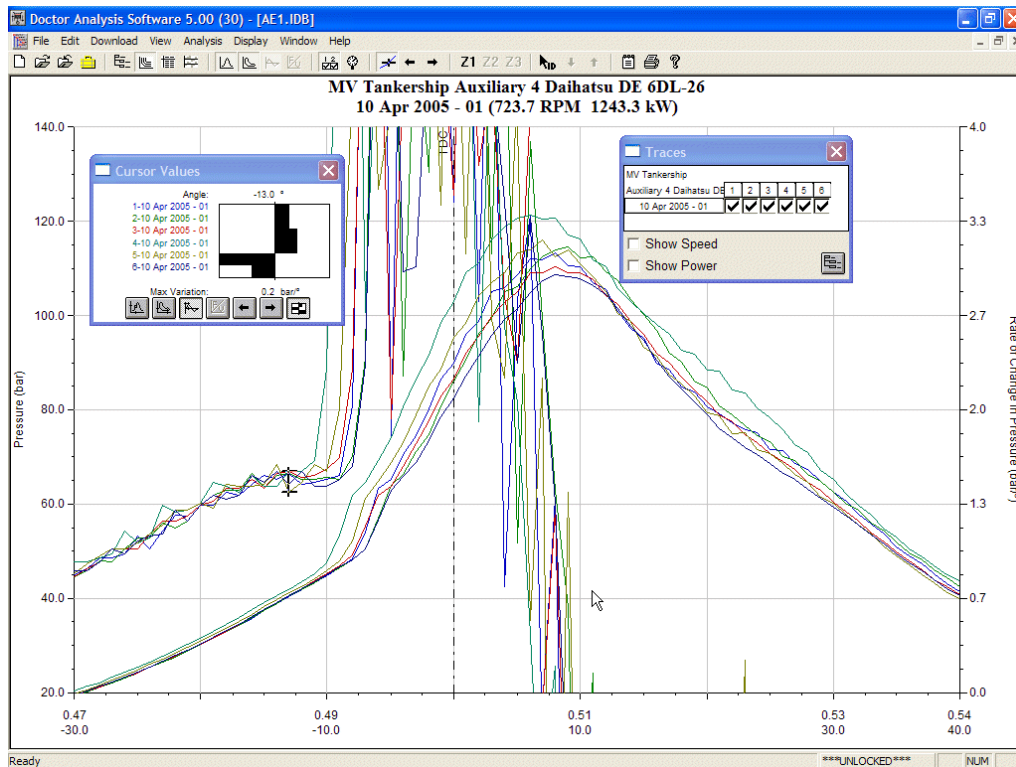
In some cases, firing occurs even earlier, and in these cases a visual extrapolation needs to be made over a greater distance as in the traces below.



This set of traces has already been moved to the correct position and it can be seen that the extrapolated Derivative traces would cross the zero line at TDC. Note that on this V-engine, the compression pressure and compression gradients are different for the two banks. This is caused by unbalanced boost pressures, but nevertheless it can be seen that the *Derivative* traces for both banks will cross zero at the same angle.

The cursor has been positioned next to the highest point of the compression rate of change before ignition and it is at an angle of  $-12^{\circ}$ . In many engines, experience has shown that this peak normally occurs at around  $-12^{\circ}$  to  $-13^{\circ}$ . In some engines, this is really the only pointer that can be used to identify TDC correctly. The following graph illustrates this point.

## Chapter 2 – Starting Off



When going through this procedure, several positions can easily be tried until you are satisfied with the TDC position. To ensure that future readings will be taken with the same offset applied, in the dialogue box for **Adjust Trigger Relative to TDC**, there is an option for **Traces And New Data**. If this is selected, the engine parameters will be automatically adjusted to apply the new offset to future data during download. If this has not been done during the last angle change, it will be necessary to alter the offset angle in the **Engine Data** dialogue box under the **Trigger Parameters...** button. Remember to use the **Set All To** button to apply the offset to all cylinders.


Your results are now in good shape to be fully analysed.




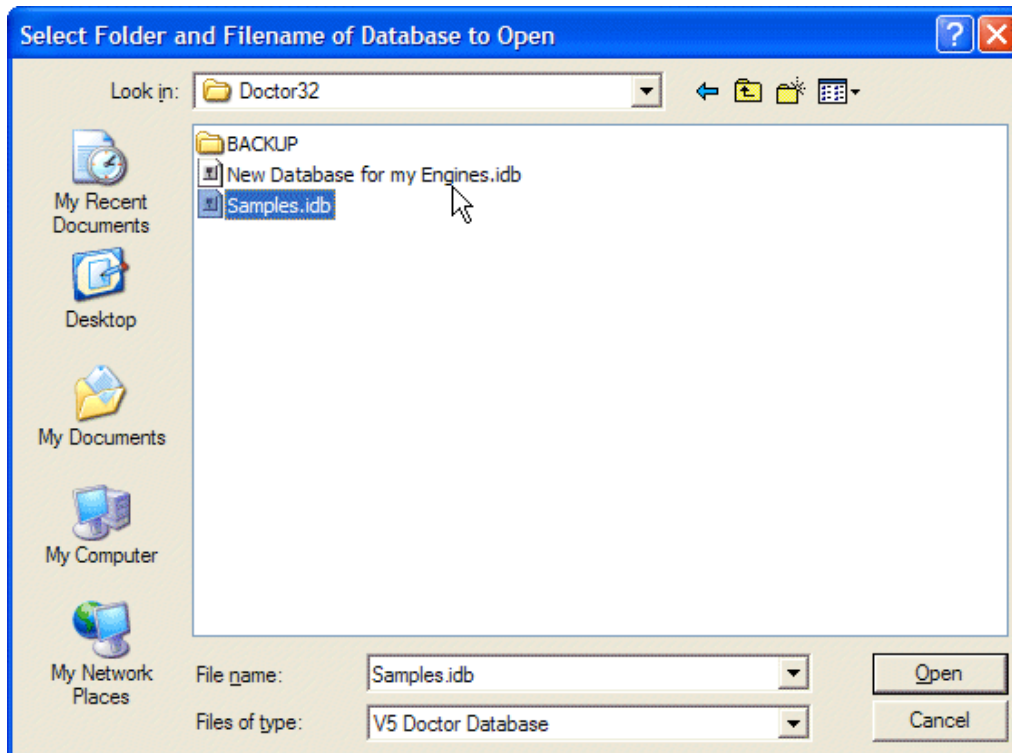


# CHAPTER 3 - Analysis Functions

## 3.1 Opening a Database

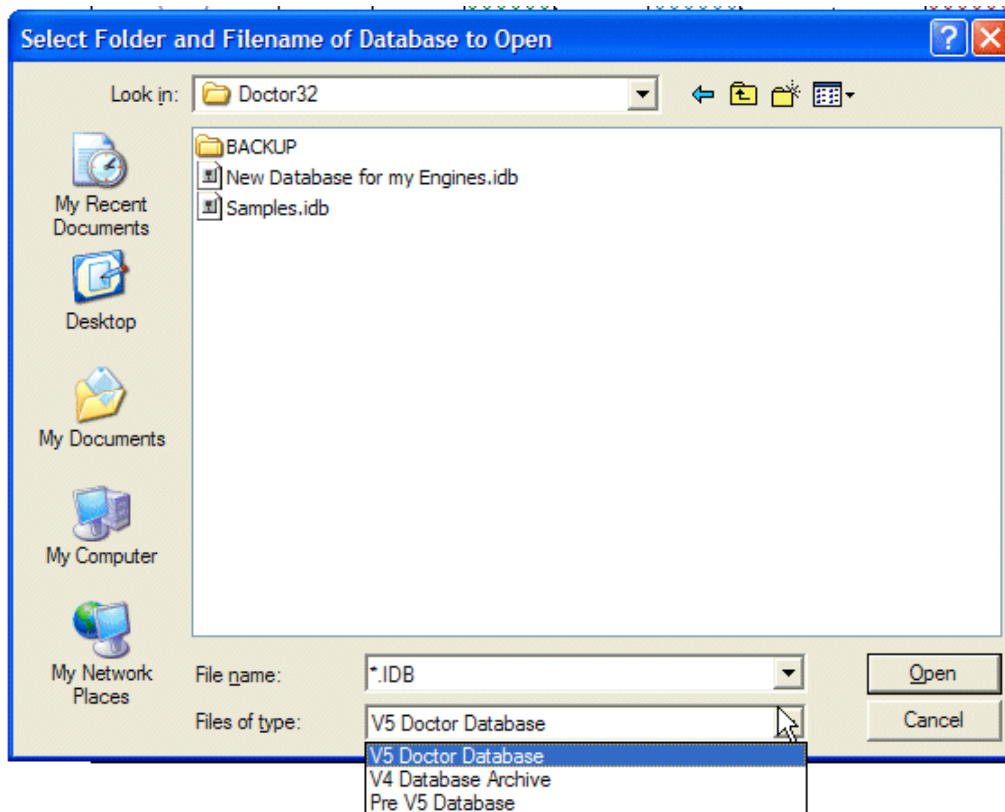
The Doctor program will automatically start in the database you were last looking at. To open another database, you can either close the one you are in using the  button, or you can have as many databases as you want open at the same time.

Click on the  button and the following dialogue appears.



Select the location and the database file you want to open.

If you would like to convert a database from an earlier format, use the *Files of type:* drop down at the foot of the dialogue box. The selections are shown in the following picture.



More information on types of databases that can be opened is available in the section on Data Sources.

With a database open, you are ready to look at the results in it. There are several types of results – Graphs, Tables and Bar Graphs. These are useful for analysis and let you see the data on your engine quickly and easily. They allow comparison of the results for the whole engine for any particular cylinder, comparison of a cylinder's results over a period of time as a trend, or any combination of these. It is possible to compare different engine results on the same screen, which is very useful, when an operator has several engines of the same type.


For fleet analysis, it is possible to copy and paste operators, ships or engines into a single database. See the section on Database Functions for more details.



### 3.2 Tests

Results are stored in the database(s) as tests. Each test covers as many cylinders on an engine as were measured at the time of the test. Normally, this will be the whole engine, but in certain circumstances there could be cylinders missed or a series of tests could have been made on a single cylinder for some particular reason.

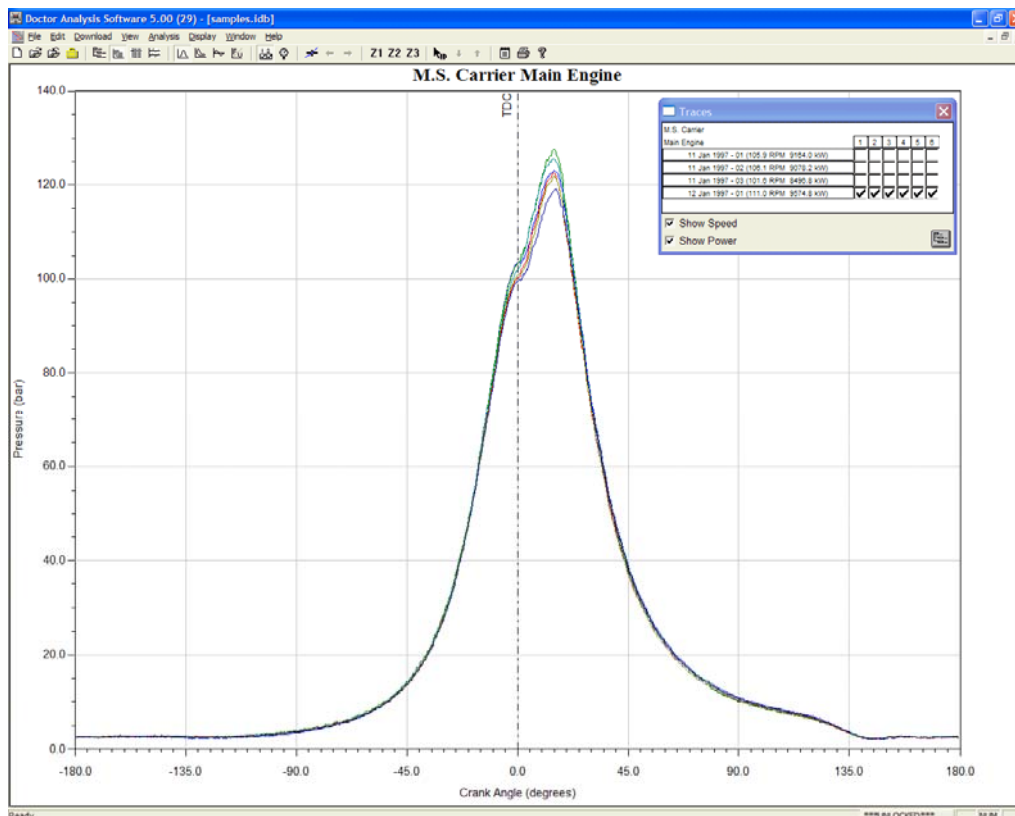
#### Selecting Tests

The first method is with an engine highlighted. The last engine you were looking at will be highlighted when you open the program. If you want a different one, use the mouse button to point at it and click the left button to highlight it.

To start the **Graphs**, point to the  button in the toolbar and click the left mouse button. The results displayed will automatically be the most recent test as in the screen below.

Note that pressing the  button will go directly to the **Table** of results for the selected engine and pressing the  button will go directly to the **Bar Graphs** of results.

In the example below, the option for **Graphs** has been used.




The traces shown will be the last type or types of graph you were looking at. In this case, the *Pressure versus Angle* traces are shown for the latest test. You can select and deselect sets of results by clicking on the date in the buttons on the left of the **Traces** box.

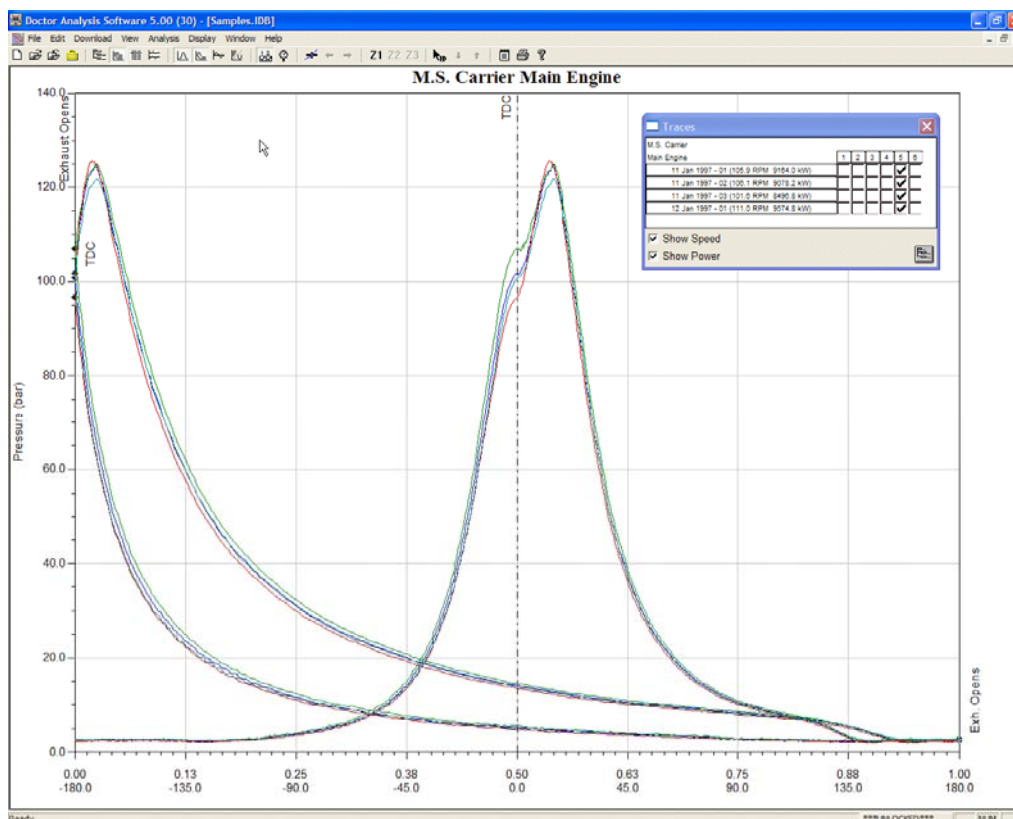
## Chapter 3 – Analysis Functions


To see a trend for a cylinder, click on the cylinder number. To see any individual result, click in the white box which is in line with the date and the cylinder number you want to see. You can click on any combination of complete tests, trends or individual cylinders.

The pop-up box can be moved around so that it does not cover any useful part of the graph (or table or bar graph). Click and hold on the bar where the label **Traces** is seen and drag the whole box to where you want it. Let go of the mouse button and it will stay where you have put it.

In the graph below, the latest result has been switched off and the trend for cylinder 5 selected. The pop-up box has been moved as well to avoid covering the title. The

*Pressure versus Volume* traces have also been selected by pressing the  button.

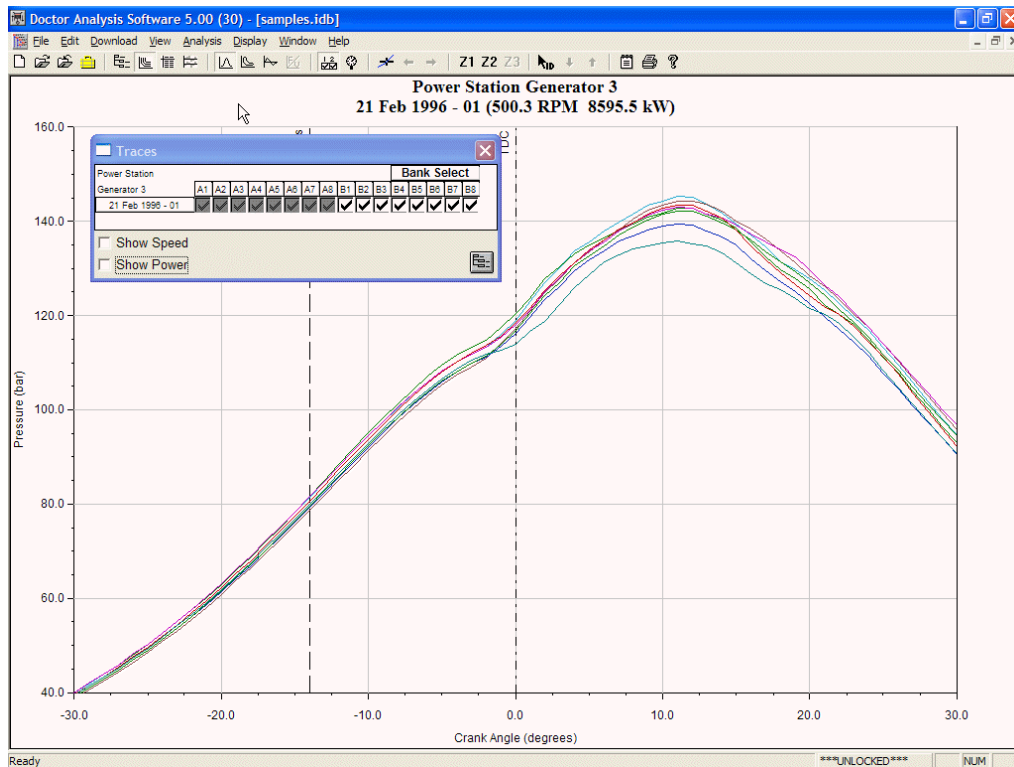


If you want to see the screen without the pop-up box, you can switch it off by clicking the **X** in the top right corner. You can always switch it on again by pressing the  button in the toolbar.

The **Show Speed** and **Show Power** check boxes allow the speed and power for each test to be shown next to the test date and test number in the **Traces** selection box. These are very useful for selecting tests at similar conditions for comparison. The settings used for these are remembered for each engine.

An additional feature of the **Traces** selection pop-up facility is for V-Configuration engines and there is a button that allows you to select one bank at a time. In the following screen, the B bank has been selected and the A bank is not shown. To see the A bank, click the **Bank Select** button in the pop-up box. The next screen will show the whole engine and clicking again will show just the A bank. The same selection procedure applies to **Tables** and **Bar Graphs**.

## Chapter 3 – Analysis Functions

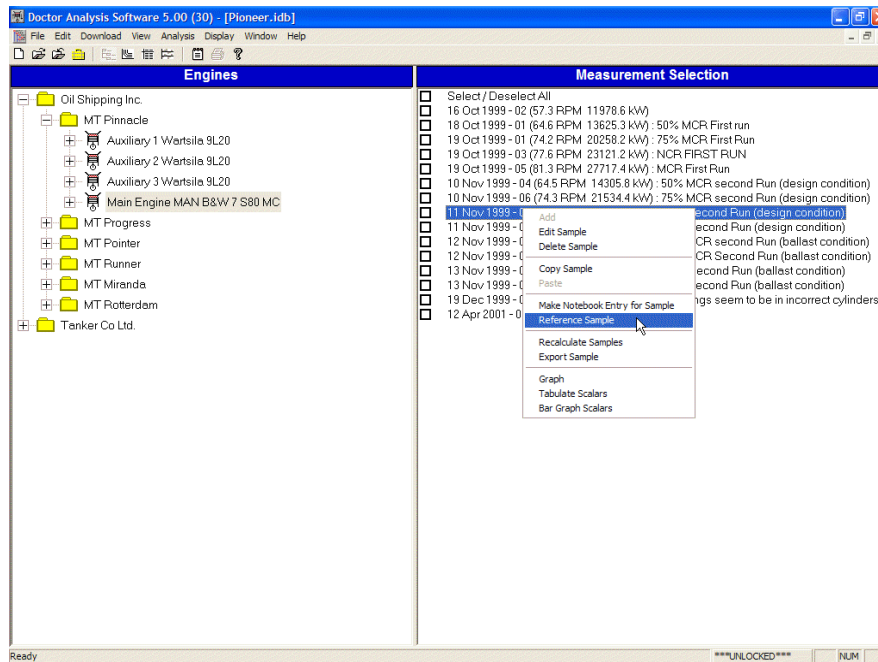


### Reference Tests

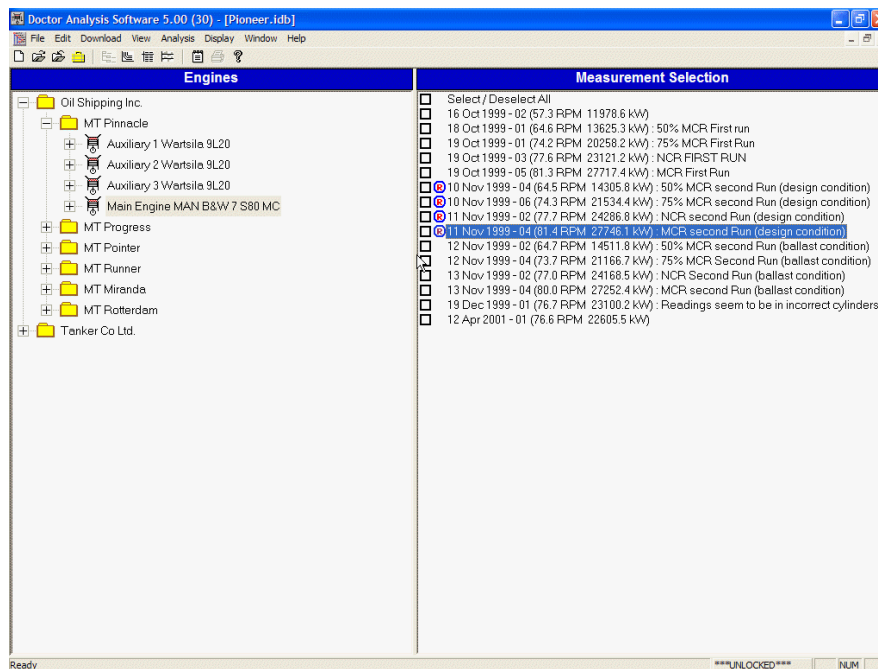
It is often useful to have a reference test for an engine. For 2-stroke main engines in particular, several references can be useful at different RPM settings for the engine. On other engines with constant RPM, references at specific load conditions can be useful. Often the results for these are from the tests taken at sea trials. If sea trial results are not available, tests under good conditions when the engine is known to be in good repair will do just as well.

To designate a test as a reference, first highlight the test that you want to designate as a reference in the **Measurement Selection** pane of the database view.

## Chapter 3 – Analysis Functions



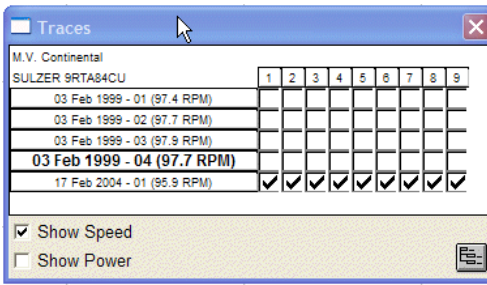
Right click with the mouse on the test and select **Reference Test** from the list of options that appears. Alternatively, this can be done from the **Edit.... Reference Trace** selection in the drop down menus. As many tests as you want can be selected as references in this way.



When selected for viewing, the Reference Test dates and test numbers appear in bold in the **Traces** selection box.

## Chapter 3 – Analysis Functions

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	1	2	3	4	5	6	7	8	9
M.V. Continental									
SULZER 9RTA84CU									
03 Feb 1999 - 01 (97.4 RPM)									
03 Feb 1999 - 02 (97.7 RPM)									
03 Feb 1999 - 03 (97.9 RPM)									
<b>03 Feb 1999 - 04 (97.7 RPM)</b>									
17 Feb 2004 - 01 (95.9 RPM)	✓	✓	✓	✓	✓	✓	✓	✓	✓

☒ Show Speed  
☐ Show Power

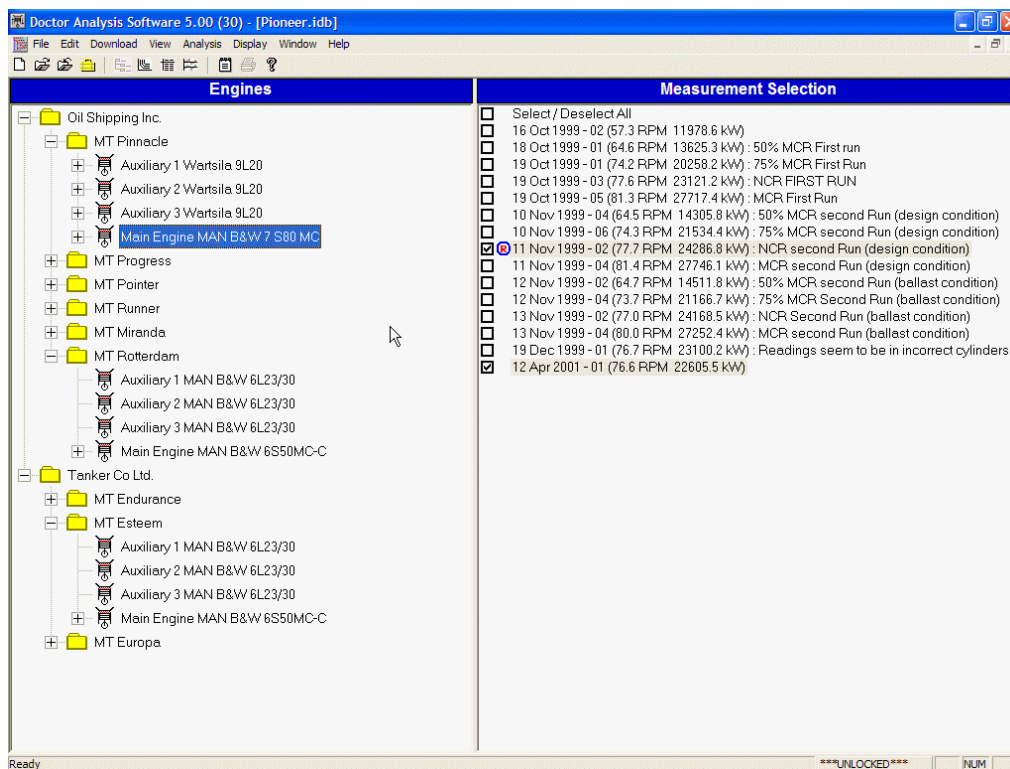
### 3.3 Selecting Tests for Multiple Engines – Fleet Comparisons

In a database with multiple operators, ships and engines, it is possible to view results for any combination of engines of the same type at the same time. That is to say you can look at a group of 4-strokes or a group of 2-strokes, but you can't look at 4-strokes and 2-strokes at the same time.


To set up a selection of tests, the following methods can be used.

Select an engine and the tests for that engine can be seen in the right hand pane of the database view. You can select all the tests for an engine using the **Select / Deselect All** check box at the top of the right hand pane.

Note in the view below that one trace has been marked as a Reference. As many Reference traces as needed may be set in a database. See the section on Reference Traces.



You can select as many tests from as many compatible engines as you like. If an engine is not compatible with the initial selection, there will be no check boxes next to the test descriptions in the right hand pane.

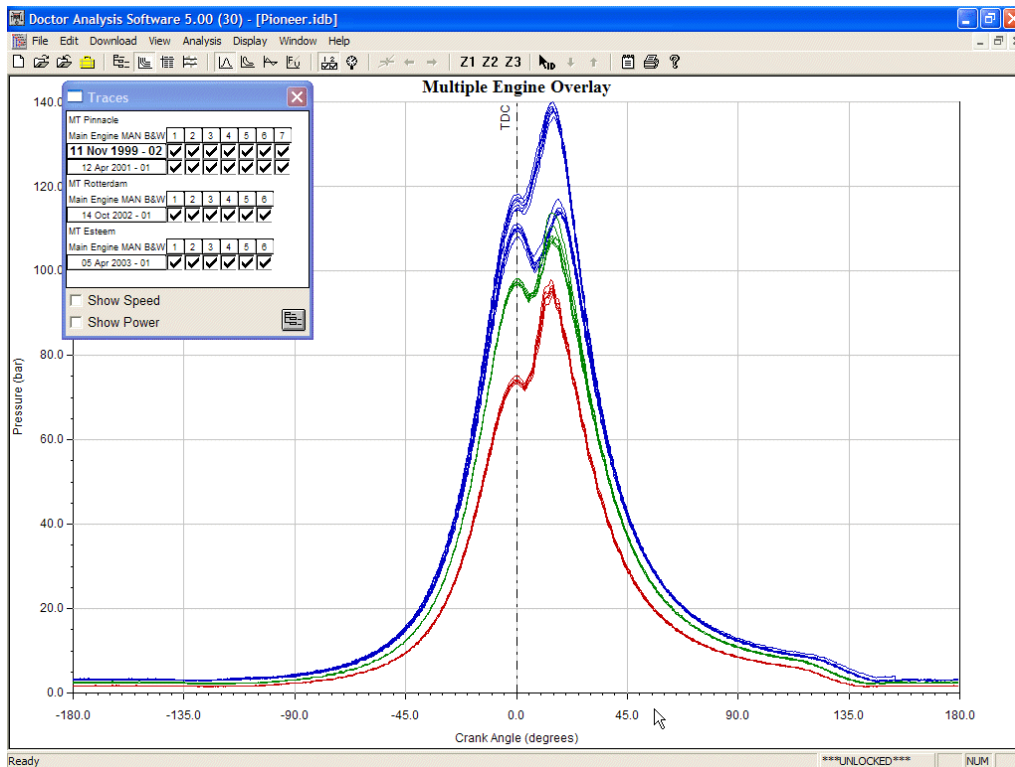
To see the traces for your selections, click on the  button. Note that you could select the **Tables** or **Bar Graph** view at this stage as alternatives.



The traces will be shown with a different colour for each engine. If you wish to see individual cylinders with a colour for each cylinder, it is necessary to view only a single engine.

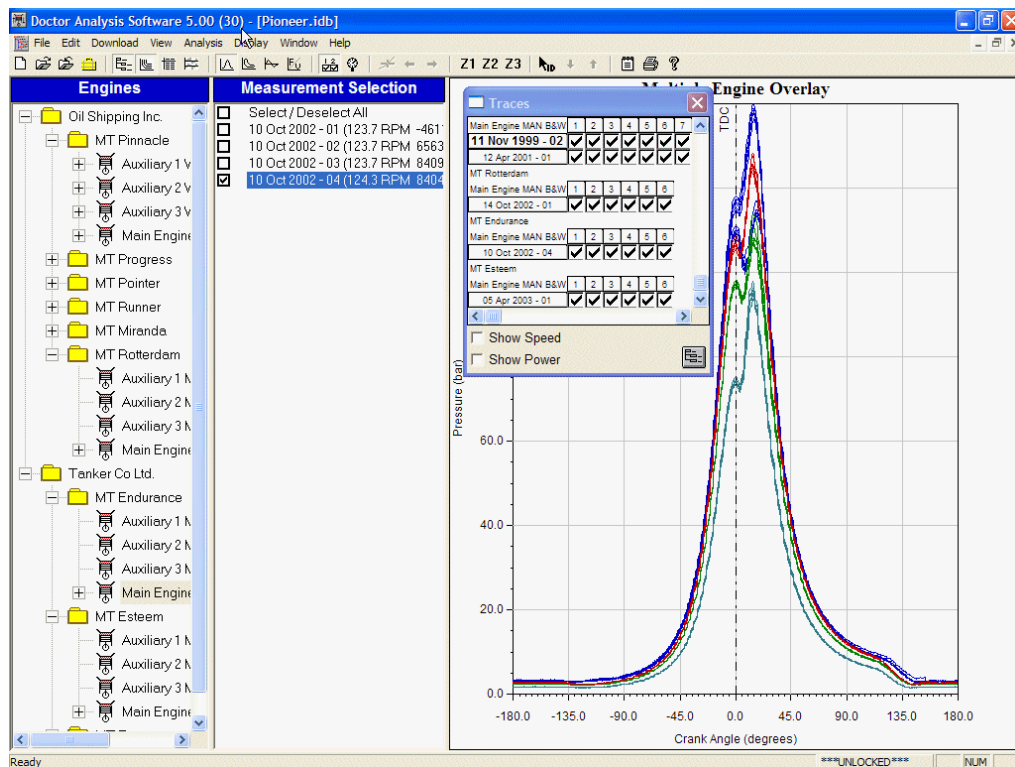
In the example below, tests for 3 engines have been selected. One of the tests was a reference test and its entry in the **Traces** box is shown in bold print.








## Chapter 3 – Analysis Functions

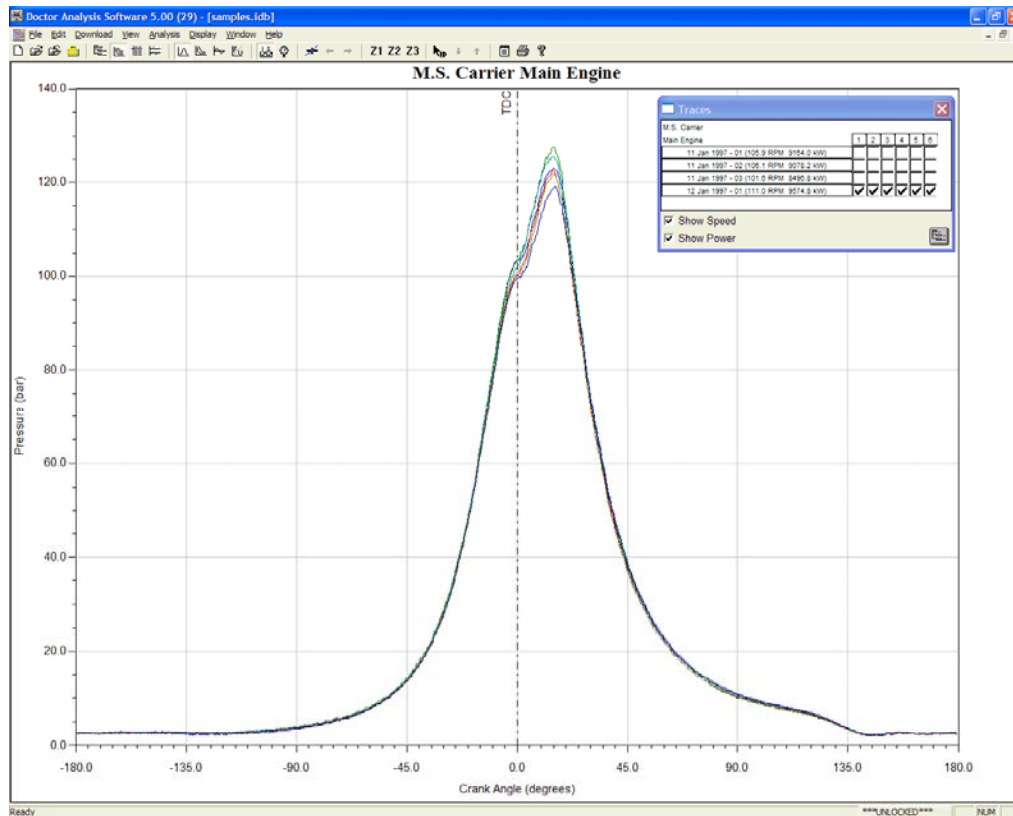


To edit your selection of tests, click on the  button. You can add or remove tests and see the result in the right hand pane. To return to the full screen graphs, click on the  button again.



### 3.4 Types of Graph

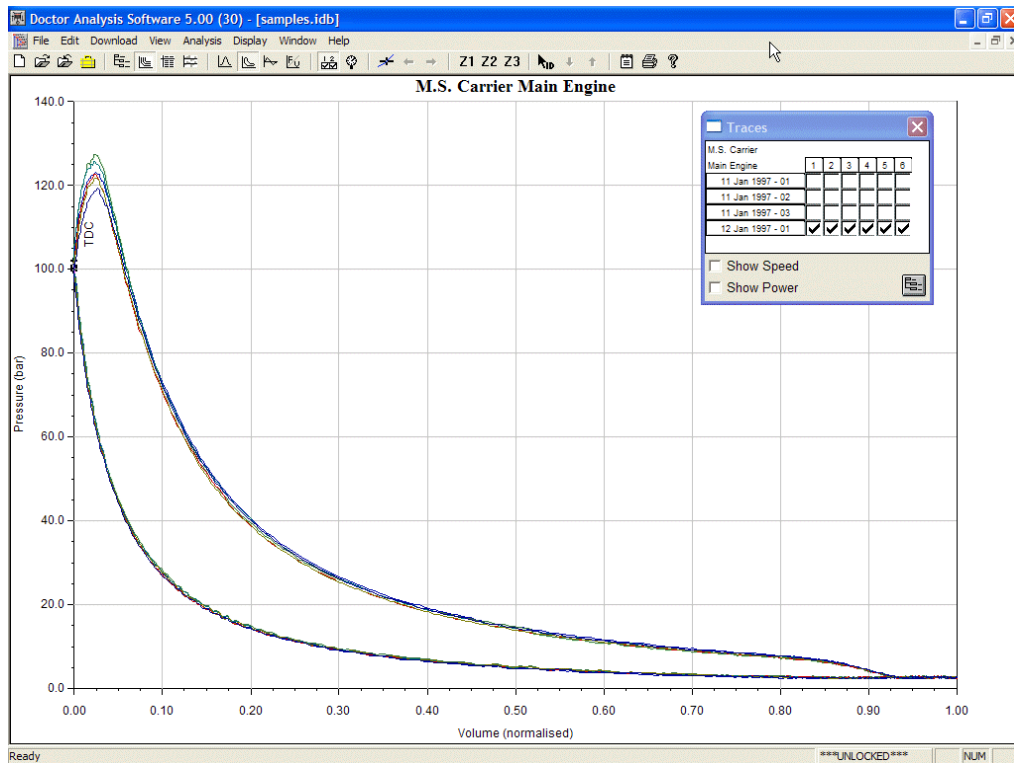
The     buttons allow you to select graph types. The first of these is the *Pressure versus Angle* graph, sometimes referred to as a Draw Card and is selected with the  button.



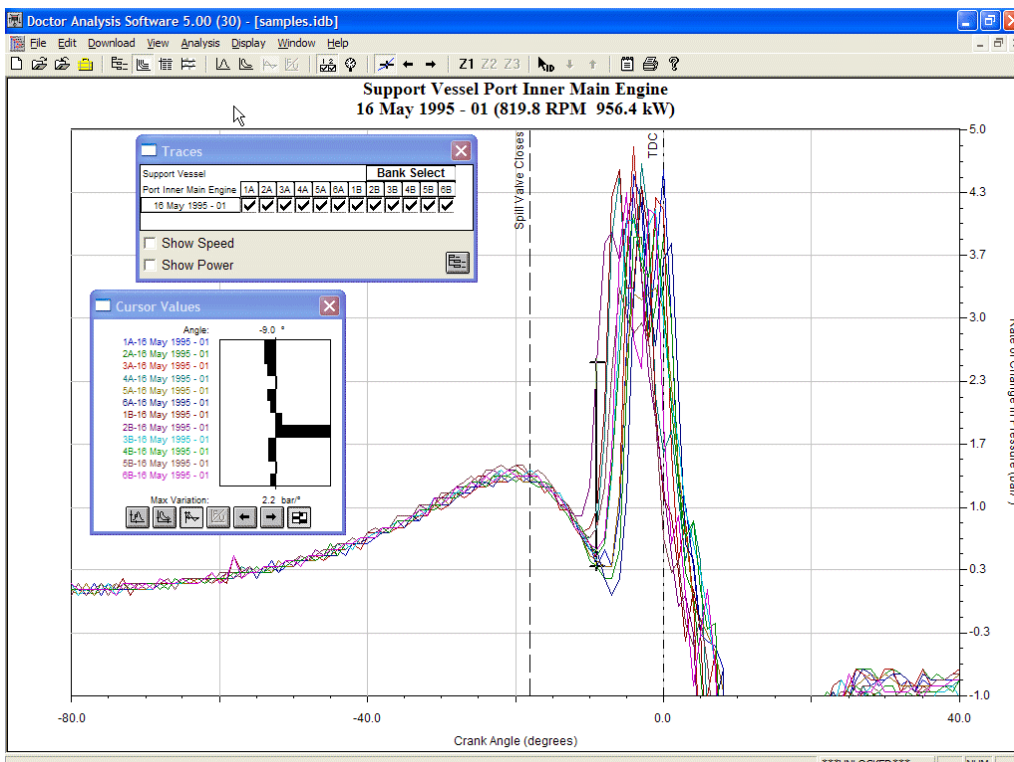
The next selection is the *Pressure versus Volume* graph. This is sometimes referred to as a closed loop diagram or an Indicator Card. The area of this graph if converted to a rectangle and laid along the bottom of the graph will have a height equivalent to the MIP (Mean Indicated Pressure) for the cylinder.

An example of this is shown below.

## Chapter 3 – Analysis Functions

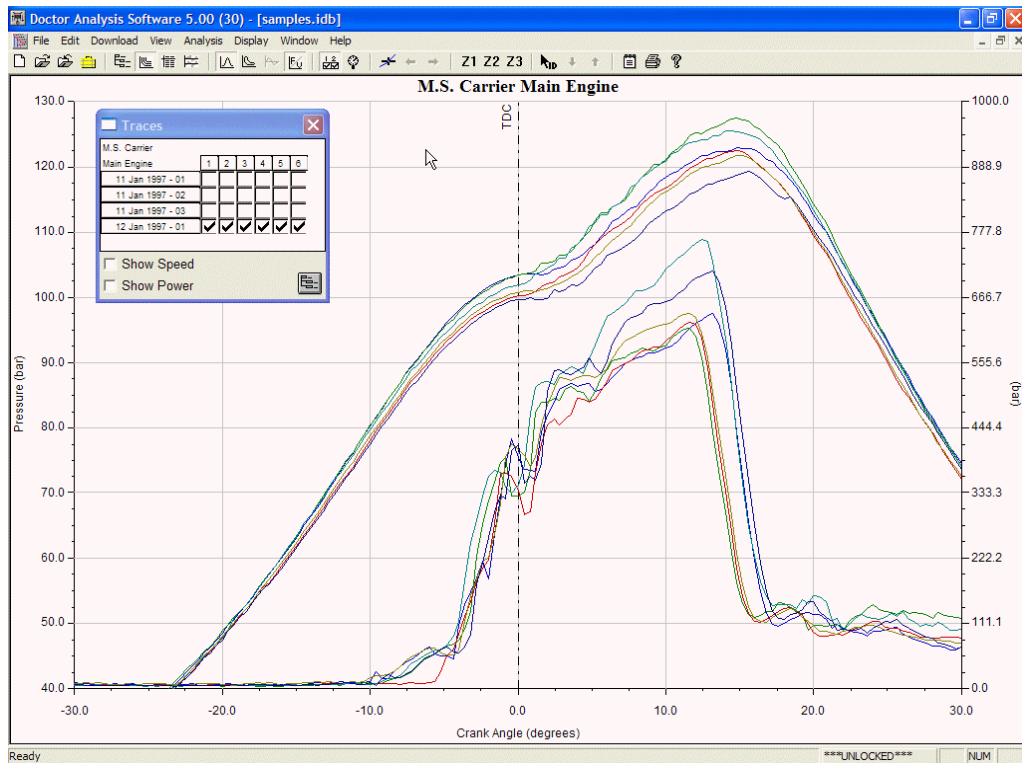


The *Pressure versus Volume* graph is used to calculate power. This is also known as an Indicator Card. A zoom from 0 bar to say 10 bar provides a Light Spring Diagram.

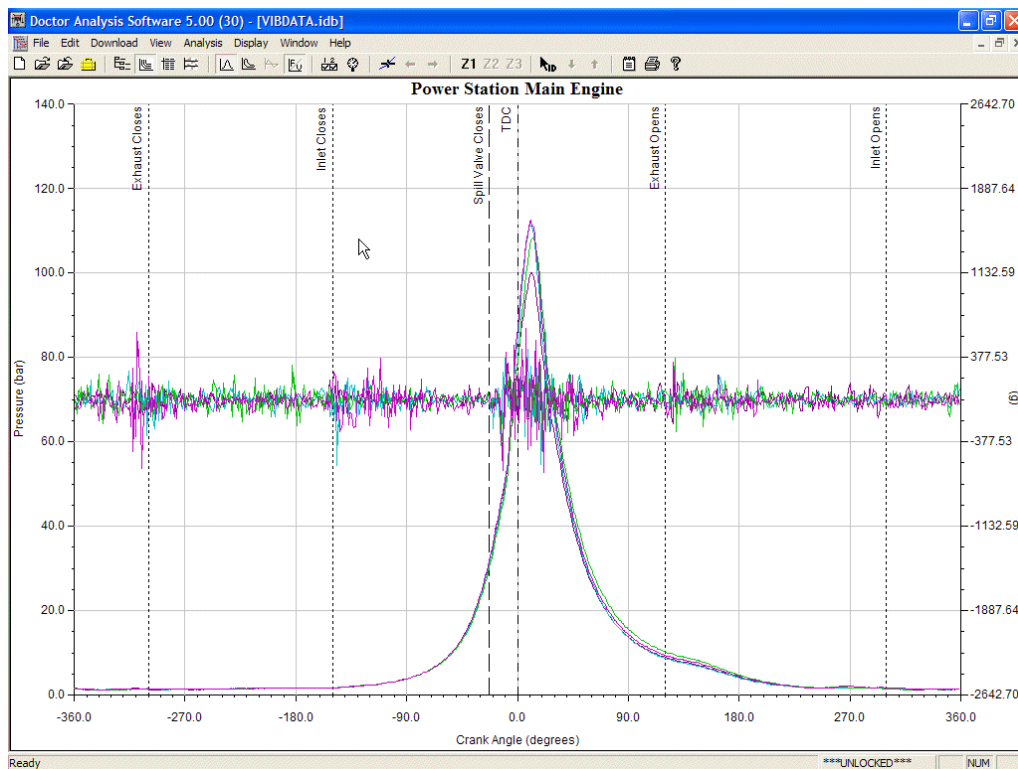


The graph of *Rate of Change of Pressure versus Angle* graph is useful for identifying the ignition point accurately and for assisting in determining the correct position for TDC. Note that the true ignition point on the pressure trace is one step after the minimum point on the derivative trace.

## Chapter 3 – Analysis Functions



Graphs of *Fuel Pressure Versus Angle* and *Pressure Versus Angle* are shown together here. These are very helpful in diagnosing pump, injector and fuel system condition. It is possible to overlay several graph types at the same time – the only graphs that cannot be seen together are the *Rate of Change of Pressure versus Angle* and the *Fuel Pressure* or *Vibration versus Angle*.



*Vibration versus Angle* graphs are useful for checking valve timing, diagnosis of valve

### **Chapter 3 – Analysis Functions**


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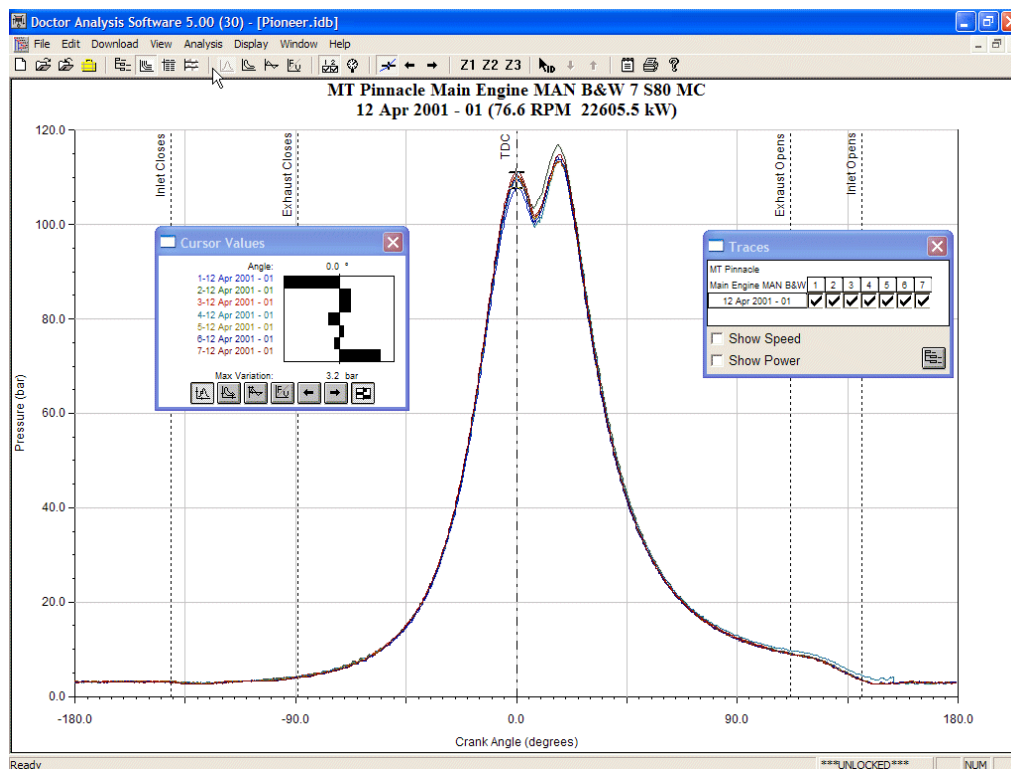
bounce, and many other conditions. The results are dependent on the position of the pickup. Fuel system elements can also be checked using vibration.

### 3.5 Graph Tools

There are a number of tools that aid analysis once traces are being viewed. These can be used to modify how the traces are viewed on the screen; they can pick cylinders from overlays and show the variations between selected traces at any point.


#### Cursors

Each type of graph can display a cursor. The cursors are enabled using the  button on the toolbar. The screen will look something like the one below.



The cursor will appear on whichever type of graph is showing. If there is more than one type of graph showing, the cursor starts on the graph type which is farthest left on the buttons on the toolbar.

There is a selection of buttons in the pop-up box. These allow you to select the graph type for which you want a cursor displayed. If the graph type is not already there, clicking its cursor button will bring it on to the screen.

The buttons are  and the two arrow buttons allow you to move the cursor one step at a time. To jump multiple steps, hold the CTRL key on your keyboard down while clicking on the arrow button. If you want to move faster, use the arrow keys on your keyboard.

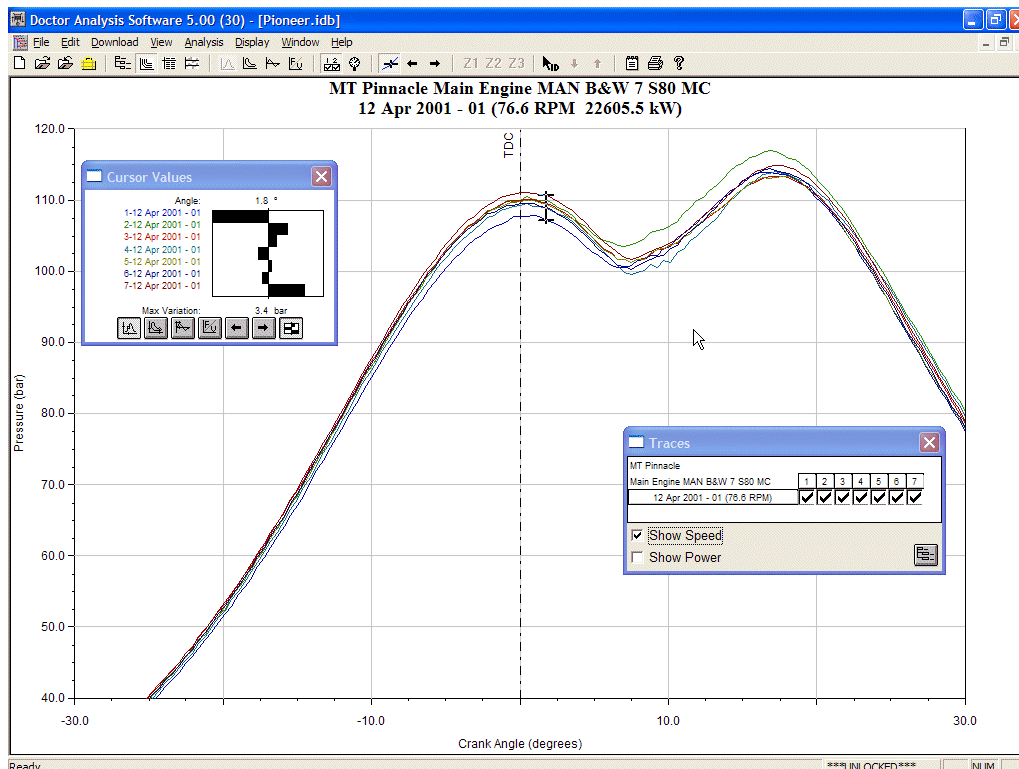
The button on the right lets you change the display in the pop-up box from a bar graph to numerical values.

The pop-up and the cursors can be removed by closing the pop-up box with the X in the top right corner.

### Zooming

It is often useful to magnify part of a graph or set of graphs to see more detail. This is done using the mouse to click and drag a box around the area you want to look at.

Imagine a box around the area you want to enlarge. Point the mouse arrow to one corner of the box, click and hold the left mouse button and drag to the far corner of the imaginary box. A dotted line box will follow your moves. Let go of the left mouse button when you have surrounded the area you want. A zoom screen could look like the one below. The cursor has been left on and moved to the right, its pop-up box moved to a convenient place and a bar-graph of the cursor values is displayed.



**You can always get back to the full size graph by double clicking anywhere in the graph area.**

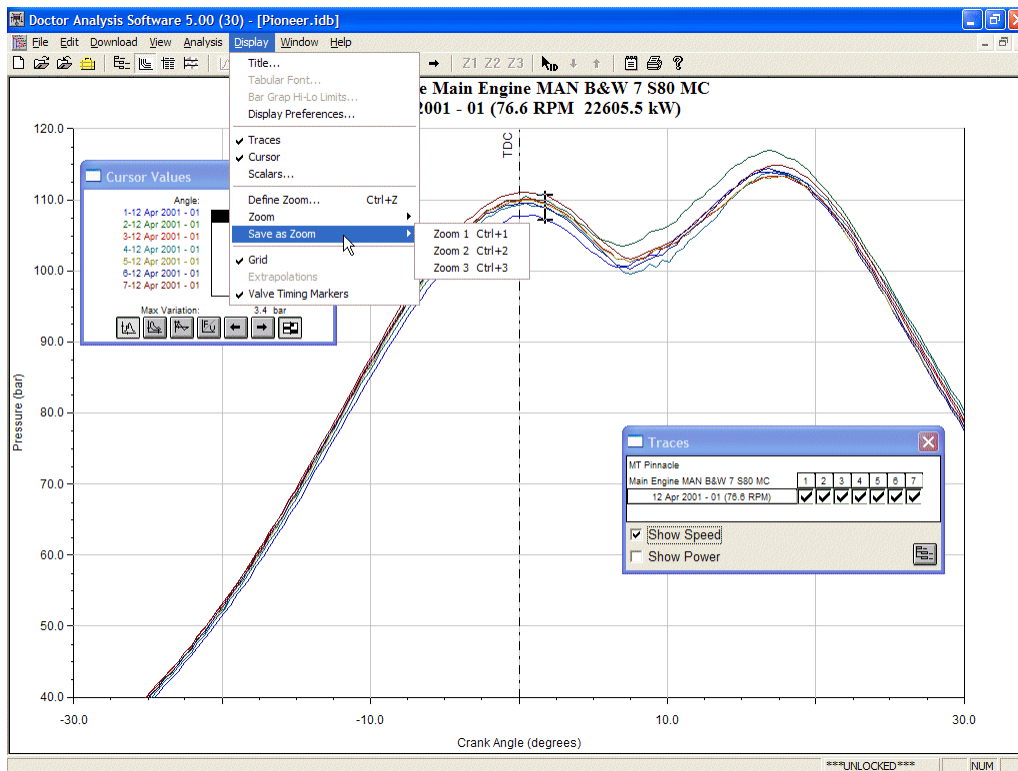
The bar graph shows the relative values of each graph with the low values to the left. In this example, cylinder 6 has the lowest pressure and cylinder 1 the highest. The overall variation is shown as 3.8 bar and the angle of the cursor is  $-2^{\circ}$ . Cursors are a valuable tool in identifying which cylinder is showing a variation. The graphs are coloured and the colours match the test description in the pop-up box. The value (high or low) also helps to identify which graph is which.

### Favourite Zooms

Certain zooms are very useful for analysis and you may want to be able to bring them up quickly. The **Favourite Zooms** **Z1 Z2 Z3** buttons let you do this. First you need to allocate a zoom button and then pressing the button will automatically bring up the chosen zoom. Note that the **Favourite Zooms** can be locked by a password. You may need to enter the password to change stored zooms. See the section on passwords.

## Chapter 3 – Analysis Functions

To allocate the zoom from one you have made by clicking and dragging, select the **View** drop down menu and go the **Save as Zoom** selection and choose **Zoom 1, 2** or **3**. A shortcut is to press **Ctrl 1** on the keyboard for zoom 1 for example. This action will make the zoom button active and pressing the button will zoom automatically.



Zooms can be changed by repeating the above process if you want something else. Zoom values are stored for each engine separately.

For more exact zooming and selecting different axis values for each parameter, select the zoom tool from the **Display** drop down menu under **Define Zoom ...**, or use the shortcut **Ctrl Z** on the keyboard. This brings up the following screen.

The 'Define Zoom' dialog box allows users to set minimum and maximum values for various parameters. The parameters and their current values are:

Parameter	Min	Max
Crank Angle (degrees)	-30	30
Volume (Normalised)	0.42	0.58
Pressure (bar)	40	120
Pressure Derivative (bar/degree)	-2	6
Fuel Pressure (bar)	20	70
Vibration (G)	-0.1	0.5

At the bottom, there are buttons for 'Store as' (Z1, Z2, Z3), 'Clear' (Z1, Z2, Z3), 'Show Axes Limits', 'OK', and 'Cancel'.


Fill in the axis values you want displayed and use the **Store as** buttons to store the zoom. This box also lets you set the limits for each axis and allows zooms to be cleared. Click **OK** when finished.

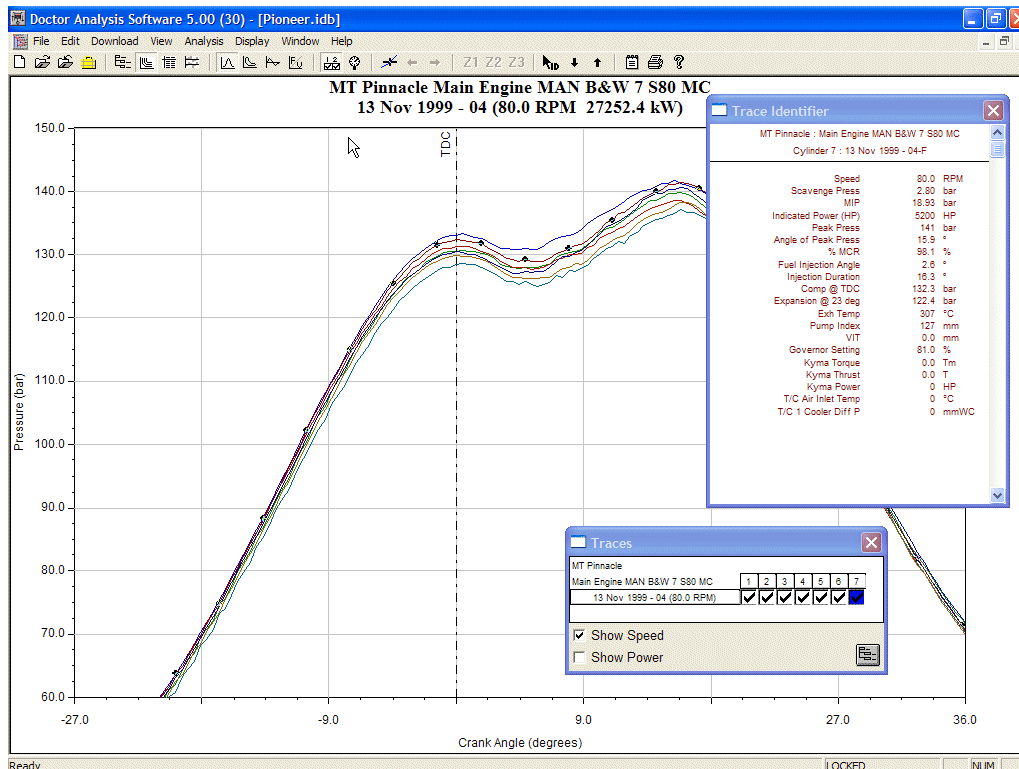


## Chapter 3 – Analysis Functions

### Identifying a Trace

Identifying a trace among a group of traces is made easy with the **Trace ID** function.

This is activated using the  button. Click once on this button and then move the mouse pointer to the graph area. The pointer will have **ID** next to it. Point to the trace you wish to identify and it will be highlighted with dots, and a pop up box will contain the details for that trace. If there are a lot of parameters selected for the trace, you can scroll through them in the pop up using the slider bar at the right hand side. The screen will look like the one below when a trace has been selected.




In the *Traces* box, the trace that has been selected is highlighted in blue.

Another way of using the **ID** function is to click with the right mouse button on one of the tick marks in the *Traces* popup.

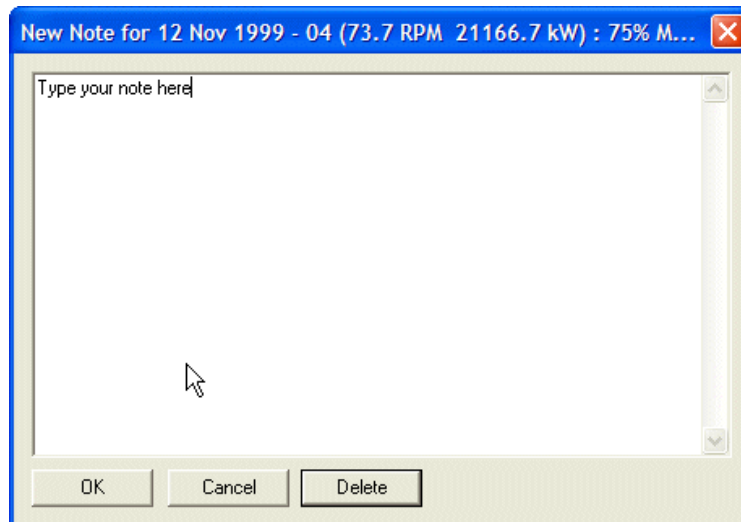
You can move between traces by using the up and down arrows on your keyboard.

### Notebook

The notebook can be accessed by clicking on the  button. The notebook can take notes for tests, engines or for all engines on a ship.

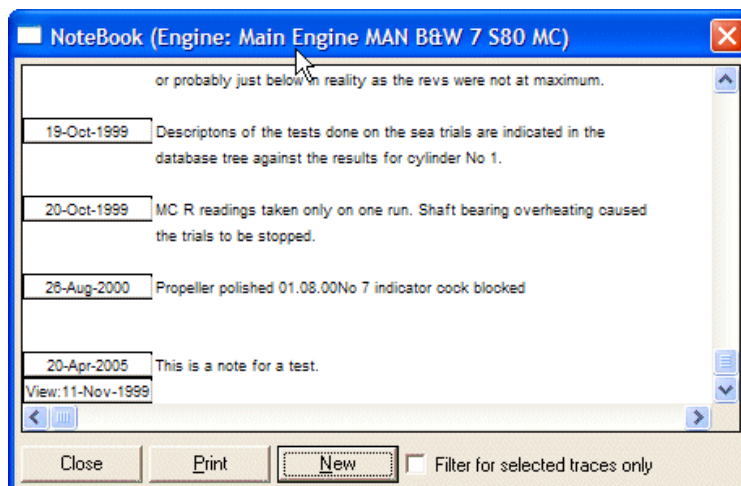
In the database view, if a ship is highlighted, the note made will be specific to the ship (all engines). If an engine is highlighted, the note will be specific to that engine. If a test is highlighted, the note will be specific to that test.

The example below shows a note being entered for a test.



Another way of linking a note to a test is from the *Traces* view. When all cylinders for one test are displayed, click on the **Notes** button and the note will be linked to that test. If multiple tests are displayed, the note will be linked to the engine.

When in the notebook, if a note is linked to a test, you can click on the **View** tab below the note and the traces for that note will be displayed.

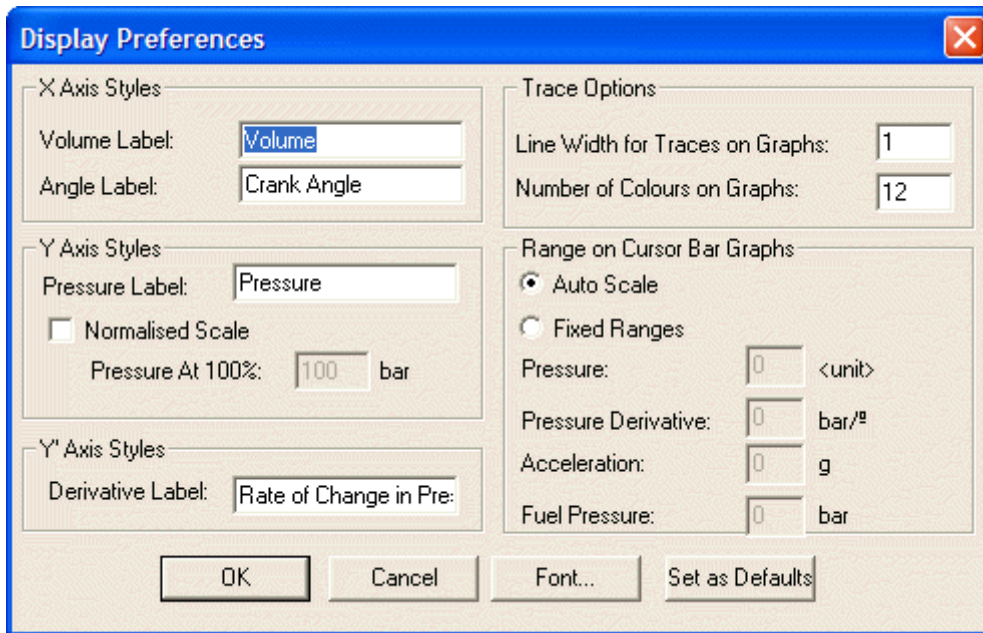


The **Filter for selected traces only** selection will hide notes that are not related to the samples that are available for viewing in the *Traces* window.

Notes may be modified by double clicking on them. This brings up the edit screen with the existing text displayed.

### Display Preferences

You can select some preferred ways to view traces using the pop up box below. Select **Display... Display Preferences** from the drop down menus, or right click on the graph area and select **Display Preferences**.



This pop up allows you to change axis labels in terms of their name and by using the **Font** button, the appearance can be changed by using a different font, colour etc.


The width of the trace lines can be increased, and the number of colours used matched to the number of cylinders on the engine being viewed.

The *Range on Cursor Bar Graphs* area allows entry of fixed ranges. The cursor bar graphs normally auto scale such that the centre line is the mean and the largest deviation cylinder's result will touch one or other side of the bar graph area. In cases where variations are small, this may look like there are large variations and so it is possible to set the scale on these bar graphs to a fixed value. In this way, the mean will still be at the centre, but the bars will only extend as far as the scaled amount.

## 3.6 Tables

The information shown in the graphs is also available in numerical format in the **Tables**.

### Viewing Tables

Tables of results are provided to give numerical information on the tests. To see the table of results for the selected traces, click on the  button in the toolbar. A screen like the one below will be shown.

Doctor Analysis Software 5.00 (30) - [Pioneer.idb]

File Edit Download View Analysis Display Window Help



MT Pinnacle Main Engine MAN B&W 7 S80 MC  
13 Nov 1999 - 04 (80.0 RPM 27252.4 kW)

	Cylinder 1 12 Apr 2001 - 01	Cylinder 2 12 Apr 2001 - 01	Cylinder 3 12 Apr 2001 - 01	Cylinder 4 12 Apr 2001 - 01	Cylinder 5 12 Apr 2001 - 01	Cylinder 6 12 Apr 2001 - 01	Cylinder 7 12 Apr 2001 - 01	Mean	Variation (per cent)	Total
Speed (RPM)	76.9	76.5	76.6	76.5	76.9	76.6	76.4	76.6	0.7	
Scavenge Press (bar)	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	0.0	
MIP (bar)	16.49	16.84	16.26	16.91	16.13	16.21	16.40	16.46	4.8	
Indicated Power (HP) (HP)	4354	4423	4276	4442	4258	4262	4301	4331	4.2	30314.5
Peak Press (bar)	114	117	113	114	113	114	115	114	3.2	
Angle of Peak Press (°)	16.8	16.8	17.6	17.2	17.6	16.8	17.2	17.1	5.2	
% MCR (%)	82.2	83.5	80.7	83.8	80.4	80.4	81.2	81.7	4.2	
Fuel Injection Angle (°)	???	???	???	???	???	???	???	0.0	0.0	
Injection Duration (°)	???	???	???	???	???	???	???	0.0	0.0	
Comp @ TDC (bar)	107.7	110.0	109.9	109.2	109.8	109.4	111.0	109.6	3.0	
Expansion @ 23 deg (bar)	101.9	104.7	103.1	103.9	102.4	102.5	103.9	103.2	2.7	
Exh Temp (°C)	360	346	350	363	357	347	349	353	4.8	

1 of 5

Ready LOCKED NUM

The table gives many of the standard values which are useful in assessing engine condition. Power results have a total, which is useful for single tests on a whole engine. The tests that are shown on the table can be selected in just the same way as for traces.

Click on the  button to bring up the pop-up box that will let you choose the results you want. The different results can be switched on and off as they may not all be required. To do this, click on the button  and the box to the right is shown. The **Move Up** and **Move Down** buttons allow you to change the order of the results.

Click once to turn off an item and once more to switch it on again. Note that you will need the password to activate this function if the “Scalars which are Selected for Display” option has been locked. See section on Passwords.

**Table Values**

1: ☒ Speed

2: ☒ Scavenge Press

3: ☒ MIP

4: ☐ Indicated Power (kW)

5: ☒ Indicated Power (HP)

6: ☐ Indicated Power (PS)

7: ☒ Peak Press

8: ☒ Angle of Peak Press

9: ☐ Press at TDC

10: ☐ Max Rate of Press Rise

Move Up Move Down

User Values... User Angles... Hi-Lo Limits


OK Cancel

### Automatically Calculated Results

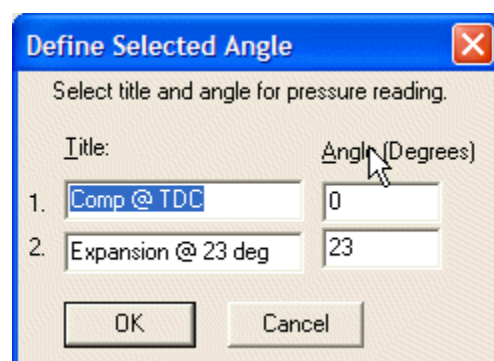
There are 16 standard values and 2 selectable values that can be shown as described in the following table.

Item	Description	Comment
RPM	Engine speed	
Pscav	Scavenge or boost pressure	Manual input at download
MIP	Mean indicated pressure	
Power (kW)	Power in kilowatts	
Power (hp)	Power in horsepower	
Power (ps)	Power in ps – metric horsepower	
Pmax	Peak pressure	
Ang of Pmax	Angle of peak pressure	
Ptdc	Pressure at TDC	
Ang of Ign	Ignition Angle	Shows -999 if not identified correctly. Can be altered manually.
Ign Delay Ang	Delay from spill port closure to ignition	Shows 0.00 if Ang of Ign incorrect.
Max Pr Rise	Highest rate of pressure rise	
Ang of Max Pr Rise	Angle at max pressure rise	
Pow Rel to MCR	Cylinder and engine output as %	Requires indicated MCR to be entered.
Inj Ang	Angle of fuel injection	Fuel pressure traces only.
Inj Duration	Duration of fuel injection	Fuel pressure traces only.
User Angle 1	Pressure at a selected angle	Defaults to TDC if no angle entered.
User Angle 2	Pressure at a selected angle	Defaults to TDC if no angle entered.

### User angles

Click on the  button and from the *Table Values* pop up, select **User Angles....** to see the window opposite.

You can enter 2 angles at which you want to see values in the tables and bar graphs. These can be given a name as in the dialogue box on the right. These are often used to compare compression on engines that fire ahead of TDC and to provide a comparison of the expansion traces at a point well after ignition.



The dialog box is titled "Define Selected Angle" and contains the instruction "Select title and angle for pressure reading." It has two input fields: "Title:" and "Angle (Degrees)". There are two rows of input fields, numbered 1 and 2. Row 1 has "Comp @ TDC" in the title field and "0" in the angle field. Row 2 has "Expansion @ 23 deg" in the title field and "23" in the angle field. There are "OK" and "Cancel" buttons at the bottom.

Row	Title	Angle (Degrees)
1.	Comp @ TDC	0
2.	Expansion @ 23 deg	23

### Manual Data Input

It is possible to enter data into tables manually for items that the Doctor does not measure. A typical example of this would be exhaust gas temperature.

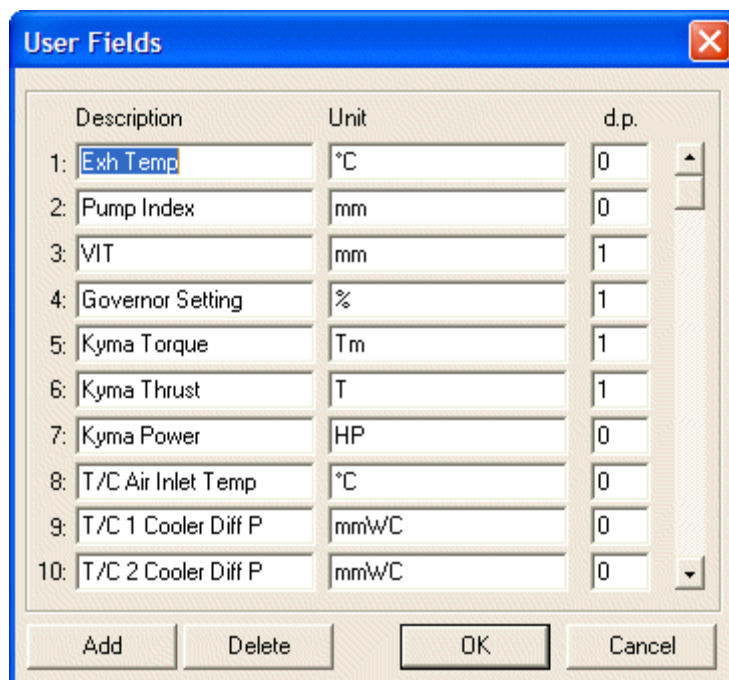
Each user entered parameter can be given a name, unit, and the number of decimal places required for accurate entry.

From the *Table Values* pop up, select **User Values....**

Click on **Add** to enter a new value.

To delete a value, first highlight the description then click on **Delete**.

A large number of user variables are included in all databases created by version 5.10 software or later. Several of these are selected by default, including Texh, Turbo (RPM) and Rack.



The 'User Fields' dialog box contains a table with the following data:

	Description	Unit	d.p.
1:	Exh Temp	°C	0
2:	Pump Index	mm	0
3:	VIT	mm	1
4:	Governor Setting	%	1
5:	Kyma Torque	Tm	1
6:	Kyma Thrust	T	1
7:	Kyma Power	HP	0
8:	T/C Air Inlet Temp	°C	0
9:	T/C 1 Cooler Diff P	mm/W/C	0
10:	T/C 2 Cooler Diff P	mm/W/C	0

At the bottom of the dialog are four buttons: Add, Delete, OK, and Cancel.

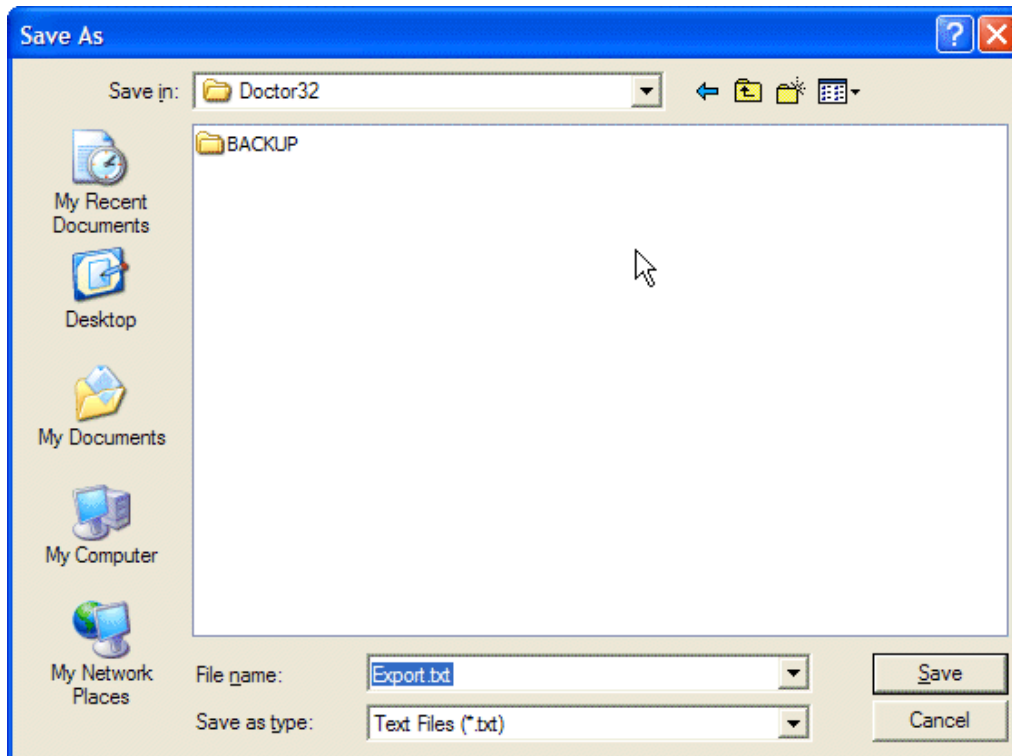
### Exporting Tables

***This is for special use only to allow tabular data to be used by other applications. Do not use this for regular transferring of results for review or correction. Please see Archiving and Sending Data.***

A table of results may be exported as a text delimited file. To do this, right click on a table of results and select **Export**. In the pop up that will appear, choose the destination for the file and give it a name. The default is Export.txt, but any name may be entered.

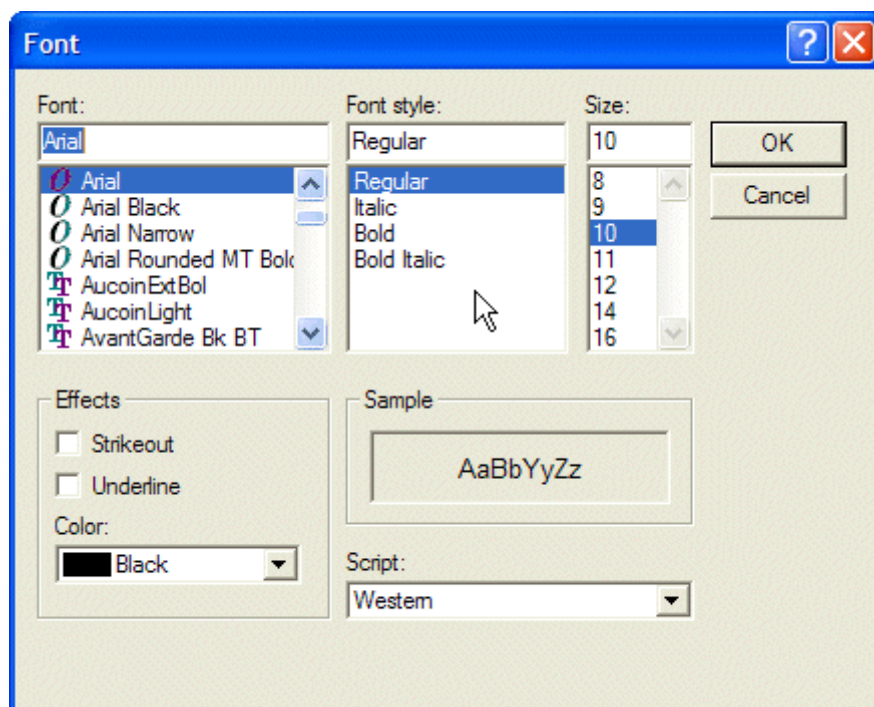
The resulting file is comma and tab delimited and is easily opened up with programs such as Microsoft Excel. These files are not able to be opened by Doctor software.






### Table Fonts

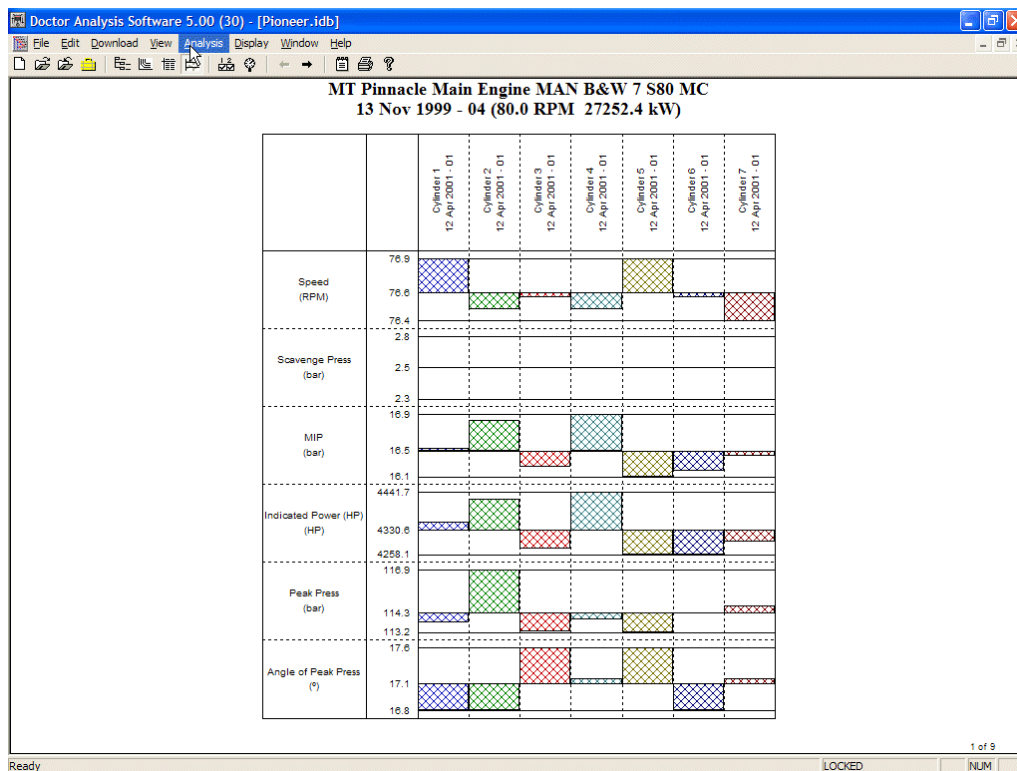
To change the fonts used in your tables, right click on a table and select **Tabular Font**. This selection is also available from the **Display....** drop down menu. The following dialogue box allows changes to be made to the way tables are presented.



### 3.7 Bar Graphs

The information from tests is available as bar graphs. These allow very fast identification of the results that differ from the average. To view bar graphs of results, click on the  button.

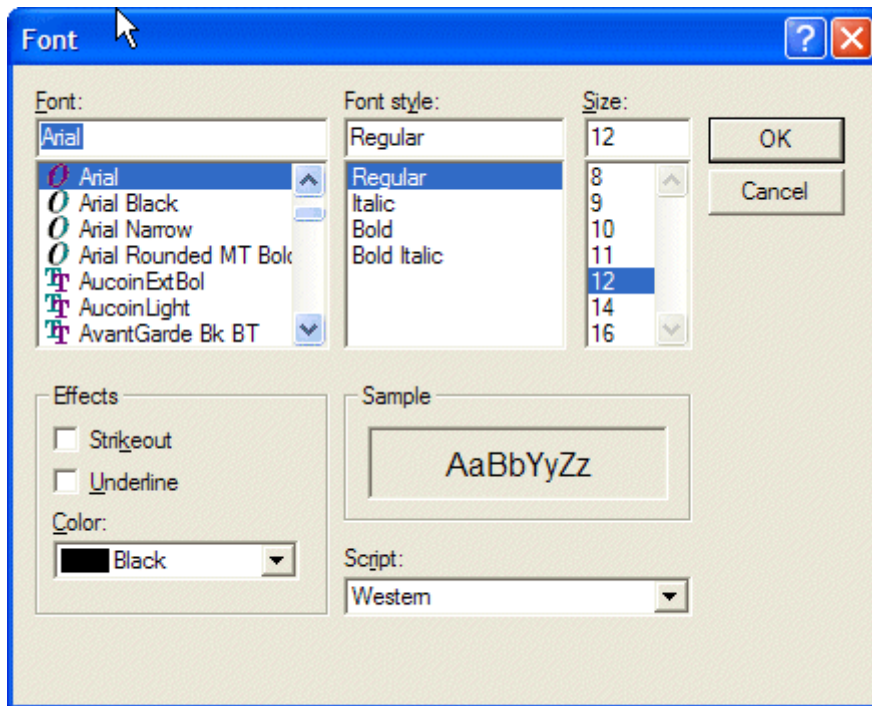
Bar graphs are shown as the top of a conventional bar graph with a line drawn through the mean value for the parameter. This saves space as the lower part of a bar graph contains little real information and this allows a large number of results to be shown on a single screen.



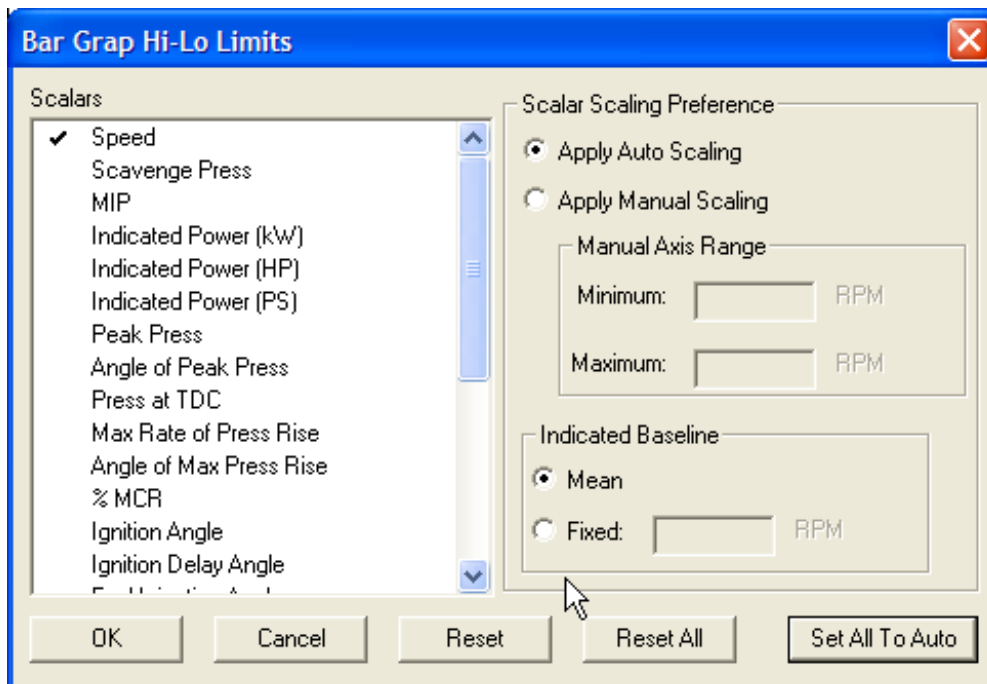


## Chapter 3 – Analysis Functions

The appearance of the bar graphs may be changed by right clicking on the bar graph and selecting **Bar Graph Fonts....** This selection is also available from the **Display....** drop down menu.



The bar graphs may be adjusted to scale automatically, or scales may be imposed on them. To access the pop up that this is done from, right click on a bar graph and select **Bar Graph Hi Lo Limits.** This selection is also available from the **Display....** drop down menu.



## Chapter 3 – Analysis Functions

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The **Set All To Auto** button is useful if you are not sure what ranges have been set for some of the parameters. It is also useful for databases converted from earlier formats where limits have been set that are no longer required.

# CHAPTER 4 - Database Functions

The database used for the Doctor analysis software is Microsoft Access. The file extension that has been used for Doctor files is .IDB (short for Icon DataBase).

By using a standard database, many functions become available to users. It is even possible to use Access to look at the raw data within a Doctor database. Note that settings in a database should not be altered in Access. Any changes made in Access may result in an error when the database is next opened by the Doctor software.

Once the program is installed on a PC, double clicking on a file with an IDB extension will automatically open the file in the Doctor program providing the file is a valid Doctor database.

## 4.1 Data Sources

Doctor data can be accessed from a number of sources. These are described below.

### New Data

Downloading from a Doctor portable or installed instrument will provide new data. The section on Downloading Data describes how this is done.

### Existing Version 5 Databases

Databases may be opened using the method described in the Analysis section.

Alternatively, from Explorer, or from My Computer, you can double click on the file name for the database you want to open.

### Version 5 Archives

Archives from Doctor Version 5 are databases in their own right and can be opened up in the same way as a database. This is very convenient when receiving an archive by Email, as it can easily be checked by double clicking on it before it is integrated into the main database.

### Pre-version 5 databases

Version 5 analysis software can import data from earlier versions of the Doctor program. This will work for databases created in version 3.X software and above. For earlier versions of the software, first use version 3.29 software to convert the data to a format that Version 5 can convert.

Due to the way in which engine details were entered in pre-version 4 databases, the engine details will be incomplete in that the fields for Bore, Stroke and Con Rod Length will show as zero. This does not affect the results and the ability to download new data into the database. New databases made from version 4 databases will have all these fields filled in correctly.

**Note:** Pre-Version 4 databases will require Bore, Stroke and Con Rod Length to be entered correctly in **Engine Details**. If this is not done, any new data downloaded from a Doctor instrument will be invalid. Any re-calculation on old data will require correct entry of the full engine details to give correct results.

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## Chapter 4 – Database Functions

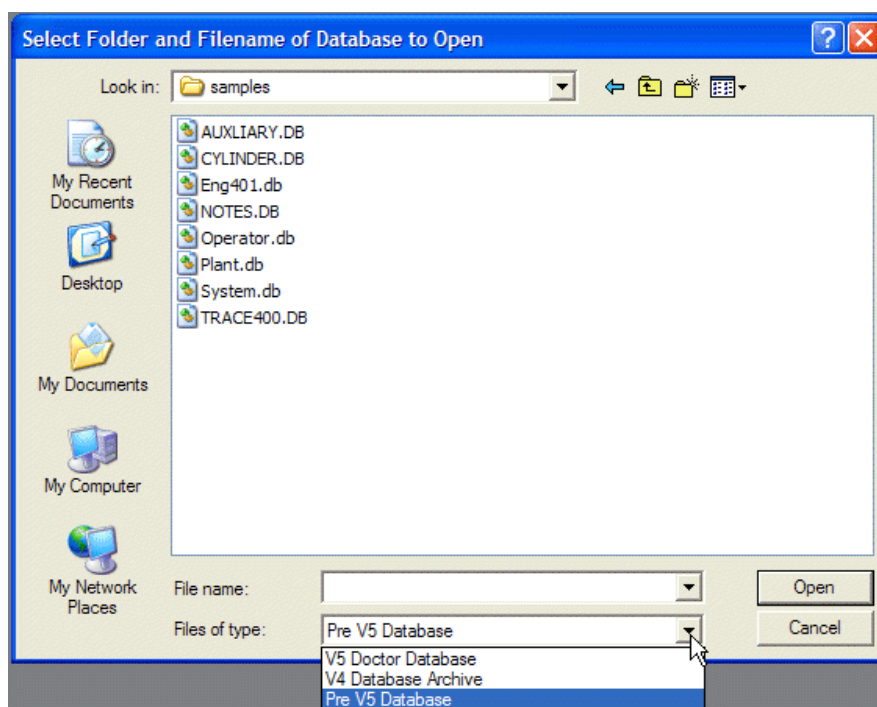
When a database is converted, the integrity of the results is checked. If there are problems with any of the results, the converter will attempt to fix these. If repair is not possible, the faulty results will be omitted from the new database. A report that itemises any anomalies is produced and can be viewed at the time of the database update, or at any later time.

**Note for operation over a network:** The upgrade process requires previous versions of the Doctor database code to run. All restrictions that applied to versions 4.21 and earlier will apply. It is strongly recommended that the data that is to be converted is first moved to the local drive before conversion. To convert files without first moving them to the local machine, the drive must be mapped to the target machine. File names must be kept to 8 letters or less.

### Steps To Open A Pre-Version 5 Database

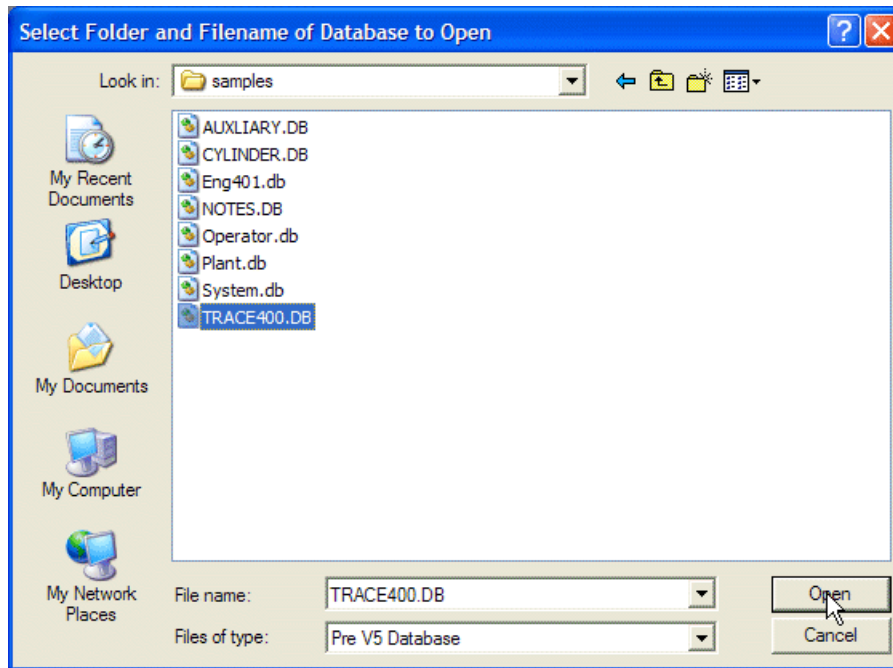
Click on the  **Open Database** button.

Navigate to the folder that contains the database you wish to convert. At the bottom of this window, select Pre V5 Database. The files in the database will then become visible as in the picture below.



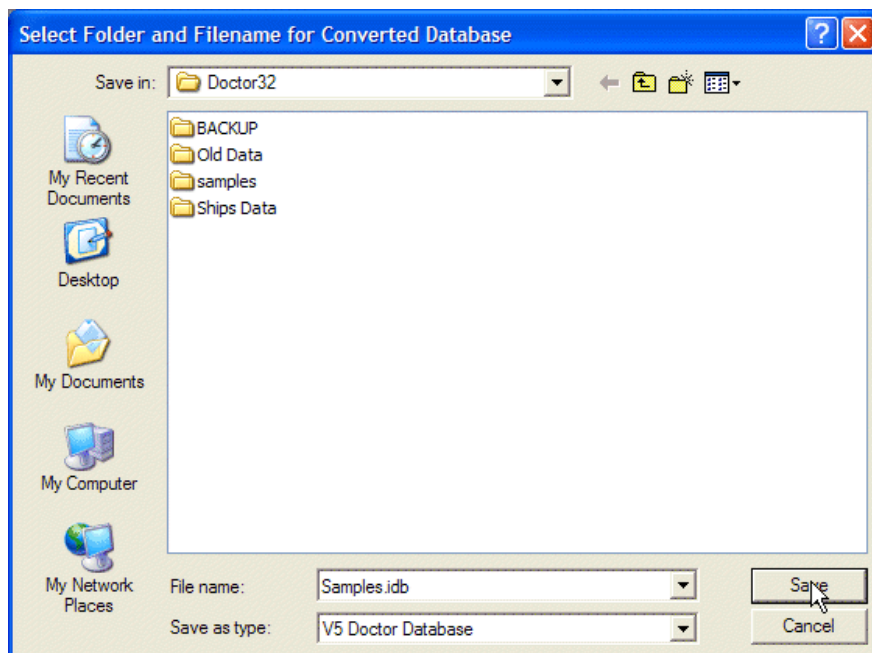
Highlight any of the files that are visible, and click on **Open**.

## Chapter 4 – Database Functions



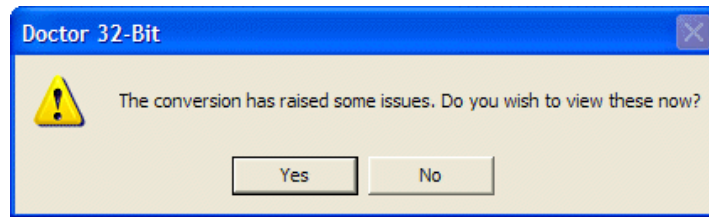
The next window requires you to select the destination for the new database that will be created. Note that the new database has already been named for you. The name it is given is the same as the name of the folder that contained your old database.

The default destination for your new database is the same as the folder above the one that contained your old database. You can choose a different location if you wish.



Alter the name and destination if you wish and click **Save**. Your new database will be created.

During conversion, data is checked for any errors and if any are found you will be advised. Errors will normally be corrected, or the data with problems will be omitted from the new database. If errors are found, the following message appears:



If you choose to view the message, it will indicate the problems found. The message is saved in any case for viewing at a later date.

Your new database will now be open and ready for use.

### Version 4 Archives

Data can be imported from archives created in version 4 of the Doctor.

When a Version 4 archive is converted, the integrity of the results is checked. If there are problems with any of the results, the converter will attempt to fix these. If repair is not possible, the faulty results will be omitted from the new database. A report that itemises any anomalies is produced and can be viewed at the time of the database update, or at any later time.

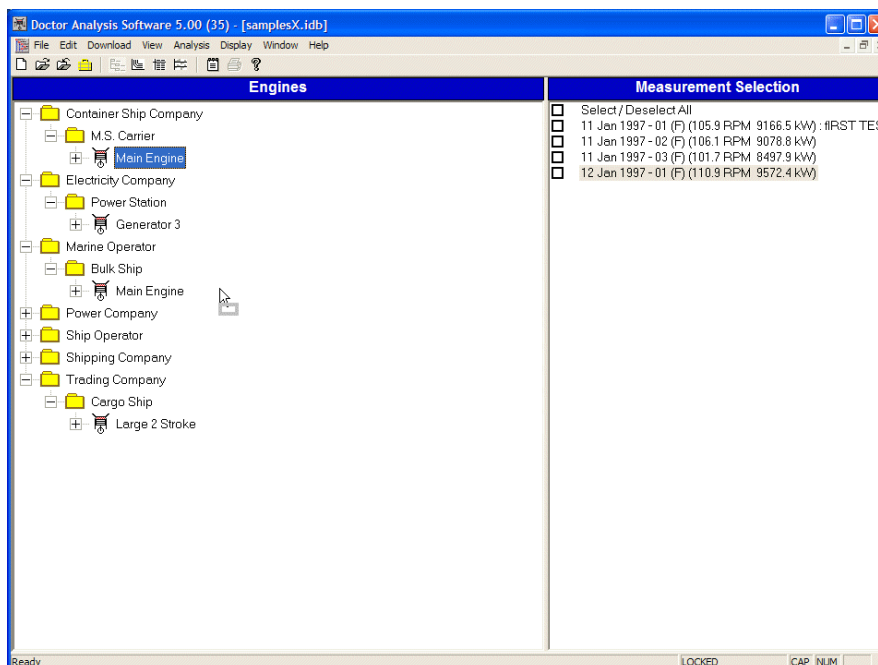
**Note for operation over a network:** If the file to be upgraded (source file) is on another machine, the drive must be mapped to the target machine. File names must be kept to 8 letters or less.

### 4.2 Moving Data

Tests, Engines and Ships may be moved within a database that has multiple operators in it. Click on the item you want to move and hold down the left button on your mouse, then drag to the location where you want to move to. When you release the mouse button, the item will be moved.

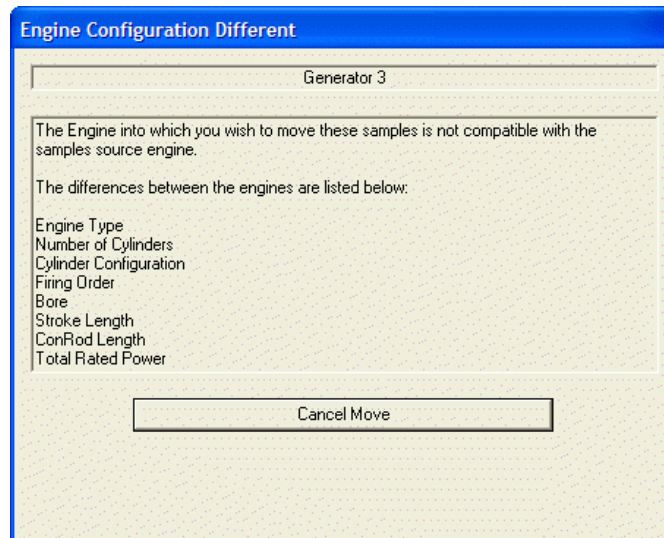
While the item is being dragged, a grey box next to your mouse pointer will indicate that the target location is valid, and a circle with a diagonal line through it indicates that the location being pointed at is not a valid location for the item.

If a Test is moved, this needs to have its hierarchy moved with it. In other words, if you move a Test from one Ship to another, the second Ship will then contain a duplicate of the Engine the Test came from. If it is moved to another Operator, a duplicate ship and engine are inserted into the new Operator. The original Operator will still have the Ship and Engine, but the Test that was moved will now only exist in the new location.



If you try moving a test into another engine, if the engine does not have identical geometry, the move will not be possible. A message that informs you of the differences will be displayed, and the only option is to cancel the move.

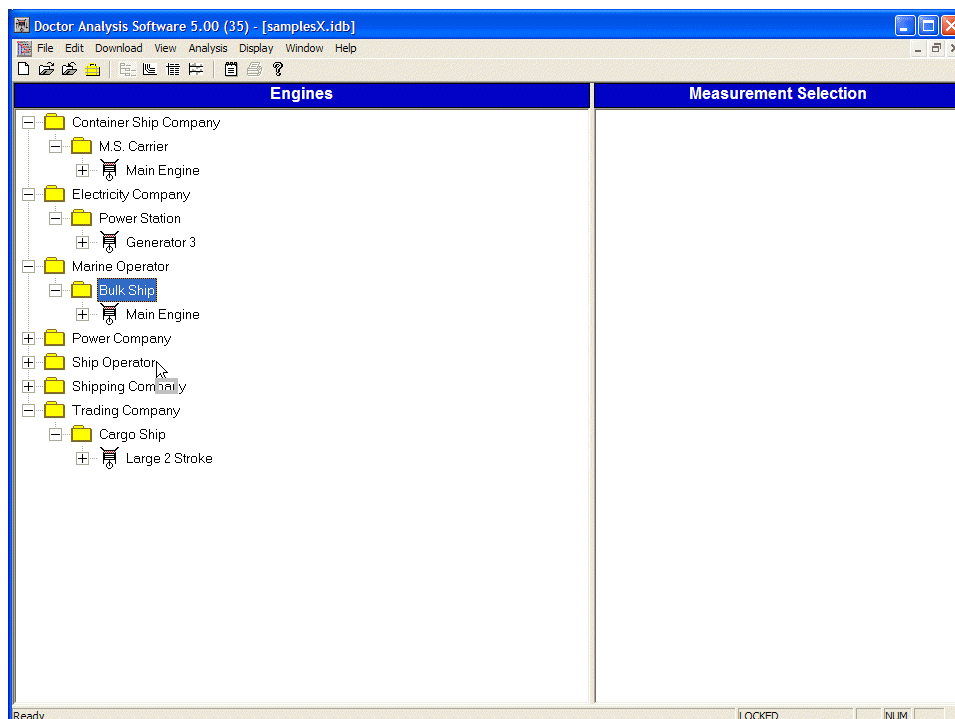
## Chapter 4 – Database Functions



In the example above, the target engine is different in several respects, and the move is not allowed.

If an Engine is moved, it will be transferred to the new Ship (and new Operator if the target is another Operator) along with all its Tests and it will cease to exist in the original Operator.

If a Ship is moved to another Operator, all its Engines and Tests are moved with it and it is removed from the original Operator. This is probably the most useful move as ships are often bought and sold.

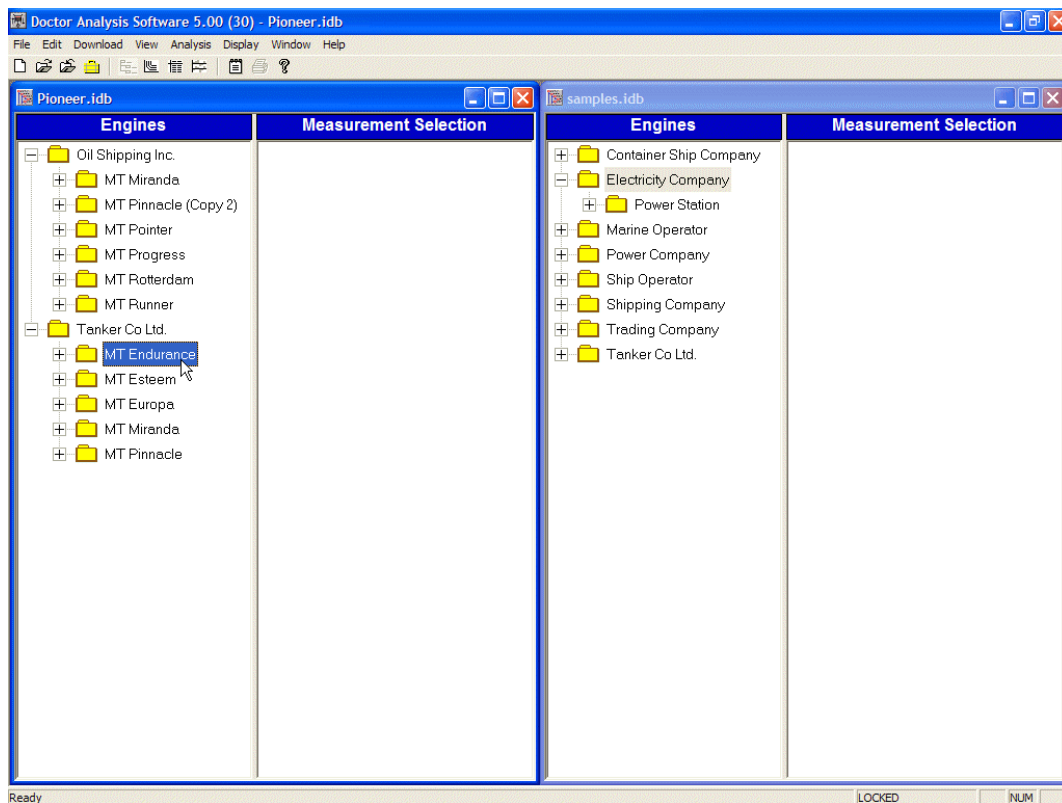


As an alternative to clicking and dragging, the same operation may be initiated through the **Edit** drop down menu, or the option will appear in a pop up if you right click on an Operator, Ship, Engine or Test.



### 4.3 Copying Data

Tests, Engines and Ships may be copied between databases. First, you need to have 2 databases open at the same time. Once you have opened multiple databases, (2 or more), use the **Window.... Tile** selection from the drop down menus and the screen will look something like this.



Use click and drag to copy between the databases.

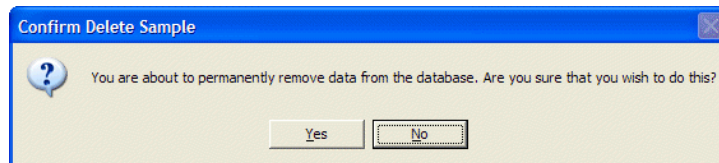
If a test is copied, its higher levels will be created in the target database. For example, if a test is copied to another Operator, the Ship and Engine will be created under that operator. If you point to a blank area in the target database, the Operator, Ship and Engine will be created along with the Test you wanted to copy.

As an alternative to clicking and dragging, the same operation may be initiated through the **Edit** drop down menu, or the option will appear in a pop up if you right click on an Operator, Ship, Engine or Test.

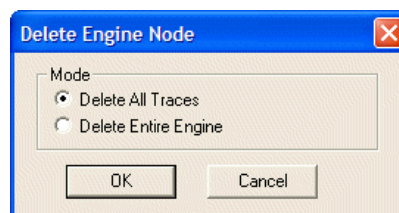
### 4.4 Deleting Data

Data may be deleted at any level in a database. Highlight the item you want to delete, and then select **Edit... Delete**. Depending on your selection the following will appear

#### Delete Sample

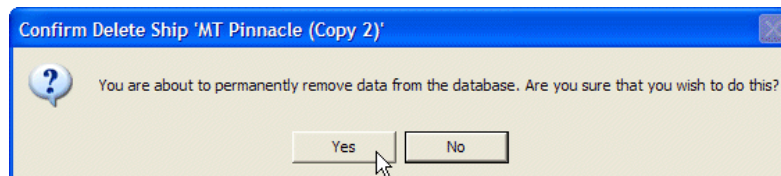


#### Delete Engine

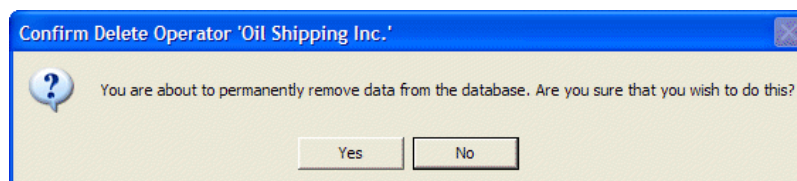


Here it is possible just to delete the Tests, or to delete the Engine with its results. It is often useful to be able to create an empty Engine if making a new database. The Engine could be copied from another Ship into the new database and then emptied of results.

#### Delete Ship



#### Delete Operator



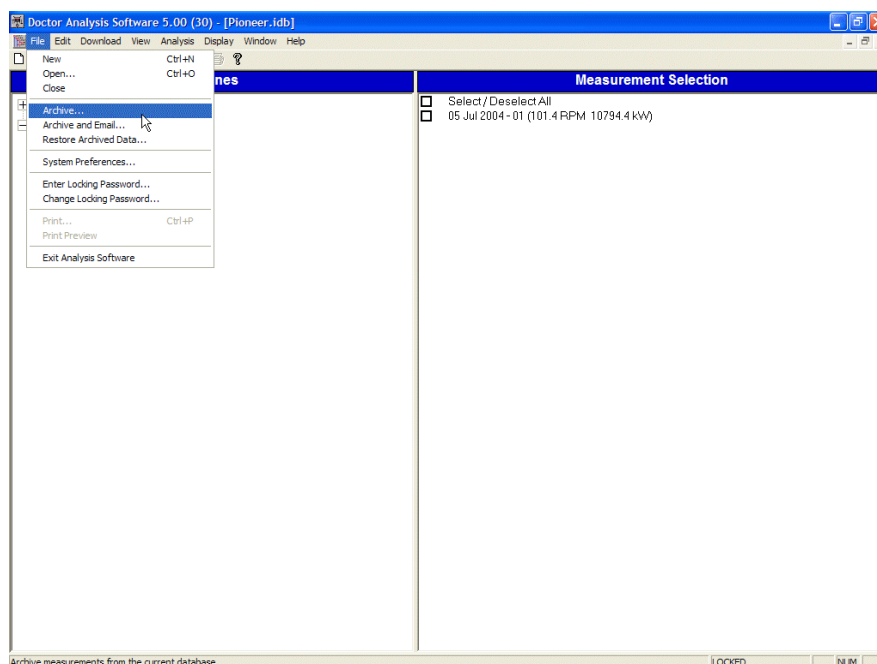
### 4.5 Archiving and Sending Data

Data may be needed by several people in an organisation. Ships often send results to the head office so that the Superintendent can see engine performance data.

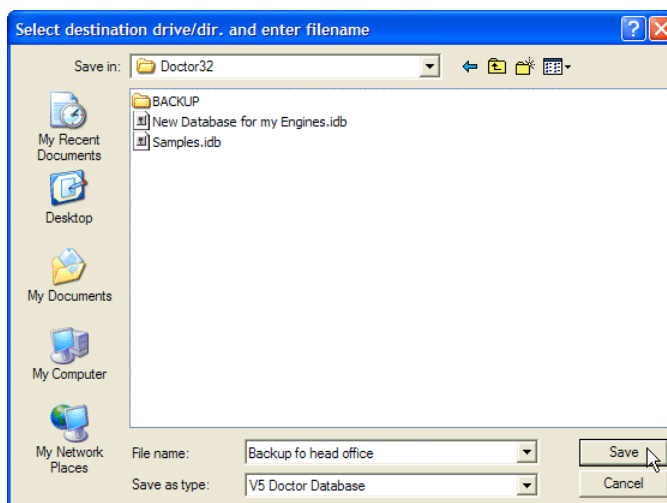
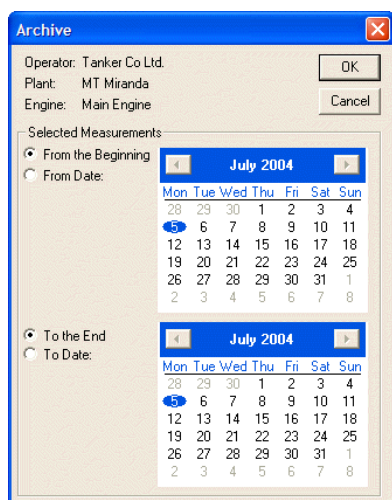
#### Archiving

*This is the way results are sent for correction and for review.*

Highlight a test or the engine to archive all the results for that engine, or highlight the ship to archive all engines. Click on the **File.... Archive** command from the drop down menus.



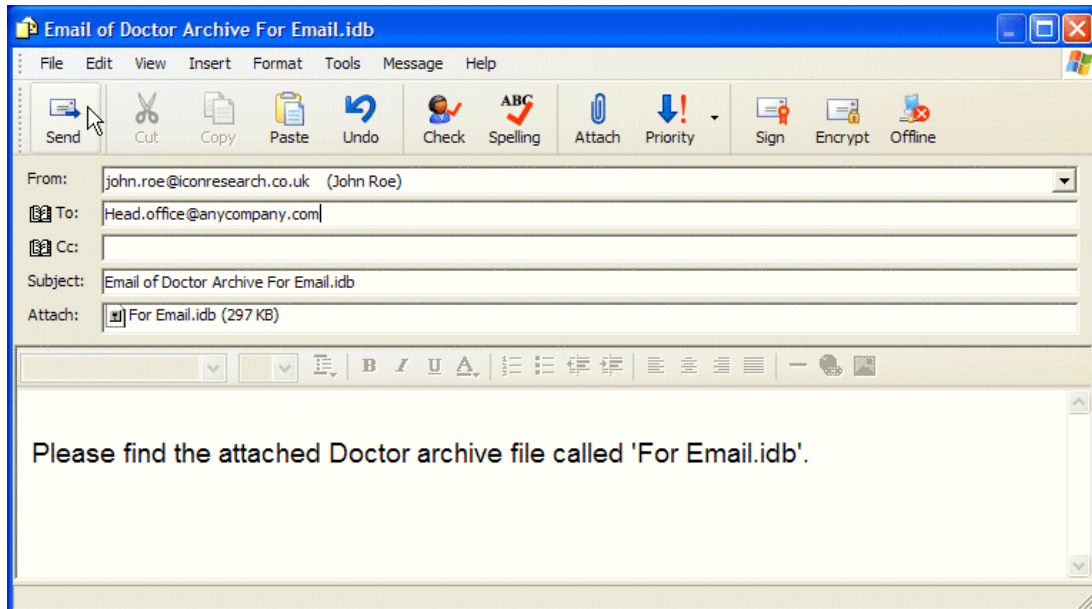
The following window will appear. Select the date range for your archive and click **OK**. The next Window allows you to choose the destination for the file and to name it.



Click **Save** and your archive is completed.

### Archiving and Emailing

If you wish to send the archive by Email, start by clicking on **File... Archive and Email**. The same process is repeated, but when **Save** is clicked, you will get the following screen.



If you use Outlook or Outlook Express, your normal address book will be available for selection of the recipient, or this can be filled in manually. Click on **Send**, and the next time you use your Email program, the message will be ready in your out-box for sending.

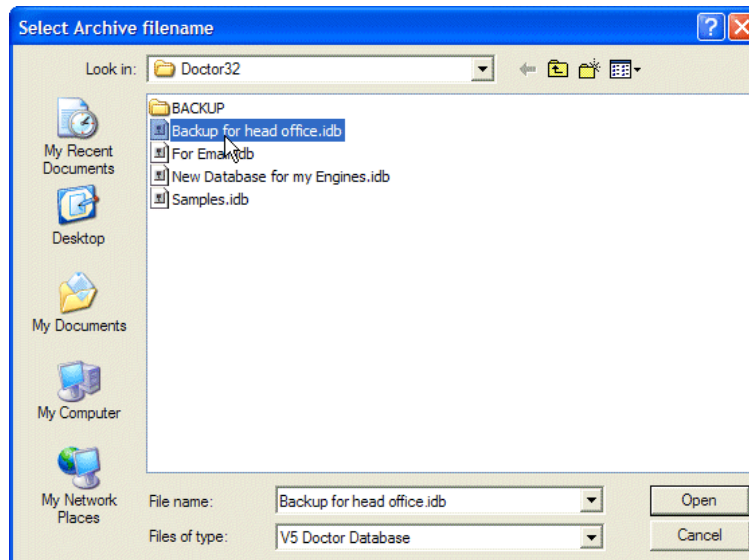
### Restoring

Archive files are databases in their own right and can be opened by double clicking on the file when it is received, provided the Doctor program has been installed.

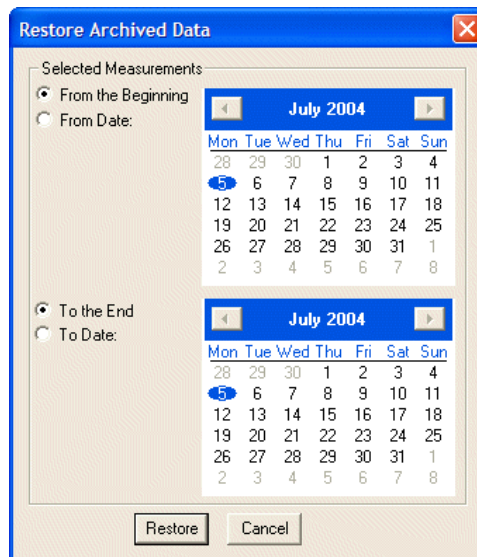
To keep data together, an archive file may be restored into an existing database. This procedure is used widely to keep a full record of ship's performance at a head office. Each month, the archive of the latest data is sent from the ship and restored into the database at the head office.

Open the target database, and then click on **File... Restore Archived Data** command.

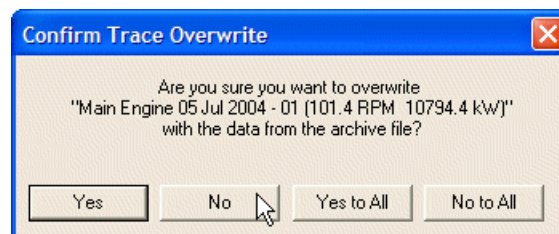
## Chapter 4 – Database Functions



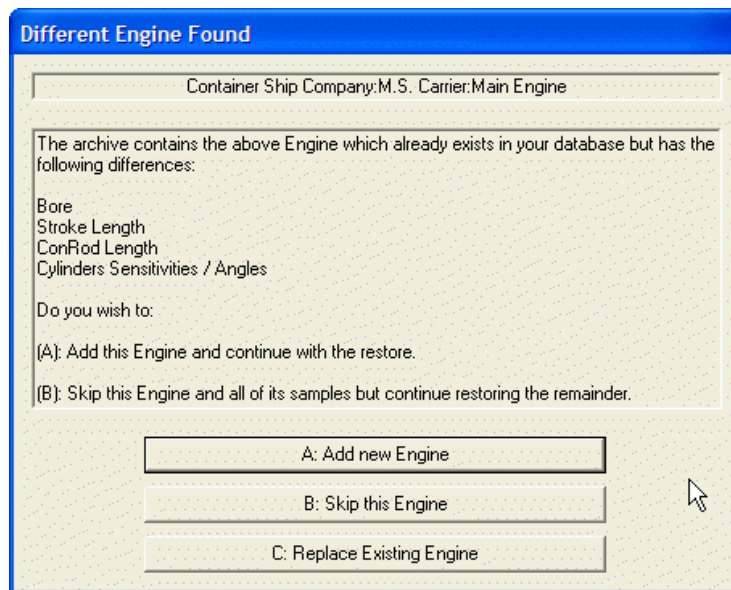
Select the location and the file you want to restore. Click on the file to select it then click on **Open**.



Select the dates you want to restore and click on **Restore**. The data will be added to your database. If there is duplicate data in the archive, the following message will be seen. You can choose whether to overwrite or not.



If engine details have been changed, either in the source database for an archive, or in the target database, a message will be shown, advising of the differences between the databases. Differences can occur if TDC position had been adjusted, or if any engine parameter such as Bore, Stroke, etc. has been altered. The changes may or may not be valid, and so choices are given as shown below.



In the above example, there are several differences between the engine in the target database and the engine in the archive. There are three choices given.

Button **A** will add a new engine to your database. This will be labelled Copy2 to differentiate it from the engine that is already there.

Button **B** will not copy anything for the engine that has differences. If there are other engines in the archive it will proceed to restore them. If they too have differences, the same procedure will be applied to allow you to choose what happens to the data in the archive.

Button **C** will update the engine details in the target database to match the details in the archive.

In the case where the engine details are updated, it is possible to update all results for that engine to match the revised engine details. See the section on Recalculation below.

### 4.6 Combining Databases

A simple way to combine databases is to have your master database open and the archive file available on your desktop. Make the master database window small enough so that you can see the icon for your archive database on the desktop. Then click and drag the archive file into your master database. The correct ship and engine(s) will automatically be located for your results.

If there are any differences in the archive engine details and your master database engine details, a message will let you what the differences are (see previous page).

The restore function provides another method by which databases can be combined. See the section on restoring above.

### 4.7 Splitting Up Databases

To split up a database, use the **File... Archive** command to create an archive of part of your database. you will then have the same data in the new archive file (which is a database in its own right) and in the original file. To finish splitting up the data, it is then necessary to delete the data in the original database. See the section on deleting for details.



### 4.8 Altering Data (Recalculation)

If mistakes have been made in the engine details when setting up a database, it is possible to retrospectively correct the data. First, double click on the engine you need to alter to get the **Engine Details** window.

**Note** that for databases that have been converted from **Pre-version 4 Doctor Databases**, this procedure will have to be followed to enter the Bore, Stroke and Con-Rod Length for the engine(s).

Engine Data (MT Pinnacle (Copy 2))

General Information

Engine Name: Main Engine MAN B&W 7 S80 MC

Engine Type: ☒ 2 Stroke ☐ 4 Stroke

Bore: 800 mm

Stroke: 3056 mm

Con Rod Length: 3504 mm

Number of Cylinders: 7

Maximum Rated Indicated Power: 27658 kW

Firing Order... Valve Timing... Transducer Sensitivities...

Table Fields... Fuel/Vib Parameters... Trigger Parameters...

V Configuration Information

Angle Between Cylinder Banks: 45 degrees

Engine Rotation: From A bank towards B bank

Cylinder Numbering Format: Sequential (1, 2, etc)

OK Cancel

It is possible to adjust most of the parameters, however the type of engine, number of cylinders and whether V or in-line cannot be corrected. Changing the firing order will be effective for future readings, but will not be re-calculated for existing readings. All other parameters may be changed. Highlight the tests to be recalculated and use **Edit... Recalculate Sample** to make the adjustment. The following message will appear, click on **OK** if you want to go ahead.

Doctor 32-Bit

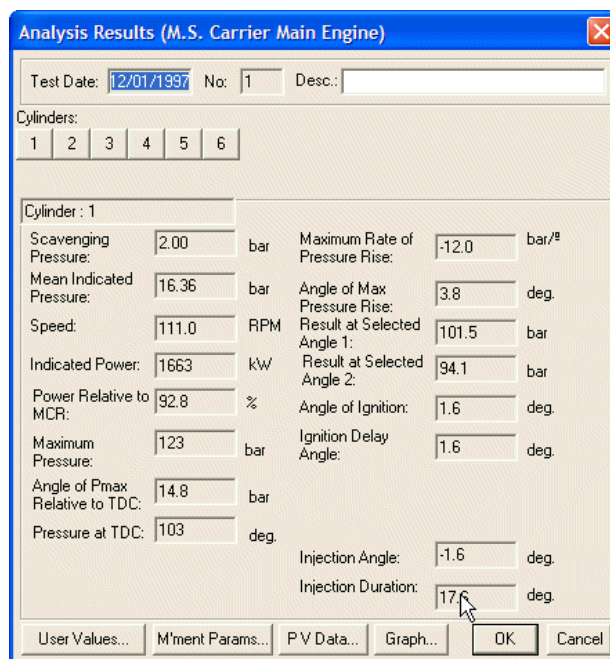
Recalculation may effect the values of the Scalars relating to the samples.

OK Cancel



### 4.9 Editing a Sample

Samples may have a description added to them and a number of other options are available through the same route. Highlight the test to be edited and use **Edit... Edit Sample**. The following window will appear.



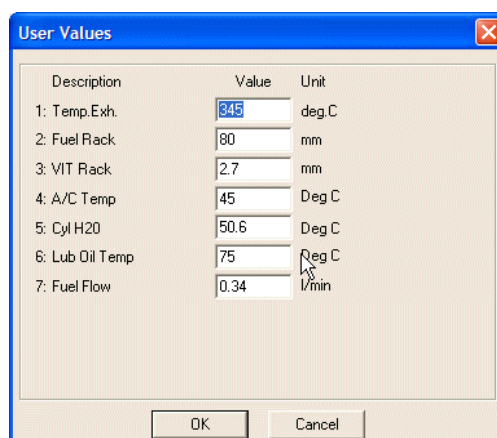
The 'Analysis Results (M.S. Carrier Main Engine)' window displays test data for a specific engine. It includes fields for Test Date, No., and Desc. Below these are buttons for Cylinders (1-6). The main section shows data for Cylinder 1, with fields for Scavenging Pressure, Mean Indicated Pressure, Speed, Indicated Power, Power Relative to MCR, Maximum Pressure, Angle of Pmax Relative to TDC, Pressure at TDC, Maximum Rate of Pressure Rise, Angle of Max Pressure Rise, Result at Selected Angle 1, Result at Selected Angle 2, Angle of Ignition, Ignition Delay Angle, Injection Angle, and Injection Duration. At the bottom are buttons for User Values..., M'ment Params..., P V Data..., Graph..., OK, and Cancel.

Field	Value	Unit
Test Date	12/01/1997	
No.	1	
Desc.		
Cylinders	1 2 3 4 5 6	
Cylinder	1	
Scavenging Pressure	2.00	bar
Mean Indicated Pressure	16.36	bar
Speed	111.0	RPM
Indicated Power	1663	kW
Power Relative to MCR	92.8	%
Maximum Pressure	123	bar
Angle of Pmax Relative to TDC	14.8	deg.
Pressure at TDC	103	deg.
Maximum Rate of Pressure Rise	-12.0	bar/s
Angle of Max Pressure Rise	3.8	deg.
Result at Selected Angle 1	101.5	bar
Result at Selected Angle 2	94.1	bar
Angle of Ignition	1.6	deg.
Ignition Delay Angle	1.6	deg.
Injection Angle	-1.6	deg.
Injection Duration	17.6	deg.

In the **Desc** box, a description for the test may be inserted. This will appear next to the test in the database tree.

The selection buttons for **Cylinders** allow the data for each cylinder to be displayed in turn.

The **User Values** button will display the user entered data for the selected cylinder.



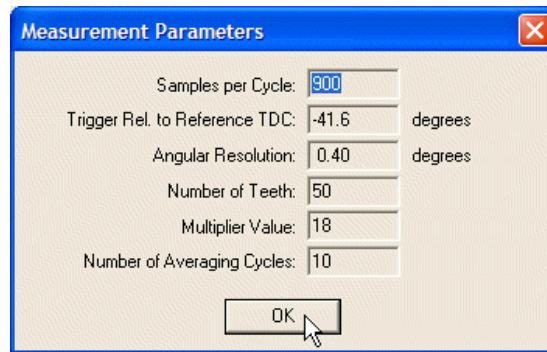
The 'User Values' window displays a table of user-entered data for the selected cylinder. The table has three columns: Description, Value, and Unit. The data is as follows:

Description	Value	Unit
1: Temp.Exh.	345	deg.C
2: Fuel Rack	80	mm
3: VIT Rack	2.7	mm
4: A/C Temp	45	Deg C
5: Cyl H2O	50.6	Deg C
6: Lub Oil Temp	75	Deg C
7: Fuel Flow	0.34	l/min

The **Measurement Parameters** button will display the raw pressure, angle and volume values for the selected cylinder. These may be copied and pasted into another program such as Excel.

## Chapter 4 – Database Functions

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The **Graph** button will switch the display to the traces screen with the graph of the selected cylinder displayed.

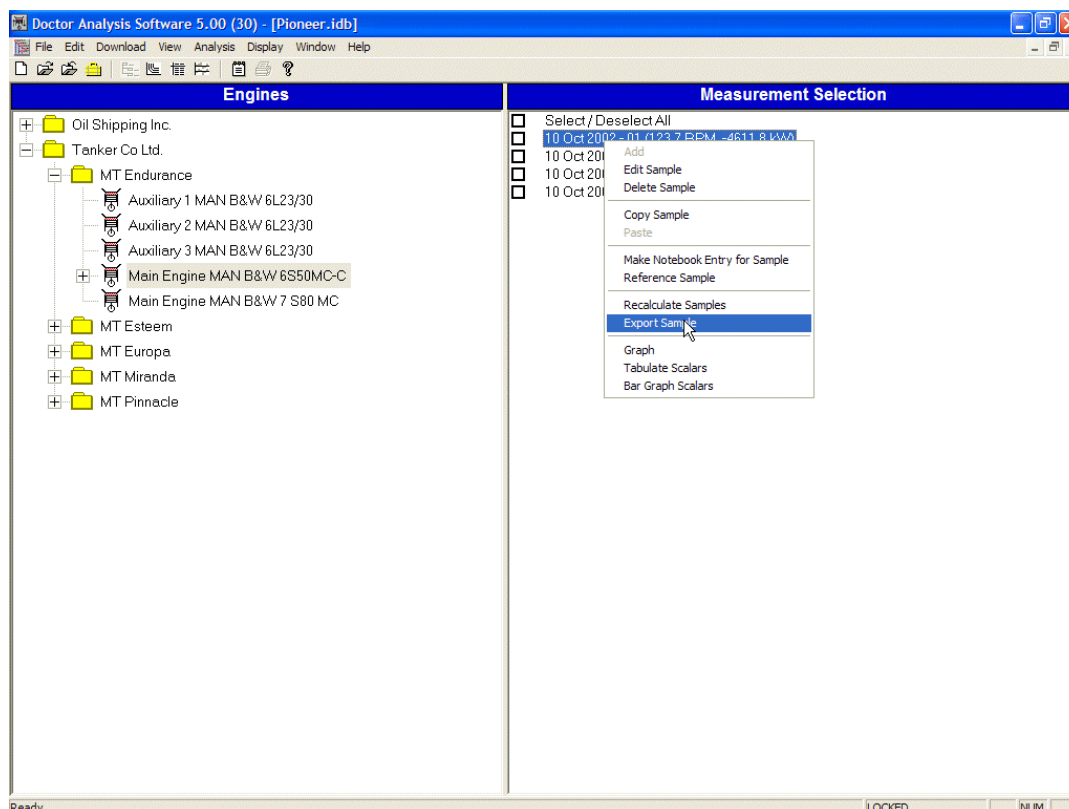
The **OK** button exits this window

The **Cancel** button will exit the window and ignore any changes that have been made.

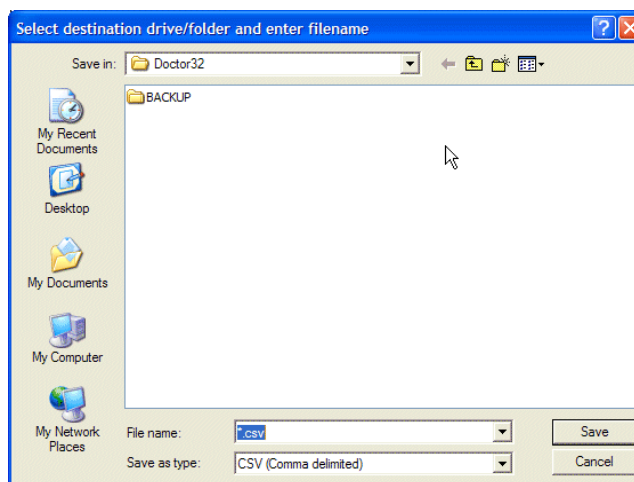
### 4.10 Exporting

***This is for special use only to allow raw data to be used by other applications. Do not use this for regular transferring of results for review or correction. Please see Archiving and Sending Data.***

Data may be exported to other software programs for special purposes. The data is saved in a comma delimited format suitable for opening in a wide variety of packages. Select the test you want to export and right click on it.



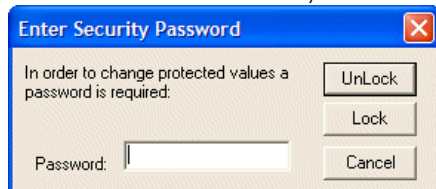
Click on **Export Sample** and the following window lets you choose a location and a name for your exported data. This data includes all the raw pressure, angle and % volume data for all the cylinders in the test.



### 4.11 Password Protection

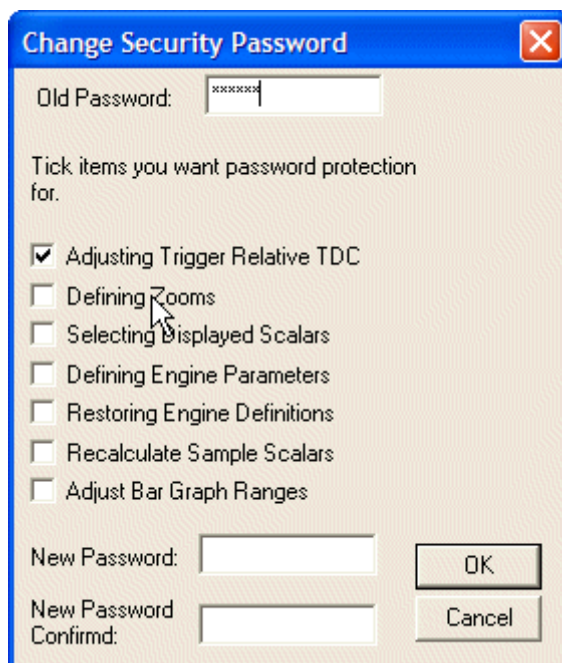
A password is set by default to lock up the TDC offset correction tool. The default password is “**doctor**” in lower case letters.

If a password locked function is selected, the following message appears.



Enter the password and you will be able to continue.

It is possible to apply password protection to a number of areas of the program. To do this, use the **File... Change Password** selection from the drop down menus.



This window also allows the password to be changed. Passwords are stored in the database in an encrypted format, so archives and copies of databases will have password protection as set up by the last user.

On new databases after version 5.10, password protection is applied to all items apart from *Defining Zooms* and *Selecting Displayed Scalars*.



# CHAPTER 5 - Report Generator

## 5.1 Overview

Reports on paper are often useful for sharing information gathered by the Doctor system. A report consists of the following:

- A summary section. If the diagnostic capability has been purchased, the summary page or pages will include diagnostics and optional status indicators.
- A trace of the Pressure versus Angle and Pressure versus Volume traces for the entire engine
- A trace of a zoom on the Pressure versus Angle traces around TDC, with the Derivative traces overlaid. For V engines, one of these is produced for each bank.
- The Table of Results.
- The Bar Graphs of Results.

These last two items have defaults, but will include any items that have been selected to be viewed within the database by the user. A sample report with diagnostics is shown below. This report has 5 pages, however, the number of pages will vary from report to report.

		<b>Engine Report</b>			
Operator	Marine Operator				
Ship Name	Ambassador				
Engine Name	MAINENGINE				
Test Date	16-December-2003				
Speed	83.5 RPM				
Load	75.9 %				

---

● **Validity Test**

All traces for this test have sufficient integrity to permit automated analysis.

● **Compression Comparison at -13.2°**

Average Compression 65.1 bar  
Compression Variation 2.7 %  
Compression variation is acceptable.

● **Pre-Ignition**

There are no symptoms of pre-ignition.

● **Ignition**

Average Ignition Angle 0.6°  
Ignition Variation 17.8°  
Earliest Cylinder 6  
Latest Cylinder 4  
Ignition angles should be verified on the traces and if found to be correct, then engine ignition timing is likely to require adjustment.

● **Spread of Flame**

Flame spread is indicated as consistent.

● **Power Balance**

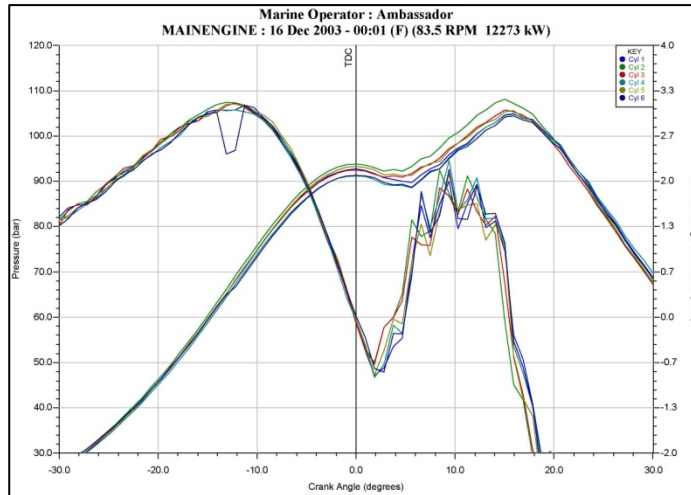
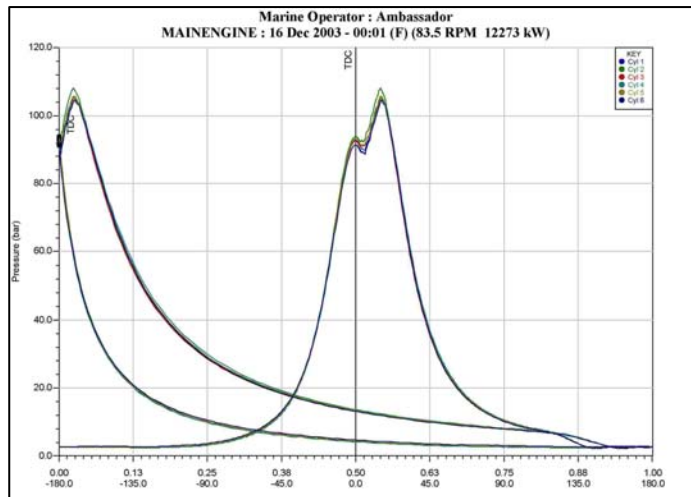
Indicated Power 12273 KW 16459 HP  
Power Variation 7.3 %  
Highest Cylinder 4  
Lowest Cylinder 6  
Power balance can be improved, however any cylinder problems should be resolved first.

**Comments**

No comments were supplied for this report.

Disclaimer: While every effort has been made to provide accurate results, Icon Research Ltd. is not liable for the consequence of any actions taken based on any diagnosis whether automatically or manually produced from Doctor results. Automated analysis uses algorithms that can give false interpretation on occasions. The results from automated diagnostics should always be checked by other means before any action is taken.

## Chapter 5 – Report Generator



Marine Operator : Ambassador  
MAINENGINE : 16 Dec 2003 - 00:01 (F) (83.5 RPM 12273 kW)

	Cylinder 1 16 Dec 2003 - 00:01	Cylinder 2 16 Dec 2003 - 00:01	Cylinder 3 16 Dec 2003 - 00:01	Cylinder 4 16 Dec 2003 - 00:01	Cylinder 5 16 Dec 2003 - 00:01	Cylinder 6 16 Dec 2003 - 00:01	Mean	Variation (per cent)	Total
Speed (RPM)	83.4	83.2	83.9	83.0	83.9	83.7	83.5	1.0	
Scavenge Press (bar)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.0	
MIP (bar)	14.45	14.22	13.95	14.94	14.36	13.78	14.29	8.1	
Indicated Power (kW)	2067	2028	2007	2128	2066	1978	2046	7.3	12273
Indicated Power (HP)	2771	2719	2692	2853	2770	2652	2743	7.3	16459
Peak Press (bar)	105	108	106	105	106	104	105	3.4	
Angle of Peak Press (°)	15.9	15.0	15.0	15.9	15.9	15.9	15.6	6.0	
Press at TDC (bar)	93	94	92	91	93	91	92	2.9	
% MCR (%)	76.7	75.2	74.5	78.9	76.7	73.4	75.9	7.3	
Ignition Angle (°)	2.8	2.8	1.9	5.6	2.8	-12.2	0.6	2850.0	
Exhaust temperature (°C)	325	325	300	320	325	310	318	7.9	
Fuel rack position (no)	89.0	87.0	86.0	90.0	88.0	84.0	87.3	6.9	
VIT rack position (no)	2.7	2.6	2.7	2.5	2.3	2.3	2.5	15.9	
J.W. Outlet temps (°C)	82	83	82	83	84	84	83	2.4	
Piston running hrs (hrs)	0	0	0	0	0	0	0	0.0	

## Chapter 5 – Report Generator

### Marine Operator : Ambassador MAINENGINE : 16 Dec 2003 - 00:01 (F) (83.5 RPM 12273 kW)

		Cylinder 1 16 Dec 2003 - 00:01	Cylinder 2 16 Dec 2003 - 00:01	Cylinder 3 16 Dec 2003 - 00:01	Cylinder 4 16 Dec 2003 - 00:01	Cylinder 5 16 Dec 2003 - 00:01	Cylinder 6 16 Dec 2003 - 00:01
Speed (RPM)	83.9						
	83.5						
	83.0						
Scavenge Press (bar)	2.20						
	2.00						
	1.80						
MIP (bar)	14.94						
	14.29						
	13.78						
Indicated Power (kW) (kW)	2128						
	2046						
	1978						
Indicated Power (HP) (HP)	2853						
	2743						
	2652						
Peak Press (bar)	108						
	105						
	104						
Angle of Peak Press (°)	15.9						
	15.6						
	15.0						
Press at TDC (bar)	94						
	92						
	91						

		Cylinder 1 16 Dec 2003 - 00:01	Cylinder 2 16 Dec 2003 - 00:01	Cylinder 3 16 Dec 2003 - 00:01	Cylinder 4 16 Dec 2003 - 00:01	Cylinder 5 16 Dec 2003 - 00:01	Cylinder 6 16 Dec 2003 - 00:01
% MCR (%)	78.9						
	75.9						
	73.4						
Ignition Angle (°)	2.8						
	2.7						
	1.9						
Exhaust temperature (°C)	325						
	318						
	300						
Fuel rack position (no)	90.0						
	87.3						
	84.0						
VIT rack position (no)	2.7						
	2.5						
	2.3						
J.W. Outlet temps (°C)	84						
	83						
	82						
Piston running hrs (hrs)	0						
	0						
	-0						



### 5.2 Preparing Results for Analysis

Automated diagnostics require the traces for a test to be in good condition and properly adjusted for TDC position. Also, the ignition point for each cylinder must be correctly identified.

**Quality of Traces:** Validity checks are incorporated and can identify readings taken with the indicator cock closed, faulty indicator cocks, clogged indicator passageways, and a variety of other conditions that can affect the accuracy of results. The diagnostic routines will identify most questionable traces, however in some cases suspect readings may not be identified. Traces should be checked visually to ensure they are of good quality with no “electronic” interference, or no effects from clogged indicator passageways or faulty indicator cocks. The traces should be smooth and free of glitches.

**Position of Traces:** The TDC reference must be correctly set. If traces are not positioned correctly relative to TDC, then the calculated power will be incorrect. Please see section 2.6 for instructions on how to do this. Please note that TDC setting is a service offered by Icon Research and is free of charge on new systems for initial readings. Send an archive copy of your database to [doctor@iconresearch.co.uk](mailto:doctor@iconresearch.co.uk) for this service.

**Ignition Points:** The ignition point for each trace must be correct for the analysis module to work properly. The Doctor program automatically identifies ignition points but the algorithm used can occasionally fail to find an ignition point especially if the traces are of poor quality. In these cases the system will report the text ??? and prompt you to enter a value. In a very few other cases the program may identify ignition incorrectly, and in these cases, you should alter the value that the system has generated in the *Table of Results*. Double click on the entry in the table and a new value can be entered as shown below.

**Marine Operator : Ambassador**  
**MAINENGINE : 16 Dec 2003 - 00:01 (F) (83.5 RPM 12273 kW)**

	Cylinder 1 16 Dec 2003 - 00:01	Cylinder 2 16 Dec 2003 - 00:01	Cylinder 3 16 Dec 2003 - 00:01	Cylinder 4 16 Dec 2003 - 00:01	Cylinder 5 16 Dec 2003 - 00:01	Cylinder 6 16 Dec 2003 - 00:01	Mean	Variation	Total
Press at TDC (bar)	93	94				91	92	3	
% MCR (%)	76.7	75.2				73.4	75.9	5.6	
Ignition Angle (°)	2.8	2.8				2.8	2.7	0.9	
Exhaust temperature (°C)	325	325	300	320	325	310	318	25	
Fuel rack position (no)	89.0	87.0	86.0	90.0	88.0	84.0	87.3	6.0	
VIT rack position (no)	2.7	2.6	2.7	2.5	2.3	2.3	2.5	0.4	
J.V.V. Outlet temps (°C)	82	83	82	83	84	84	83	2	

Page 2 of 3

**User Values**  
 Cylinder Identifier: Cylinder 1  
 User Value: Ignition Angle  
 Current Value: 2.8  
 New Value: 2.8  
 OK Cancel

**Traces**  
 Ambassador  
 16 Dec 2003 - 00:01 (F)  
☐ Show Speed  
☐ Show Power



## Chapter 5 – Report Generator

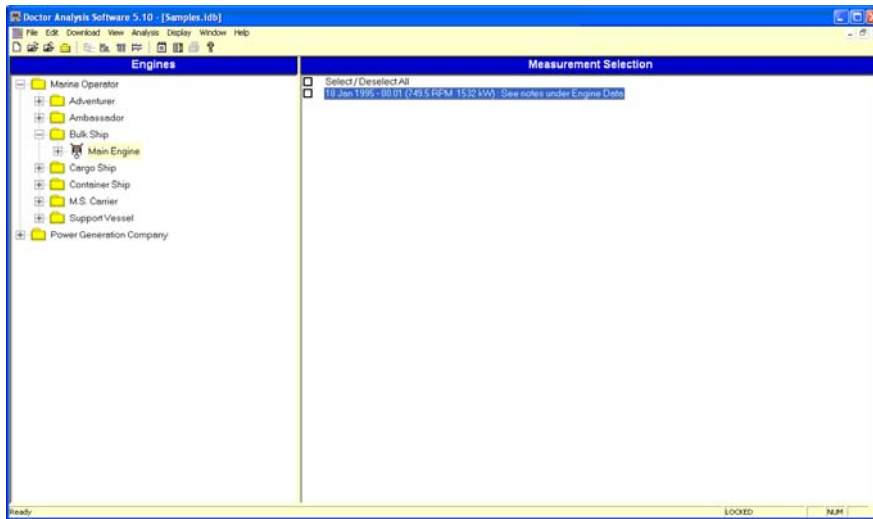
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Ignition points can often be best identified using the *Derivative or Rate of Change of Pressure* traces and by zooming in on the traces around the TDC area. Note that the true ignition point on the *Cylinder Pressure* trace is the point immediately after the low point on the Derivative trace.

When the Reporter starts, there is an option to enter an angle at which compression values will be compared. With engines that fire after TDC, this should be 0° and for those that fire before TDC it should be 1° before the earliest firing cylinder. If the ignition points have been correctly identified, or adjusted to be correct as above, there is no need to alter this value. If you think that the ignition points may be incorrect, this value may be adjusted prior to producing a report.

### 5.3 Producing a Report

Reports are initiated by selecting a test in the right hand pane of the database window.



Once the test you want to make a report for is highlighted, the *Generate a Report* button  becomes highlighted. This button is the third from the right in the toolbar. Click the button to initiate a report.

Report Generator

Report for

Ship Name: Ambassador

Engine Name: MAINENGINE

Test Date: 16-December-2003

☒ Include Diagnostic Statements

☒ Show Status Indicators

Report Printer

Adobe PDF (A4) Select Printer

Compression Check Angle

Compression values are compared at the highest pressure before any cylinder fires. The angle for this has been selected automatically. If you wish to use an alternative angle, please enter it manually below. [More Info...](#)

☐ Manually entered compression angle 0 degrees

User Comments

A report for the above ship engine is about to be generated. Please add any comments you wish attached to this report in the box below.

Print Cancel

The tick box for **Include Diagnostic Statements** can be left blank for basic reporting. If ticked, diagnostic statements will be included. A licence is required to do this and the first time a report is requested with diagnostic statements, a serial number will be requested.

Software Registration

To include diagnostics with your report, you must first register using a special Serial Number for enabling Diagnostic Reports.

The Serial Number may be found printed to the outside of the Doctor CD / Memory Stick.

Enter the Serial Number supplied into the box below.

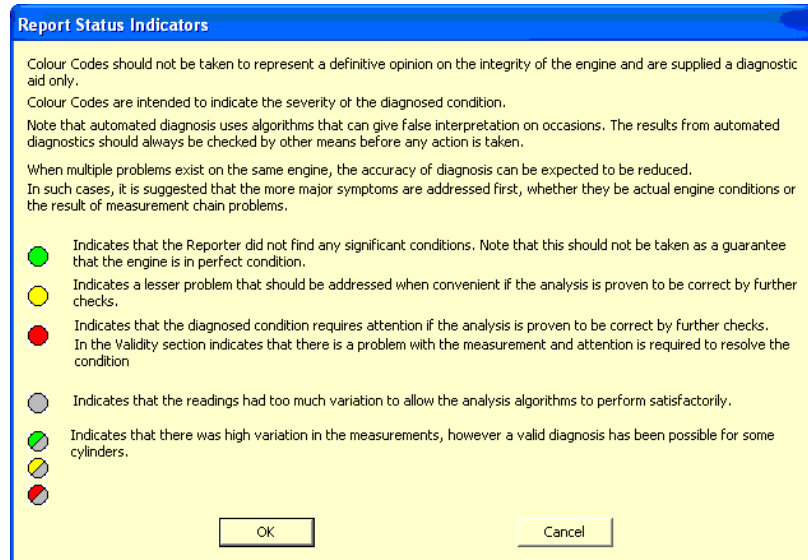
Serial Number:

OK Cancel

## Chapter 5 – Report Generator

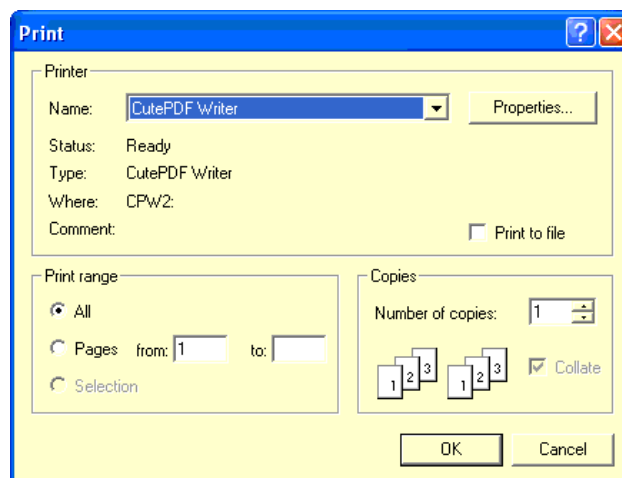
Your serial number will be on the CD cover or memory stick that your software came on. If you had your software delivered electronically, it will come in an Email to you. Note that you may already have a serial number to enable downloading of data from the Doctor instrument, but you should enter the new one to enable diagnostics.

The tick box for **Show Status Indicators** is now available. If this is ticked, you will see the following window and you must click on OK to show you have read and understood the indicator system.



It is possible to print directly to a printer, or to create a file in pdf format. To print a hardcopy of the report, simply select the printer you wish to use. To create a pdf file, you will need a pdf writer application such as Adobe Acrobat™ or similar on your PC. If you don't have a pdf writer installed, you can install CutePDF Writer™ that is provided on the Doctor installation CD. Refer to section 1.1 in this manual for installation instructions. You may have to use the **Properties** button to select the correct paper size initially to match your printer or the size of paper that you wish your file to be on.

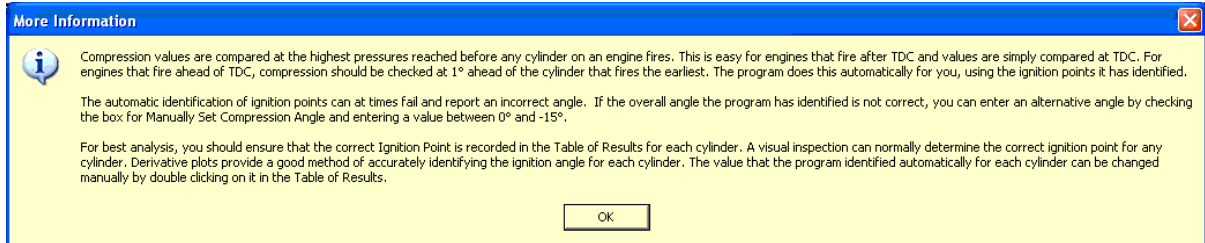
Note that you can add your own remarks in the **User Comments** box prior to printing and these will appear on the report.



## Chapter 5 – Report Generator

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The centre section of the Report Generator window shows the angle at which compressions will be compared at. For engines that fire after TDC this is always TDC, however if your engine fires ahead of TDC, then the comparison will be made just prior to any cylinder firing. This angle may be adjusted here if desired. Please see section 5.2 above for more detail. The **More Info...** button gives the following explanation.



After you are satisfied with the settings, click on **Print** and your report will be produced and either saved as a pdf file, or printed out, depending on the selection made.

