

Webster C1000 Data Logger

User manual

For Demonstration Software

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Getting Started

Demonstration of the C1000 Hydraulic Data Acquisition System

Summary: This section gives you a brief overview of the C1000, how to install the demonstration software, and how to use it.

Welcome!

This demonstration pack is designed to be as similar as possible to the 'real thing'. The demonstration software is identical to the product software except 'real' readings cannot be recorded. This manual contains extracts from the full product manual that contains a full reference section and a total of twelve tutorials, of those three appear in this demonstration pack.

In order to run the C1000 demonstration disk your computer must meet the following minimum requirements: -

A PC with at least a 386 40 MHz processor, 2 Mb of free hard disk space, DOS version 3.2 or later, 4 Mb of RAM, a 3.5" disk drive, and a VGA monitor.

Running under MS-DOS

If your computer uses Windows 3.11 operating system boot the computer up in DOS mode. Under Windows 95 or 98 you can opt to use MS-DOS by going to the START button, SHUT DOWN and clicking on 'Restart the computer in MS-DOS mode'.

Installing the C1000 demonstration software

1. Insert the disk labelled 'Demonstration' into the disk drive
2. Switch to the floppy disk drive (usually A) by typing **A:** <ENTER>
3. Now type **install** <ENTER>
4. At the prompt **Copy from drive [A:]** type the letter of the floppy disk drive or accept A by pressing <ENTER>
5. At the prompt **Copy to drive [C:]** type the letter of the hard drive or accept C by pressing <ENTER>
6. Press <ENTER> again to start the installation. The demonstration software will be copied into a directory called C1000 on the hard drive.

Running the C1000 demonstration software

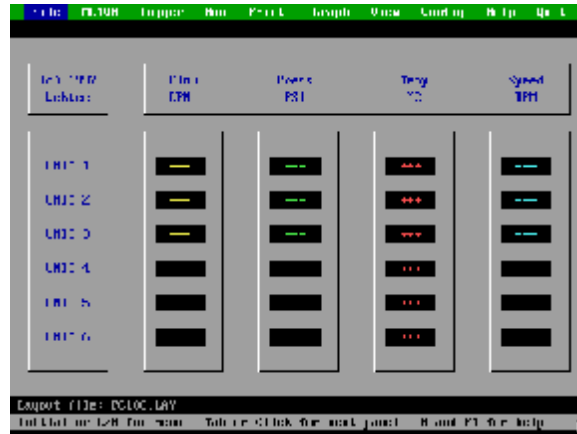
Two demonstrations have been prepared in order that you can best get a feel for the software and benefits the C1000 could be to you. To run the first demonstration type **demo1** at the C:\>C1000 prompt.

When the C1000 program starts-up you will see a title screen and then the normal panel display (shown below).

Note: If a different layout screen is displayed go to **File - Open layout file** and type - PC100.LAY <ENTER>.

Handy Hints

Handy Hints



Controls

The menu bar across the top of the screen is always present. Each of the ten menus can be activated by typing the first letter of the name, **F** for **File** etc., or by clicking on the name with the left-hand mouse button. You can select an option from within a menu in the same way.

Some functions have *Hot keys*, that is a specially assigned key or keys that take you straight to a particular option. For example <F5> is a *Hot key* for **View Last Graph**.

The C1000 uses a two-stage escape. That is if you press <Esc> once, the text you are entering will revert to how it was, pressing <Esc> a second time will cancel the menu or test and revert to the default display screen.

When entering text, like a name for example, press <Space> to clear the existing text, and press <Enter> to accept the text.

If there are a number of options for a function they will be displayed across the bottom of the screen. To scroll between these options press <Space>. To move down a list use the up and down arrows or <PgUp> and <PgDn>. To move across a table, like the **Configure Flow** table, press <Tab>.

The two foot-switches (full product version only) can also be used to provide fast hands-free control. The black foot switch is used to confirm an entry (like pressing space during a log on a key press, or choosing an option on the menu bar). The red foot switch is used to cancel an entry (equivalent to the <Esc> button). In this manner similar tests can be carried out in quick succession simply by using the foot switches to start and finish tests and log results.

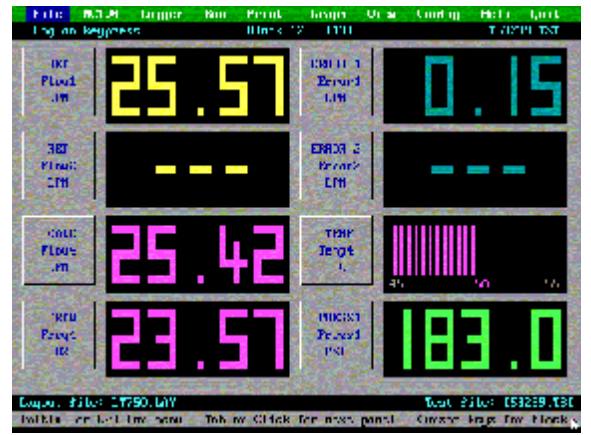
Display screens

There are five display screens: the normal panel, super panel, line graph, histogram, and data table. The data table is only available if there is test data in memory. An example of each of these screens can be seen on the next page.

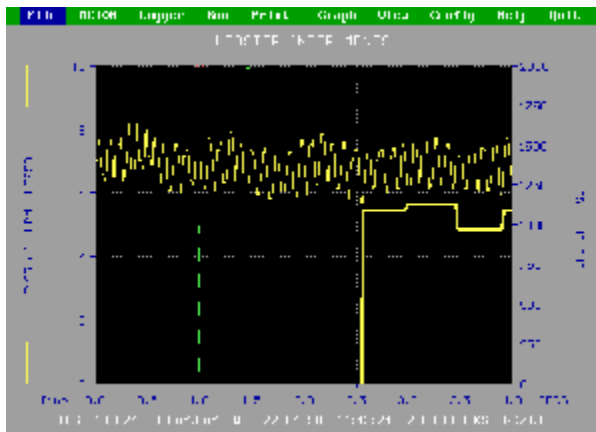
To scroll between the screens press <Tab> or click the left-hand mouse button.



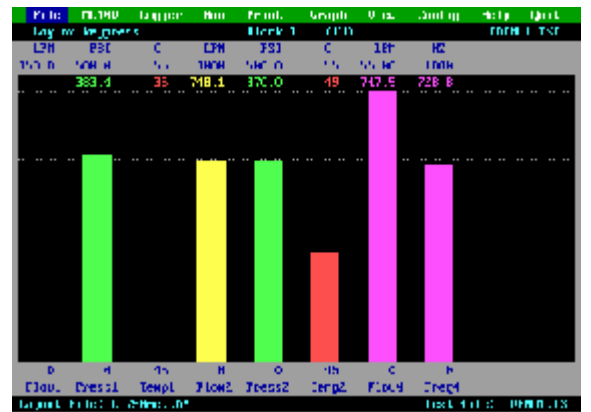
Normal Panel



Super Panel



Line Graph



Histogram

```

File  MC100  Logger  Run  Print  Graph  View  Config  Help  Quit
Log on Success Block 1 (1) Q0001.TST

QUICK REACTION TEST
CUSTOMER : DERA          1000 PSI  BLOCK 1001
DATE    : 19-06-90  13:46:19  PM10: TSD02  LAWNIT : FAST
MODEL No. : SPECIAL      SERIAL No. : -
COMMENTS : QUICK PROFILE MAIN LOG
TEST TYPE : TRIGGER ON PRESSURE 0      TEST DET : QRT1
OPERATOR  : JPP          SUPERVISOR : MRC

      UNIT 2  UNIT 1  UNIT 1  UNIT 2  UNIT 1
      Flow4  Press1  Press2  Temp4  Flow1
BLOCK  TIME   LPM   PSI   PSI    °F    G
1  13:46:19  11.6  2543  -    -    0.029
2  13:46:19  14.6  2543  -    -    0.021
3  13:46:19  14.6  2543  -    -    0.029
4  13:46:19  11.6  2543  -    -    0.029
5  13:46:19  11.6  2543  -    -    0.029
6  13:46:19  14.6  2543  -    -    0.021
7  13:46:19  14.6  2543  -    -    0.029
8  13:46:19  11.6  2535  -    -    0.029
9  13:46:19  14.7  2535  -    -    0.021
10 13:46:19  14.7  2535  -    -    0.021
11 13:46:19  11.7  2535  -    -    0.029
Initial or L-R for norm. Other cursor keys control table
    
```

Data Table

Handy Hints

In the demonstration software Flow1 and Press1 always display the same value. You can increase or decrease this value slowly by pressing + or - and multiply or divide the value by a factor of ten by pressing * or /. To enter an exact value type a number then =.

Note: where appropriate you must press SHIFT + key, for + for example.

Help

On the main menu bar there is a help menu. In addition pressing <F1> will activate on-line Help. This is always available unless:

1. Printing is in progress
2. Timed data logging is in progress
3. A file is being saved or loaded

Demo1

The first demonstration automatically generates random values for all of the measurements displayed to the screen except Press1 and Flow1. To move between the different screens press <Tab>.

Should you purchase the C1000 data logger, all the titles, measurements, and screens will be configured to your specification prior to you receiving the product. The user manual provides easy to follow instructions on operating the C1000 and re-configuring the layouts should it become necessary.

The first of the tutorials supplied in this demonstration pack gives detailed examples on how to log data, see Tutorial 7.

Exiting and the MS-DOS environment

To exit the C1000 program select **Yes quit** from the **Quit** menu or press <Alt> and X together.

In emergency <Ctrl> C or <Ctrl> Break can be used.

Demo2

To start the second demonstration type **demo2** at the C:\C1000> prompt. For a detailed example on how to review a test stored in memory and create and print graphs see Tutorial 8. A sample graphical report is shown at the end of Tutorial 8.

Once information has been logged the C1000 can be used to analyse the results, create graphs (as shown in Tutorial 8) and also print text reports.

Tutorial 9 contains a worked example on printing a text report of a test, a sample text report is included at the end of the Tutorial.

Exiting and the MS-DOS environment

To exit the C1000 program select **Yes quit** from the **Quit** menu or press <Alt> and X together.

In emergency <Ctrl> C or <Ctrl> Break can be used.

Further Information

Should you require further information or like to discuss your requirements in greater detail please do not hesitate to ring us on **Tel: 01480 397 888**

Appendix

The appendix contains information on ViscoCorrect™, useful equations and formulae to help you create virtual channels, and other background information.

Introduction to the tutorials

In order to help you familiarise yourself with the C1000 software as quickly as possible, three tutorials have been included here (listed in bold). The tutorials cover the different methods of data logging, how to create and print graphs, and printing text reports.

The full manual supplied with the C1000 product includes these three tutorials plus nine others covering many typical situations, all documented in the same easy-to-follow fashion.

- Tutorial 1 - C1000 background - *Layout files* and sensor connections
- Tutorial 2 - How do I configure the *hard* inputs: flow, speed, temperature, and pressure?
- Tutorial 3 - How do I configure viscosity measurement, ViscoCorrect™ and VT type turbine flow meters?
- Tutorial 4 - How do I configure *soft* and *virtual* inputs?
- Tutorial 5 - How do I customise the *normal layout*, *super panel*, and *histogram*?
- Tutorial 6 - How can I calibrate / re-calibrate an analogue sensor?
- Tutorial 7** - Data logging
- Tutorial 8** - How do I draw and print a graph?
- Tutorial 9** - How do I print the results as a report?
- Tutorial 10 - How can I transfer data from the MC100 to the C1000?
- Tutorial 11 - How can I export results to a spreadsheet such as Lotus 1-2-3?
- Tutorial 12 - Troubleshooting

Nomenclature

Certain words within the tutorials have been written in different fonts / styles to highlight their meaning.

Config Italic and bold is used to show a word is referring to the name of a menu / function within the C1000 software.

CONFIGURATION Upper case bold is used to show a word is referring to the name of a menu / function within the MC100 software.

Soft input Italic is for used for words that are particular to the C1000 software and aren't common language. See the reference section for a full description.

RIG1T3 Upper case text is used to show text entered by the user - such as a test name.

<Enter> Pointed brackets are used to show the name of a key that must be pressed.

Handy Hints

On to Tutorial 1

Tutorial 7

Data logging

Summary: This tutorial covers data logging: the methods available, which method to use when, and a worked example for each method. Note: Data logging using the MC100 is covered in Tutorial 10.

The C1000 offers five different methods of logging data to cover a wide variety of circumstances. The methods are:

1. **Continuous log** - records blocks of data at set time intervals of 1 second or less.
2. **Periodic log** - records blocks of data at set time intervals of 1 second or more.
3. **Log on keypress** - records one block of data each time a key / footswitch is pressed. You can review previous blocks during the test.
4. **Profile log** - records a maximum of 4 channels at a rapid rate with data capture triggered by an external event.
5. **Online log** - records blocks of data at a set rate, the measurements can be displayed simultaneously by any one of the four display screens.

In all methods of data logging the user is asked to enter a test name and fill out a test sheet.

Test name

A test will be stored to disk using the test name you have entered in the format **name.tst**. The test name can be entered in one of two ways but cannot exceed eight characters or include any spaces:

As Txxx, where the x represents a number (e.g.: T1001)

As a combination of letters and numbers (e.g.: RIG1T3)

If method one is used the C1000 will automatically assign the next consecutive test number.

Test Sheet

The **test sheet** is a useful way to record information about a test for future reference. This information is automatically printed on a report in narrow format, thus providing trace-ability for your own quality control (ISO 9001 / 2). The first line **Title** is automatically attached to the top of a line graph created from the data.

In order to help you get the most out of the data logger functions there are five examples below, one for each method of data logging.

Handy Hints

Unsure of which method to use? - See the Handy guide below. Each method has been designed with a specific requirement in mind.



Test numbers will only increment automatically from T1000 and above.

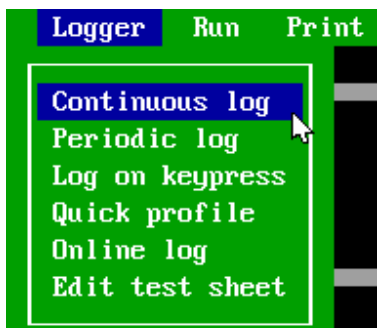
For security of data it is not possible to reuse a number of a test stored on disk.

Which method?				
Typical Situation	Example	Best method	No. of channels logged	See
To log a set of results which are not related to time.	Calibration of equipment by running a range of individual tests, e.g.: testing a pump at different pressures or speeds..	<i>Log on key press</i>	As many as are configured on the normal layout.	7.3
To rapidly log information over a set period of time – the user controls when the test begins.	Calibration of equipment by varying one or more factors over a period of time – e.g. testing of a machine cycle.	<i>Continuous log</i>	As many as are configured on the normal layout.	7.1
To very rapidly log information about an incident over a set period of time – the user has little control over when the incident occurs.	Diagnostics – to get detailed information about an unpredictable event or an event that happens too quickly to initiate manually, i.e. shock pressure.	<i>Quick profile log</i>	Four pre-selected channels.	7.4
To take a reading at regular intervals over a long period of time.	To record information about a piece of equipment in use or under development to ensure everything is correct.	<i>Periodic log</i>	As many as are configured on the normal layout.	7.2
To take readings whilst simultaneously viewing them on the screen in real time – preferably as a graph.	To monitor a piece of equipment in real time	<i>On line log</i>	As many as are configured on the normal layout.	7.5

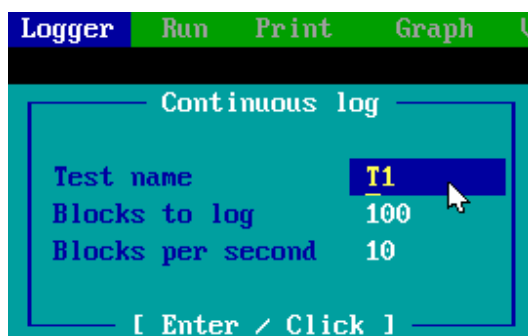
Worked example 7.1

How do I run a test using continuous log?

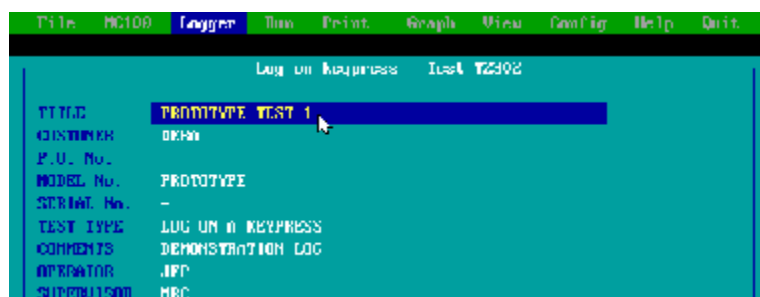
1. From the **Logger** menu select **Continuous log**.



2. You will arrive at the **Continuous log** menu shown below.

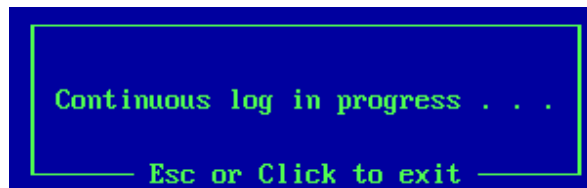


3. Enter the test name next to **Test name** or use the name suggested by the computer.
4. A continuous log will record between one and ten blocks per second and up to a maximum of 8000 blocks in total. (This limit could be slightly lower – depending on the amount of memory available).
5. Enter the total number of blocks to log and the number of blocks per second. The total test time is the number of blocks divided by the blocks per second.
6. Once complete press <Enter> / click.
7. You will now come to the **Test sheet** as shown below.

Handy Hints

Handy Hints

8. The **Test sheet** is purely a text document to record information about the test. The information can appear on reports and the first line – **Title** is used as a title on the *Line graph*.
9. Press <Enter> / click to start the test.
10. Across the top of the screen you will see the number of the block being logged, the total number of blocks to log and the number of the test. By pressing <Esc> you will terminate the test early.



11. Once the test is complete you will return to the **Test sheet** to add / change any details if necessary. Press <Enter> / click to close.
12. You will then see the table of test results with the **Test sheet** information laid out at the top, as shown below.
13. The **Type of test, Time, Date, Layout file name, Fluid type** and **Test number** are automatically included in the table of results.

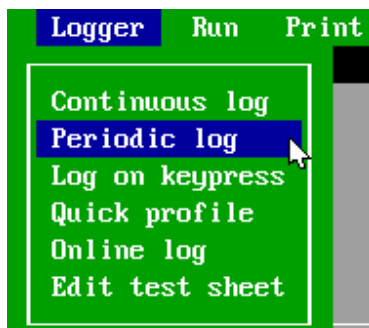
File	PK100	Logger	Run	Print	Graph	View	Config	Help	Quit
PROTOTYPE TEST 1									
LOG ON KEYPRESS									
CUSTOMER	:	DEBN					P.O. No. :		
DATE	:	24-07-98 14:03:48		FLUID:	INCR		LAYOUT :	FAST	
MODEL No. :		PROTOTYPE					SERIAL No. :		
COMMENTS :		DEMONSTRATION LOG							
TEST TYPE :		LOG ON n KEYPRESS					TEST REF :	12301	
OPERATOR :		JPP		SUPERVISOR:	MBC				
				UNIT 2	UNIT 1	UNIT 1	UNIT 2	UNIT 1	
12301.TST				Flow1	Press1	Press2	Temp1	Crat1	

Note: All active channels will be logged using the **Continuous log** however you will only see all of them under the *normal layout*, and as a *wide report* when printing – see Tutorial 9. The *data table* displays the same channels as the *super panel* (i.e.: a maximum of eight).

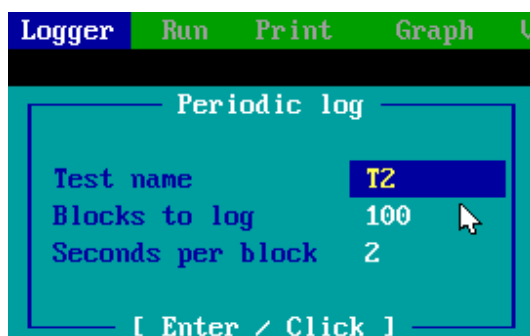
14. You can review the test in any of the 5 screens, press <Tab> to switch between them.
15. See Tutorials 8 & 9 respectively to see how to plot a graph and print reports.

Worked example 7.2
How do I run a test using periodic log?

1. From the **Logger** menu select **Periodic log**.



2. You will then see the **Periodic log** menu shown below.



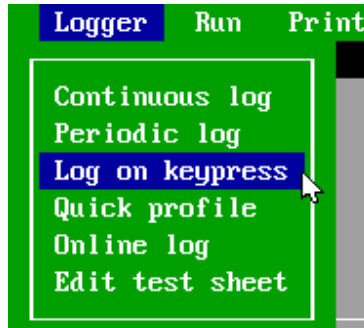
3. Enter the test name next to **Test name** or use the name suggested by the computer.
4. A **periodic log** will record a block at intervals between 1 and 600 seconds up to a maximum of 8000 blocks in total. (This limit could be slightly lower – depending on the amount of memory available).
5. Enter the total number of blocks to log and the number of seconds per block. The total test time is the number of blocks multiplied by the seconds per block.
6. Once complete press <Enter> / click.
7. The format is the same as for **Continuous log**, you will have the **test sheet** to fill out, the test will start and on finishing you will have another opportunity to edit the test sheet prior to seeing the table of results. During the test you can toggle between screens by pressing <Tab>. Pressing <Esc> will terminate the test early.
8. See Tutorials 8 & 9 respectively to see how to plot a graph and print reports.

Handy Hints

See Scenario 7.1 steps 7-

Handy Hints**Worked example 7.3****How do I run a test using log on a keypress?**

1. From the **Logger** menu select **Log on keypress**.



2. You will then see the **Log on keypress** menu. Enter the test name or use the name suggested by the computer.

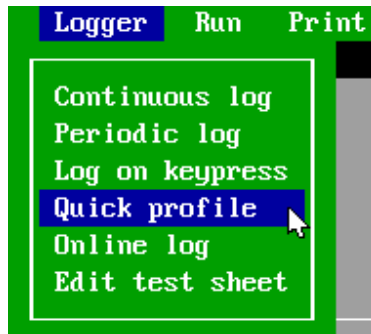


3. Press <Enter> / click to close the menu
4. There after the test format is the same as for **Continuous log**, you will have the **test sheet** to fill out, the test will start and once completed you will have another opportunity to edit the test sheet prior to seeing the table of results.
5. In order to log a block of results press <Space> or the black foot switch. You can log up to a maximum of 8000 blocks, or until the memory is full, whichever is sooner. During the test you can toggle between screens by pressing <Tab>. The help menu can be accessed by pressing <F1>. If you wish to review the blocks already logged press <Enter> and you can scroll through the blocks using the cursor keys. To resume testing press <Esc>. When you have completed testing press <Esc> to exit to the 'test sheet'.
6. See Tutorials 8 & 9 respectively to see how to plot a graph and print reports.

Worked example 7.4
How do I run a test using 'quick profile log'?

Handy Hints

1. From the **Logger** menu select **Quick profile**.



2. You will then arrive at the **Quick profile** menu as shown below.



3. The **Quick profile** log differs from all the other methods of data logging in that up to 4 channels can be recorded at very high speed. To configure the test the user must fill out the **Quick profile** menu shown above.
4. In this example the pressure rising above 1000 psi triggers the start of the test whilst channels Flow 1, Flow 2, and Temp 1 are also logged.

Handy Hints



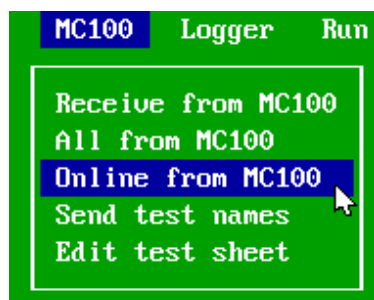
5. The quick profile test starts recording information into a buffer as soon as the user exits the set-up menu. When the test is triggered a pre-set number of readings over a pre-set period of time are stored in a data table. In the example above 2000 readings are taken over a two second period with a 50 % pre-trigger. This means when the pressure measured by 'Press 1' rises above 1000 psi the test will be triggered. Since the test requires 50% pre-trigger, 1000 readings will be recorded in the second prior to the trigger, and 1000 readings in the second after the trigger.
6. The number of **Blocks to log** can be set between 10 and 2000 whilst the **Test time** can be between 1 and 300 seconds. If more than 2 channels are logged the minimum test time is 2 seconds.
7. Press <Enter> to exit the set-up menu. The computer will then display the test sheet as with other tests.
8. Press <Enter> / click to close the test sheet, the computer will then display the message '**Waiting for Trigger**'.
9. When the trigger conditions are met the test will start.
10. When the test is complete the message **processing** is displayed since the test speed is so fast all processing has to be carried out after the test.

You will then have another opportunity to edit the 'test sheet' prior to the results being displayed in the *data table*.

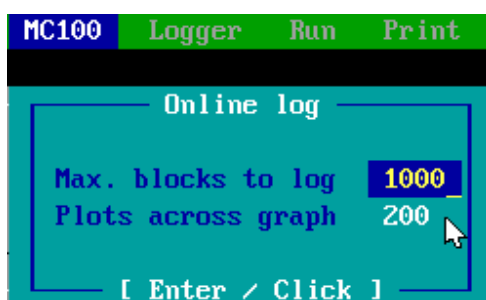
Worked example 7.5

How do I run a test using 'online log'?

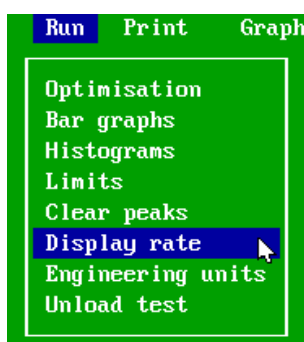
1. An **Online log** is the default method of logging. Every time the C1000 is switched on, it will automatically start on-line logging. A test is only stored if you enter a name under **Online log**.
2. From the MC100 menu select **online log** as shown below.



3. You will then see the **Online log** menu, as shown below.



4. You can enter two parameters, the maximum number of blocks to log (between 20 and 2000) and number of plots across the page (between 10 and 1000). The number of plots across the page dictates the width of a line graph, thus in this example the graph would scroll 5 times to display 1000 blocks. When you have entered both parameters **PRESS <Esc>**.



5. An online log will allow the user to choose between two speeds at which to record data; these are dictated by the **Display rate**. Under the **Run** menu select **Display rate** as shown below. You can choose between **Slow** (every 1000 millisecond – 1 second) and **Fast** (every 333 millisecond, 1/3 second).

Handy Hints

By changing the number of plots across the graph you can vary the graph resolution.

Handy Hints

6. Lastly you need configure the graph settings, which channels will be displayed to the screen on the *rolling graph*. From the **Graph** menu select **Draw graph**.
7. Enter the channels you want to log by configuring the left and right y-axes. In each case you can log 2 channels of the same type. Scroll through the **feature** options until you arrive at the desired input, for example **Flow**. Then enter the number of the Flow channels you wish to log next to **channel A** and **channel B**. When you have completed the menu, press <Enter> / click and the computer will start logging immediately and display the results as a *rolling graph*.

Y-axis left trace	Full
feature	Flow
channel A	1
channel B	2
Y-axis right trace	Full
feature	Press
channel A	1
channel B	0

Pressing any other key, apart from <Tab> will automatically cancel the test and start another one.

8. You can view the data in any of the four screens, simply press <Tab> to scroll between them.
9. The test will continue until the user either presses <Esc> or saves the test. To save test to a data file select **Online log** from the **Logger** menu at the top of the screen.
10. On the **Online log** menu enter the test name and press <Enter> / click. You will then have the opportunity to fill in the *test sheet* before the results are displayed as a *data table*.
11. See Tutorials 8 & 9 for information on creating and printing graphs and reports.

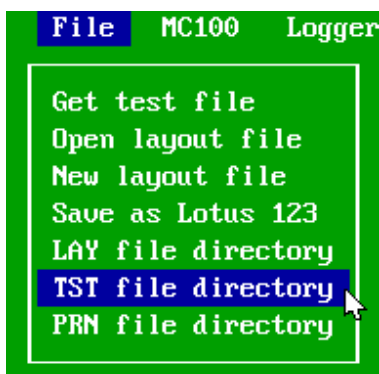
On to Tutorial 8

Tutorial 8

How do I draw and print a graph?

Summary: This tutorial covers taking an existing test and drawing and printing a line graph from the test results.

1. Have you just carried out a test? Assuming you have a data table in memory you can plot a graph straight away. If not you will need to load in a test file.
2. To load a test, select **File** from the menu bar and go to **TST file directory** as shown below.



3. Select 'PST.TST' or a test of your own using the mouse.
4. When the file is loaded you will see the data table with the test sheet information at the top.



5. To draw a graph of the results select **Draw graph** from the **Graph** menu. You will then be presented with the **Graph settings** menu.

Handy Hints

If you don't have a mouse connected press <Esc> and select **Get test file** from the 'File' menu.

Handy Hints

You can only graph channels that appear in the data table for the test you have carried out. Sometimes (for instance when carrying out a quick profile log) less channels are logged than appear on the normal layout.

Graph settings	
X-axis scale	1/1
feature	Time
channel	0
time units	MSECS
centre blk	1501
Y-axis left trace	Full
feature	Press
channel A	1
channel B	0
Y-axis right trace	Full
feature	Flow
channel A	4
channel B	0
Grid lines	Trace 1
Plots and/or lines	Lines
[Enter / Click]	

6. The **Graph settings** menu defines four parts of the graph:

- ü The x-axis
- ü The left hand side y axis
- ü The right hand side y axis
- ü The graph style

7. The x-axis has five parameters, these will be automatically set by the program to give a meaningful result, press <Enter> to accept the given parameters. Here is a description of each of the parameters should you wish to change some or all of them.

X-axis scale

Allows the user to stretch or compress the graph. **Auto** will fit a time-based graph to one page. **1/1**, **1/2**, **1/3**, **1/4** are scale factors and reduce the length of the graph by only plotting every 2nd, 3rd, or 4th value. **Band** is only possible for non-time based graphs and will set the x-axis between the minimum and maximum values recorded.

X-axis feature

Used to set what the x-axis will represent, typically this will be time however this can be set to any measured quantity, e.g.: flow, temperature, pressure, speed, or any soft or virtual type.

X-axis channel

If the x-axis feature is a measured quantity (i.e.: not Time) then you must set this to the relevant channel. For example should you wish the x-axis to display **Press 4** set x-axis feature to **Press** and x-axis channel to **4**.

X-axis time units

If the x-axis feature is **Time** then this parameter will set what the time units are: hours, mins, secs, msec, or blocks.

X-axis centre block

This parameter need only be set if the x-axis feature is **Time** and the scale is not **Auto**. Setting this parameter tells the program how to display the graph, the number of the block entered will be located centrally on the page.

8. Both the left and right y-axes each have four parameters.

Y-axis trace

This allows the user to control the y-axis scale. The options are full, band, limit, and off. **Full** sets the scale between zero and the maximum value. **Band** automatically sets the scale from the minimum to the maximum value recorded. **Limit** allows you to select the scale, the default is between zero and one thousand. **Off** switches the axis off.

Y-axis feature

This is used to set which measured input type you wish to display, press space to scroll through the options, these will include all standard, soft and virtual inputs.

Y-axis channel

If you wish to display **Temp2** then set y-axis feature to **Temp** and y-axis channel to **2**. If you don't wish to have two traces set the second channel to zero.

9. The final set of parameters refers to graph style.

Grid lines

This is used to control whether you wish to display gridlines. The gridlines can be aligned with either the left axis (Trace 1) or right axis (Trace 2).

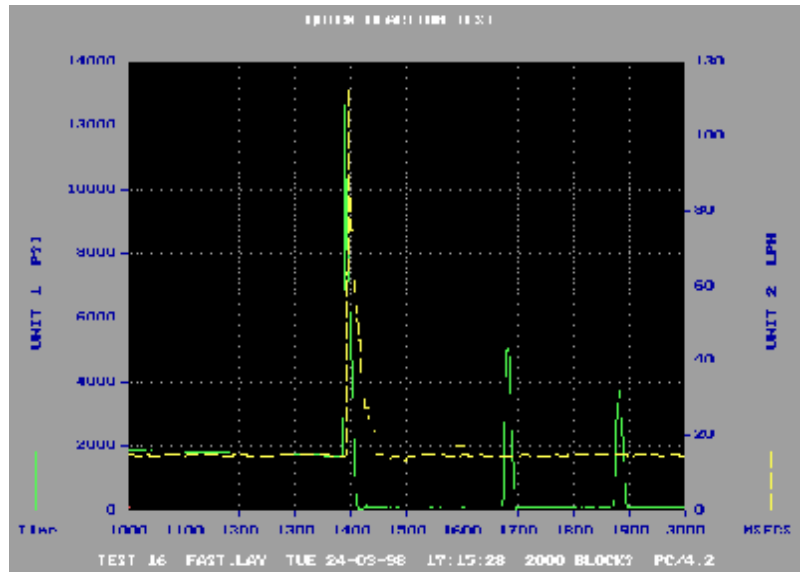
Plot marks

This enables / disables a marker to be displayed at each data point. Markers are ideal for short tests e.g.: log on a keypress. Where the x-axis is set to a measurement type, i.e.: not time, markers are always used.

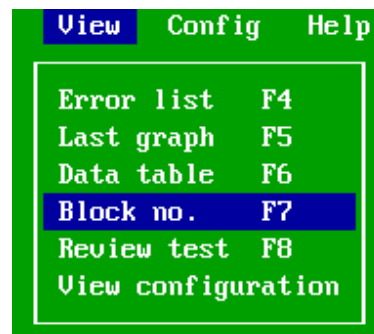
Once you have set the parameters press enter / click to confirm the settings and to draw the graph. The graph below was defined using the settings shown above

Handy Hints

You can change the limits for each channel logged under **Run - Limits - Channel**.

Handy Hints

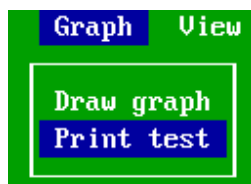
10. In this example there are 2000 blocks yet we can only see half. In order to scroll along the graph use the <Ctrl> and left arrow to move left and <Ctrl> and right arrow to move right. Press <Tab> to scroll between the graph, data table and other screens.
11. After inspecting the graph you may wish to review the test or look more closely at a particular block. From the menu bar select **View** and you will see the menu below.



12. If from the graph you have identified an incident, for instance the main peak on the above graph, you might wish to know what was the maximum-recorded pressure? In the above test a reading was recorded every millisecond, thus say the peak occurs at approximately 1400 msec, that will coincide with the 1400th block of data. From the view menu select **Block no.** and enter 1400.
13. The data table will be displayed with the 1400th block centred on the page. To scroll up or down use the cursor keys or <PgUp>, <PgDn>.

QRT1.TST		UNIT 2	UNIT 1	UNIT 1	
BLOCK	SECS	Flow4	Press1	Press8	Grav1
		LPM	PSI	PSI	G
1390	1.389	14.6	11519	4508	28.05
1391	1.390	14.6	13769	4505	38.42
1392	1.391	14.6	13769	4505	38.89
1393	1.392	14.8	11876	4505	38.87

14. By scrolling up slightly you could identify that in the 1391st millisecond Press1 peaked at 13769 psi.
15. Alternatively you might wish to review the test a block at a time in one of the other screens. Press <Tab> to switch to a different screen and again use the up and down arrow keys to scroll through the test.
16. Once you have drawn a graph you can easily obtain a printed copy. From the **Graph** menu on the top menu bar select **Print test** as shown below.



17. You will then see the same **Graph settings** menu as before with the current settings. Assuming you wish the printed graph to look the same as the copy on the screen just press <Enter> / click to accept. You will then be asked to confirm the choice of printer.



18. Press **Y** to confirm and the program will start printing the graph. See Tutorial 9 for information on configuring the printer.

On to Tutorial 9

Handy Hints

Another way to do this would be to select 'Review test' from the 'View' menu.

Tutorial 9

How do I print the results as a report?

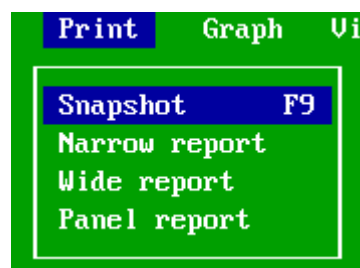
Summary: This tutorial tells you how to take a test file and create a variety of printed reports. The tutorial describes the different types of report, when to use which and how to configure your printer.

Once you have completed a test you can easily print out the results for your own records or for quality assurance purposes to supply to your customer.

1. When you run a test in all but the **Quick profile** log, all the current channels are logged. When you review a test the number of channels displayed will depend on the screen you are in, see the table below

Screen name	Number of inputs
Data table	8 channels (as per <i>super panel</i>)
Normal panel	All current channels (up to a maximum of 28)
Super panel	8 channels (as defined in Configuration)
Histogram	10 channels (as defined in Configuration)
Graph	4 channels (as defined in Graph settings)

2. Similarly there are four ways of printing results and each method will present the results differently.

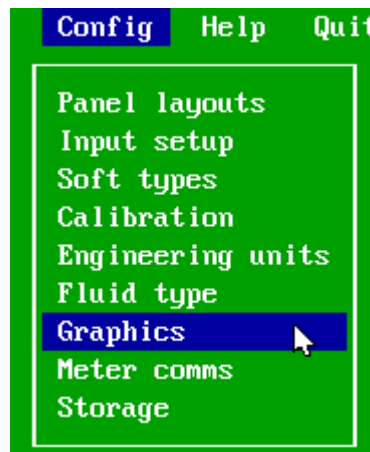


3. The first of the four methods is **Snapshot**, this is a very quick way of printing a report and represents what is displayed on the screen at that moment. If you are in the *normal layout* the **Wide report** will be printed, in *super panel* a **Narrow report**. The hot key <F9> can be pressed during or after a test.

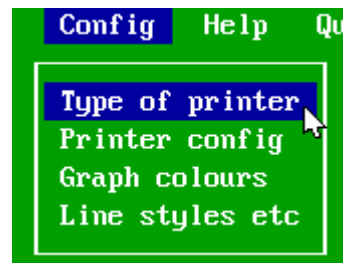
Handy Hints

Handy Hints

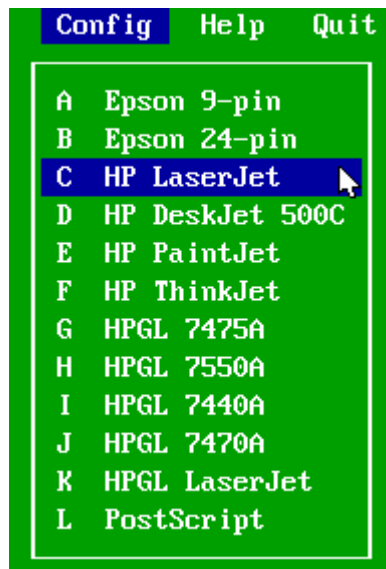
4. A **Narrow report** will print up to eight channels according to the configuration of the super panel. The report will be presented as a certificate of calibration and have the test sheet attached. The style of report is ideally suited to short tests like **Log on keypress**. Typically a narrow report will run to one page, an example is shown at the end of the tutorial.
5. The **Wide report** will print all current channels as per the normal layout, thus often making this a much longer report. An example is shown at the end of the tutorial.
6. The **Panel report** is a print of the whole normal screen layout including titles, measurements, headers and footers for signature. A panel will be printed for each block of data, two panels are printed per page. An example is shown shown at the end of the tutorial.
7. To print any of the above types of report you must first ensure your printer is correctly configured and secondly have a test in memory.
8. To set your printer configuration select the **Config** menu from the panel at the top of the screen.



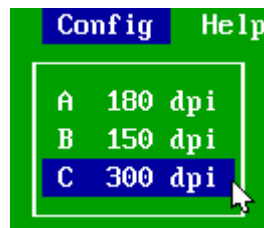
9. Then select **Graphics** and **Type of printer**.



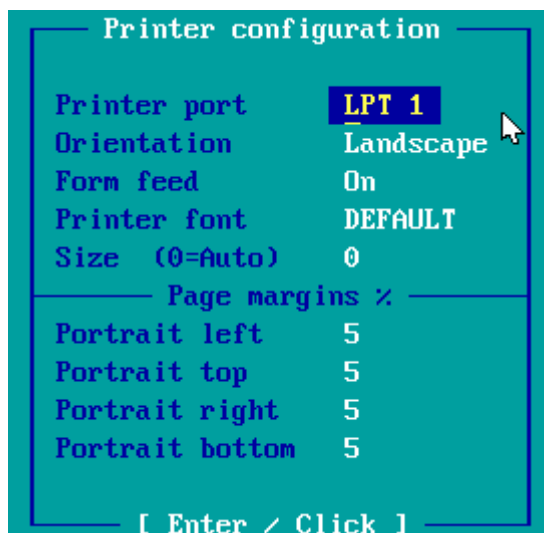
10. Then from the list of printers offered select the printer driver for your printer, for instance **HP LaserJet**.

Handy Hints

11. Once you have selected the printer type on certain printers you will be asked for the resolution.



12. The final menu covers the page layout and where the printer is connected.

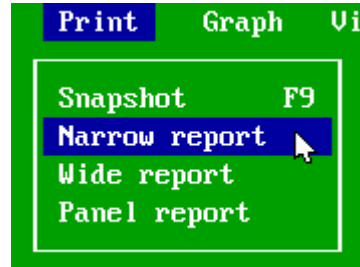


13. Scroll through the port settings until the port matches where the printer is connected. Typically all further settings need not be altered. Orientation controls whether the print is portrait or landscape and depending on the printer type you will have a variety of fonts available.

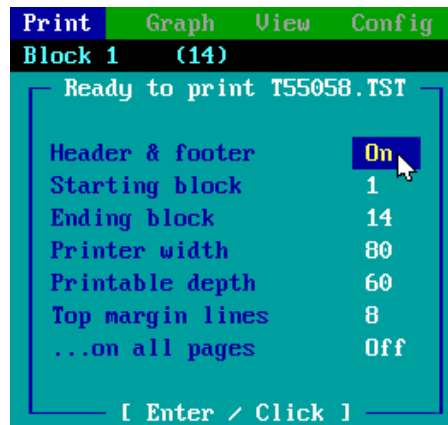
Handy Hints

Top margin lines allows you to move the report down the page - 6 lines are equivalent to one inch.

14. Once you have configured the printer press <Enter> / click to return to the main menu. Now select **Print** from the menu bar.
15. Click on the type of report you wish to print, **Narrow report** for example.



16. You will then be presented with a *print settings* menu. The default settings are usually correct, however you might wish to limit the number of blocks you print. To do this you can enter the **starting block** and **ending block** numbers. Should you wish to print on to headed stationary, you can use **Top margin lines** to control how far down the page printing starts.



17. Ensure the printer is online then press <Enter> / click to accept the options and the printer will start printing the report.

On to Tutorial 10

Equations

Virtual channels are a powerful tool on the C1000 allowing you to carry out simple equations in real-time and display the results to the screen. Here is a short list of some useful equations and conversion factors.

Remember virtual equations are carried out using primary units. If the equation requires units to be in anything other than primary units, an appropriate conversion constant must be included. The C1000 primary units are as follows:

Flow	litres per minute (lpm)
Speed	pulses per second (Hz)
Pressure	pounds per square inch (psi)
Temperature	degrees Celsius / Centigrade (°C)
Viscosity	centiStokes (cSt)

Hydraulic Torque

Theoretical

$$\text{Torque (Nm)} = \frac{\text{Pump displacement (m}^3) \times \text{Pressure drop (psi)} \times 6894.8}{2p}$$

$$\text{Torque (Nm)} = \text{Pump displacement (cm}^3) \times \text{Pressure drop (psi)} \times 0.0011$$

Actual

$$\text{Torque (Nm)} = \text{Mechanical efficiency (\%)} \times \text{Theoretical torque (Nm)}$$

Hydraulic Power

Theoretical

$$\text{Power (kW)} = \frac{\text{Flow (lpm)} \times \text{Pressure (psi)}}{600 \times 14.504}$$

$$\text{Power (kW)} = \text{Flow (lpm)} \times \text{Pressure (psi)} \times 0.0001149$$

Actual

$$\text{Power (W)} = 2p \times \frac{\text{Frequency (Hz)}}{\text{no. of teeth (n)}} \times \text{Torque (Nm)}$$

$$\text{Power(kW)} = \text{Frequency (Hz)} \times \text{Torque (Nm)} \times \frac{0.00628}{n}$$

Differential Pressure

$$P_d \text{ (psi)} = \text{Pressure 1 (psi)} - \text{Pressure 2 (psi)}$$

Conversion Factors

Multiply this		By this	To get this	
Unit	Symbol	Conversion Factor	Unit	Symbol
Bar	bar	14.50377	pounds per square inch	psi
Gallons per minute (UK)	GPM (UK)	4.546	litres per minute	lpm
Gallons per minute (US)	GPM (US)	3.785	litres per minute	lpm
Millimetre ² per second	mm ² /s	1.0	centiStoke	cSt
Horsepower (550 ft-lb/s)	HP (imperial)	0.7457	kilowatt	kW
Horsepower (electric)	HP (electric)	0.746	kilowatt	kW
Horsepower (metric)	HP (metric)	0.7355	kilowatt	kW
Pound foot	lb.ft	0.73756	Newton metre	Nm
Foot	ft	0.3048	metre	m
Square foot	ft ²	0.0929	square metre	m ²
Cubic foot	ft ³	28.317	litres	l

Temperature

$$\text{Temperature } ^\circ\text{C} = \frac{(\text{Temperature } ^\circ\text{F} - 32)}{1.8}$$

Menu Tree

This is a tree of the menu structure, all top-level menus are on the far left, and each sub-menu is then indented to the right.

File

- Get test file
- Open layout file
- New layout
- Save as Lotus 123
- LAY file directory
- TST file directory
- PRN file directory

MC100

- Receive from MC100
- All from MC100
- Online from MC100
- Send test names
- Edit test sheet

Logger

- Continuous log
- Periodic log
- Log on keypress
- Quick profile
- Online log
- Edit test sheet

Run

- Optimisation
- Bar graphs
- Histograms
- Limits
 - Flow
 - Press
 - Temp
 - Speed
 - Visc
 - Custom inputs

- Clear peaks
- Display rate
- Engineering units
- Unload test

Print

- Snapshot
- Narrow report
- Wide report
- Panel report

Graph

- Draw graph
- Print test

View

- Error list
- Last graph
- Data table
- Block no.
- Review test
- View configuration

Config

- Panel layouts
 - Normal layout
 - Super panel
 - Histogram
 - Display detail
 - Flow
 - Press
 - Temp
 - Speed
 - Visc
 - Custom inputs
- General

Input setup

- Flow
- Press
- Temp
- Speed
- Visc
- Custom Inputs

Soft types

- Soft types
- Virtual types

Calibration

- Engineering units
- Fluid type
- Graphics

- Type of printer
 - Printer resolution
 - Printer configuration
- Printer configuration
- Graph colours
- Line styles etc.

Meter comms

Storage

- Print configuration
- Restore config
- Restore layout
- Reset config
- Reset layout
- Startup modes
- Amplifier gain

Help

- Context help**
- Overview**
- Menus**
- Entries**
- Tables**
- Mouse**
- Config**

Quit

- Yes quit**
- Notice**
- Memory**

Instructions for re-installing the C1000 software

Re-installing the C1000 software

1. Switch on the computer and ensure you have C:\> prompt
2. Insert the disk labelled 'Demonstration' into the disk drive
3. Switch to the floppy disk drive (usually A) by typing **A: <ENTER>**
4. Now type **install <ENTER>**
5. At the prompt **Copy from drive [A:]** type the letter of the floppy disk drive or accept A by pressing <ENTER>
6. At the prompt **Copy to drive [C:]** type the letter of the hard drive or accept C by pressing <ENTER>
7. Press <ENTER> again to start the installation. The C1000 software will be copied into a directory called C1000 on the C: drive.

Re-installing the C1000 layout files

1. Insert the disk labelled 'Layout files' into the disk drive
2. Switch to the floppy disk drive (usually A) by typing **A: <ENTER>**
3. Type **copy *.* C:\C1000 <ENTER>**
4. All files on the disk will be copied into the C1000 directory
5. Type **C:\C1000 <ENTER>** to return to the main directory.

Troubleshooting

If you are still having problems getting the C1000 to work, check the Config.sys and Autoexec.bat files. Examples of typical files are shown below. Should you require any further assistance please contact your nearest sales outlet.

Config.sys file

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE RAM
BUFFERS=15,0
FILES=30
DOS=UMB
LASTDRIVE=E
FCBS=4,0
DEVICEHIGH /L:1,12048 =C:\DOS\SETVER.EXE
DOS=HIGH
COUNTRY=044,,C:\DOS\COUNTRY.SYS
DEVICEHIGH /L:1,15792 =C:\DOS\DISPLAY.SYS CON=(EGA,,1)
```

Autoexec.bat

```
LH /L:0;1,45456 /S C:\DOS\SMARTDRV.EXE /X
@ECHO OFF
PROMPT $p$g
PATH C:\DOS
SET TEMP=C:\DOS
MODE CON CODEPAGE PREPARE=((437) C:\DOS\EGA.CPI)
MODE CON CODEPAGE SELECT=437
LH /L:1,16656 KEYB UK,,C:\DOS\KEYBOARD.SYS
cd\c1000
c1000 /e
```


Overview

This is a résumé of the C1000 (Ver 5.61) specification. Information on the C1000 has been combined with information on typical Webster sensors to provide an indication of overall system performance.

Accuracy

Flow	1% of Indicated Reading	21cSt	LT Turbines
	1% of Indicated Reading	1 – 40cSt	VT Turbines
	2% of indicated Reading	40 – 60cSt	VT Turbines
Pressure	0.5% of full scale		
Pressure Peaks	1ms peaks captured to 95% to peak value		
Temperature	Within 1°C up to 120°C		
Speed	1% of full scale		

Performance

Inputs	12 Digital (Flow/Speed)		
	16 Analogue (Pressure/Temperature)		
	Plus up to 16 virtual channels		
Memory Scanning/Rate	224,000 (Digital & Analogue) plus 128,000 (Virtual) measurements each test. Analogue Inputs 0.010 ms on one channel. Pulse inputs - period Clock 1MHz.		
Min. rec. time	0.5ms		
Graph reports	Up to four graphs from 44 channels (hard, soft or virtual) inputs can be printed on same graph. Automatic or selectable scaling with variable length graph provides high resolution.		
Selectable Unit:	Flow:	LPM, USgpm, UKgpm, %FSD	
	Pressure:	PSI, BAR, MPa, KSC, %FSD	
	Temperature:	°C or °F	
	Speed:	Hz or RPM	
	Viscosity:	cSt or mm ² /Sec	
	Note:	Virtual channels can be used to obtain Power, Differential pressure, Load etc.	

Data logging

- 1. Continuous Log for Machine Performance testing:**
Accurately records data from all channels (max 44) at a time interval between 0.1 – 1 second and up to a maximum of 8000 blocks per test.
- 2. Periodic Log for long duration tests:**
Continuously records data from all channels (max 44) at a pre-selected time interval between 1 – 600 seconds and up to a maximum of 8000 blocks per test.
- 3. Keypress Log for specific system conditions:**
Continuously displays the active channels and accurately records data from all channels (max 44) each time a key is pressed, up to a maximum of 8000 blocks per test.
- 4. Quick Profile Log for dynamic system testing:**
Records from between 10 to 2,000 readings from between 1 and 4 channels over a time span as low as one second and up to 300 seconds. Recording commences automatically each time a user-defined trigger level occurs.
- 5. On-Line Log:**
Displays graphic and numeric data while the test is being carried out. Selectable screen resolution and graph scaling. The screen can be updated every 0.2 seconds

Pressure inputs

All 16 channels can be read in 100 milliseconds.

For **Shock Pressure Curves** select 'Quick Profile Test'. 4 channels can be graphed with the following response times:

Up to 2 channels and 2000 readings in 1 second – i.e. 0.5ms

Up to 4 channels and 2000 readings in 2 seconds – i.e. 1ms

For a Peak Pressure curve use a pressure transducer that has a full-scale value suitable for the maximum pressure you require to measure.

NOTE: Peak hold circuit only stores the numerical value of maximum pressure, with 2 to 1 over range. This can be displayed as a bar chart or numerical value. It cannot be data logged or graphed.

Two peak pressures can be specified on the order. These may be selected from any channel. If peak is specified this uses a normal analogue (ADC) channel. The options are as follows:

16 pressure and no peak hold.

15 pressure and one peak hold.

14 pressure and two peak hold.

- **C1000 Brochure**
- **ViscoCorrect™ Data Sheet**

Notes:

