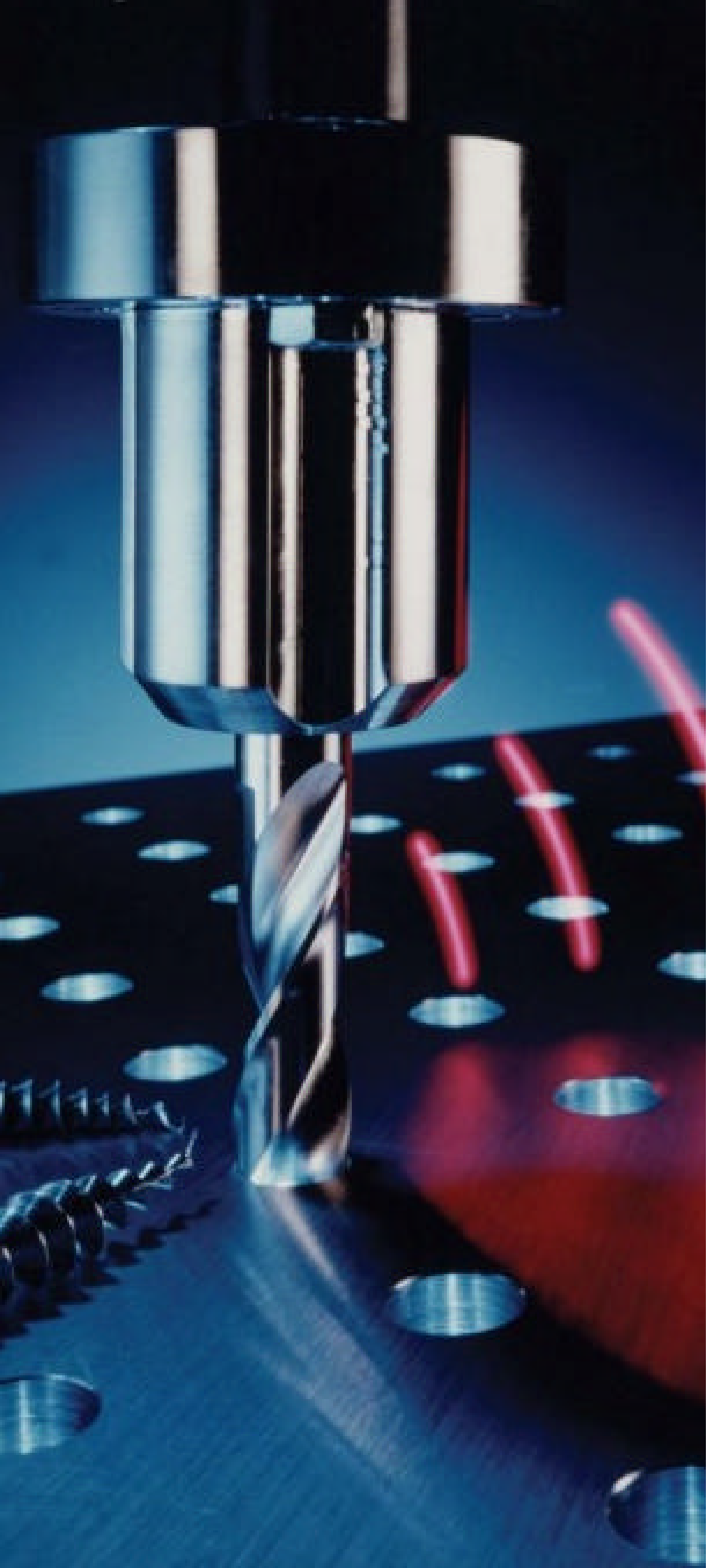


KISTLER

measure. analyze. innovate.

Instruction Manual

Dynoware
Type 2825A1-2

B19.2825Ae-06.02

Foreword

This manual is written for the data acquisition, analysis, and presentation software version V2.3x for Kistler Dynamometers. We think the Dynoware package will be easy to learn and use, yet powerful enough for your requirements.

Information in this document is subject to change without notice. Kistler reserves the right to change or improve its products and make changes in the content without obligation to notify any person or organization of such changes or improvements.

Kistler Instrumente AG
Postfach
CH-8408 Winterthur
Schweiz
Tel. +41 52-224 11 11
Fax +41 52-224 14 14
info@kistler.com
www.kistler.com

Your competent distributor:

Content

1. Introduction

We thank you for choosing a Kistler quality product. Please take the time to thoroughly read this instruction manual. It will help you with the installation, maintenance, and use of the Dynoware system.

Dynoware is an easy-to-use data acquisition and manipulation program. The typical Windows controls apply to the graphs and dialog boxes in Dynoware. This section will give you a quick overview of the capabilities of Dynoware.

The menu bar is your access to all areas of Dynoware. It is divided into sections covering specific functions such as file handling, data acquisition configuration, hardware configuration, data viewing, window control, and obtaining help. In addition to the menu bar, there is a toolbar similar to those found in major word processing and spreadsheet programs. The toolbar consists of icons that execute a specific function when clicked.

The user has full control over data acquisition. Sampling rate and length of trials, as well as amplifier range and trigger options are all easily accessible. The units of data acquisition can be customized to the desired physical data being measured.

The graphs are designed to be easy to read, and can be fully customized. The number of graphs to view is flexible, along with default parameters so each trial is readily viewed in a format that is most useful to the user.

If you have questions at any time while in Dynoware, simply press the F1 key and the Dynoware on-line help window appears. Help is also available from the menu bar.

Kistler offers a wide range of products for use in measuring technology:

- Quartz crystal sensors for force, torque, strain, pressure, acceleration, shock, vibration and acoustic-emission
- Piezoresistive pressure sensors and transmitters
- Signal conditioners, indicators and calibrators
- Electronic control and monitoring systems as well as application-specific software for measuring technology

Kistler also develops and produces measuring solutions for the application fields engines, vehicles, manufacturing, plastics and biomechanics.

Our product and application brochures will provide you with an overview of our product range. Detailed data sheets are available for almost all products.

1.1 Getting Software Help

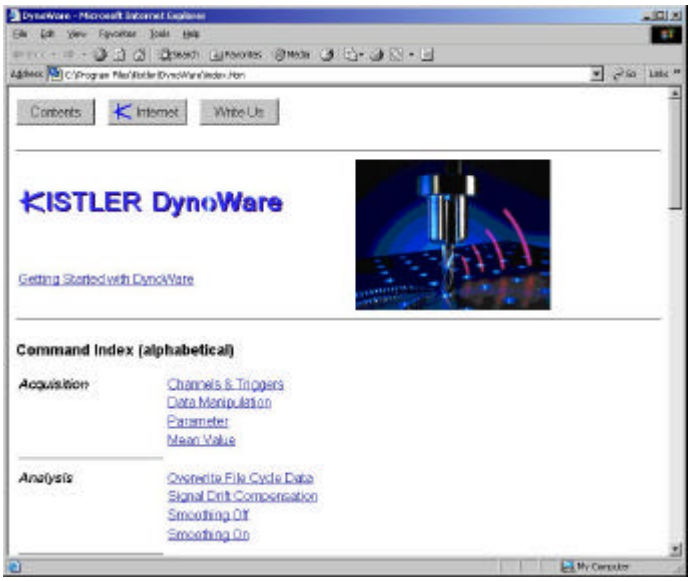


Figure 1.1: Help is available by pressing the F1 key or by selecting the Help from the menu

Dynoware software takes advantage of the HTML on-line help system to offer you quick assistance at the touch of a button. You will need Microsoft Internet Explorer Version 5.01 of newer, or comparable browser to view the HTML help. To receive immediate help from wherever you are in Dynoware, press the F1 key and a window will pop up with specific advice about where you currently are in the software.
Help is also accessible through the menu bar found at the top of the screen.

If you need additional help beyond what can be found either on-line or in this manual, please contact Kistler's extensive support organization.

1.2 Customer Support

The worldwide Kistler service organization is available for any special questions or problems that you may have after your careful study of these instructions. Note, refer to sections 1.3 through 1.6 for general policies on customer support. Before you call, please be ready to fully explain your problem. If you are experiencing a problem with Dynoware software, please try to duplicate the problem and take a snapshot of the screen by pressing the "print screen" button. This copies the screen to the clipboard so that it can be pasted into a word processing program and printed. You can fax or mail this picture to Kistler, or e-mail the data file to us via Internet.

Our Internet e-mail address for Dynoware support is: force@kistler.com

1.3 Service and Assistance

The customer is responsible for proper Dynoware installation and operation. Dynoware must be installed as per instructions provided in sections 4 and 5. If modifications to these instructions are necessary for a particular purchaser site, Kistler recommends the purchaser contact a

Kistler representative for input and advise regarding these changes.

Installation problems and subsequent system performance difficulties can be adverted by timely communication. Often, questions can be answered through email or telephone conversations. The purchaser is encouraged to email or call the appropriate Kistler organization in the event of such questions.

We welcome comments and suggestions for future features and enhancements. Please email all suggestions to force@kistler.com

1.4 License Agreement

Please refer to the Software License Agreement packet containing your Dynoware software and to the license presented during installation. This packet thoroughly details the Software License Agreement.

Dynoware is protected by the copyright laws that pertain to computer software. It is illegal to make copies of the software or documentation except for backup purposes. It is illegal to give software or documentation to another person or institution. The software contains trade secrets and in order to protect them you may not decompile, reverse engineer, disassemble, or otherwise reduce the software to human-perceivable form. You may not modify, adapt, translate, rent, lease, or create derivative works based upon this software or documentation.

You may permanently transfer the software to another user provided you notify Kistler in advance, transfer the documentation and all disks, and notify the new user of the terms and conditions of the license agreement.

1.5 Warranty

Kistler warrants Dynoware to be free from defects in material and workmanship as stated in the software license agreement. It is warranted only under normal use and service. The period of warranty is twelve (12) months from date of shipment.

When returning items under warranty, said equipment shall be returned to Kistler Instruments prepaid. Full details relative to the claim or malfunction shall accompany the shipment. No action will be taken until these details are received. Please contact Kistler or your Kistler

representative for a Return Authorization Number before returning goods.

Settlement will be made at Kistler's discretion, either through repair or replacement of the item in question or through issuance of full credit. Damage occurring through misuse or mishandling, will not be covered by this warranty.

This warranty is in lieu of all warranties expressed or implied, and of all obligations or liabilities on the part of Kistler Instruments for damages following the use or misuse of items supplied. Any unauthorized disassembly or attempt at repair shall void this warranty.

No agent or representative is authorized to assume for the Corporation any liability except as set forth within this warranty document.

1.6 Claims

Claims relating to goods delivered must be made within 14 days of receipt of goods. After fault determination by Kistler, settlement will be made either by the carrier, insurer, or Kistler. Means will be through replacement, repair or credit.

2. Important Information

Please practice common sense safety rules at all times.

2.1 For your Safety

Prior to any installation and repair work or cable changes, you must disconnect all power sources from the instruments.

Observe all local safety regulations concerning the handling of line-powered electrical and electronic equipment.

When it must be assumed that safe operation is no longer possible, the computer, charge amplifier, etc. must be taken out of operation and secured against unintentional use.

Whenever opening covers or removing parts, except where this can be done by hand, use caution where parts under hazardous voltage are exposed.

2.2 Warning

Any breakage of the ground conductor inside or outside the instruments, or loosening of the ground conductor connection may render the instrument dangerous.

The power plug must be inserted in to a socket with a ground connector. The protection must not be nullified by an extension line lacking a protective ground connector.

When changing the signal conditioner fuses, only the standard type with the specified amperage rating must be used. Use of repaired fuses or short-circuiting the fuse holder is expressly forbidden.

2.3 How To Use This Manual

Whether you are a novice at computers or a long time programming expert, you will be pleased to learn how quickly and easily you will become familiar with the operation of Dynoware. This manual will take you through the installation and setup of the Dynoware software, and a complete reference to all of the features of this software.

If you are eager to begin operation of Dynoware we recommend section 5 of this manual for a quick start guide. Remember that on-line help is always available by pressing the F1 key from anywhere in the software.

3. Description of Dynoware

3.1 General

Dynoware is a general-purpose data acquisition and display software package suitable for cutting force and general dynamometer applications. It is designed to combine the performance of the proven line of Kistler quartz dynamometers with modern computer technology. Dynoware lets you quickly setup, record, and display reaction forces and moments.

All components have been included with the system (i.e., software, cables, and A/D board). If a computer is included with your system, the Dynoware software is already installed on it and you can skip the software installation portion of this manual.

Figure 3.1: The Dynoware splash screen appears for a few seconds when the application starts

The Dynoware system can consist of many components, each specific to the user's application. These include:

- Dynamometer
- Charge amplifier
- Measurement Computing Inc. DAS-1602 or compatible A/D board
- Dynoware software and manual
- All necessary cabling.

A computer can be purchased with the software and A/D board pre-configured.

3.2 System Requirements

In order to effectively use Dynoware software you will need to have an IBM-compatible personal computer that meets or exceeds the following recommendation. Dynoware may not run properly if these computer

specifications are not met. The overall system performance is dependent on the selection of hardware.

Recommended Computer Specifications:

- IBM PC Pentium II 500 MHz or 100% compatible computer
- 32 Megabytes RAM minimum, 64 Megabytes recommended
- Hard Disk Drive with at least 100 Megabytes available for data storage and software installation
- CD-ROM
- Microsoft Windows 95, 98, NT 4.0, 2000 or ME
- 1 available expansion slot for the data acquisition board. ISA, PCI, and type II PCMCIA bus versions of the A/D boards are available
- Microsoft compatible mouse
- A color printer is recommended for creating hard copies of graphs

4. Installing Software

This chapter will show you how to install the data acquisition board, the Dynoware software, configure the data acquisition hardware, as well as hook up the cable from the A/D board to the signal conditioner.

4.1 Dynoware Software Installation

Dynoware software consists of one CD-ROM media disk containing an automatic installation procedure. If a computer was purchased as part of the Dynoware system, then the software is already installed and the enclosed Dynoware CD-ROM should be stored in a safe place as a backup. To install Dynoware perform the following procedure:

1. Insert Dynoware Disk into your CD-ROM drive.
2. (If your CD-ROM is setup to auto play you can skip this step) From the Start menu, choose **Run**, In the dialog box, type "d\:readme" (without the quotes) substitute your CD-ROM drive letter for "d" above, Choose OK.
3. The "readme.exe" program presents general information on installing Dynoware. We recommend reading this information prior continuation. Select the <click here> option under the desired language.

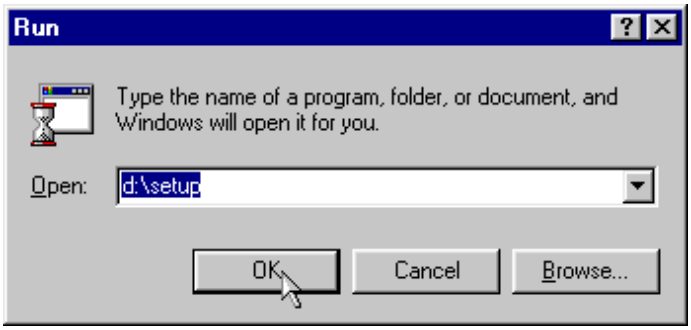


Figure 4.1: Running the setup program

Installation Note:
You may run the setup program directly by entering "d:\setup" from the **Start** ® **Run** windows dialog box.

The main Dynoware installation screen will present you with links to the three installable components: The Dynoware main application, the Runtime License driver installation, and the Data Acquisition board driver installation.

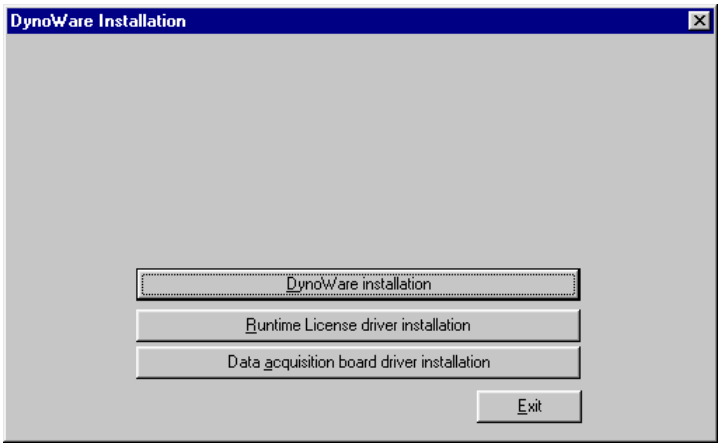


Figure 4.2: Main Installation screen

Select **Dynoware installation** and follow the instructions to review the license agreement and to install the main application.

After Dynoware is installed, the main installation dialog box will reappear (it may take a few seconds). **Select Runtime License driver installation** and follow the instructions to install the runtime license (HASP key). If you do not install the Runtime License, Dynoware will operate in only in a feature limited demonstration mode.

Next, select the Data acquisition board driver installation to install the Measurement Computing Inc. drivers for the data acquisition board. Follow the instructions on screen to install the driver. At the end you will be prompted to reboot the computer.

4.2 HASP Key installation

The HASP key is a Runtime License hardware key that enables Dynoware to operate in full feature mode. The HASP key should be installed onto the 25 pin D-Sub parallel port connector of your computer. The readme.exe notes provide detailed information on installing the HASP software.

4.3 Data Acquisition Board Installation

The data acquisition board should be installed by someone who is familiar with installing computer peripherals and familiar with the insides of a computer. If you are unsure how to open your personal computer or if your system is warranted under a service contract, please have a qualified technician install the board.

Installation Note:
The installation CD-ROM contains board specific Installation Technical Notes for the various A/D boards supplied by Kistler. See these technical notes as well as the information below. The procedure to install and configure the board is highly dependant on the specific board purchased with Dynoware.

Warning:
Make sure to disconnect the power source from your computer before opening it.

Warning:
Protect the system and A/D board from static discharge by touching the computer chassis to ground yourself prior to handling the A/D board.

4.3.1 PCIM-DAS1602/16

The following steps are recommended for A/D board installation:

1. See technical note K20.302-4e PCIM-DAS1602.pdf contained on the installation CD for detailed information.
2. With the power off and the power cord unplugged, remove the computer PC cover to gain access to the system's expansion slots. Avoid touching any components inside the PC.
3. Touch the metal computer chassis prior to handling the A/D board to avoid inducing static shocks.
4. Set the on board switch to BIP (bipolar) (see your board manual).
5. Set the on board switch to 8 channels (differential).
6. Select an available PCI slot, and remove the back plate metal covers with a screwdriver.
7. Carefully insert the A/D board into the slot making sure that it seats correctly into the computer. Replace the slot cover screw, fastening the edge of the board to the chassis of the PC.
8. With the A/D board properly installed, replace the cover of the computer and tighten the screws.
9. Restart the computer. The board will be auto-detected by the Plug-and-Play operating system. When prompted for the driver, insert the Dynoware CD-ROM and locate the CBI95.INF file.

4.3.2 PC-CARD-DAS16/16

The following steps are recommended for A/D board installation:

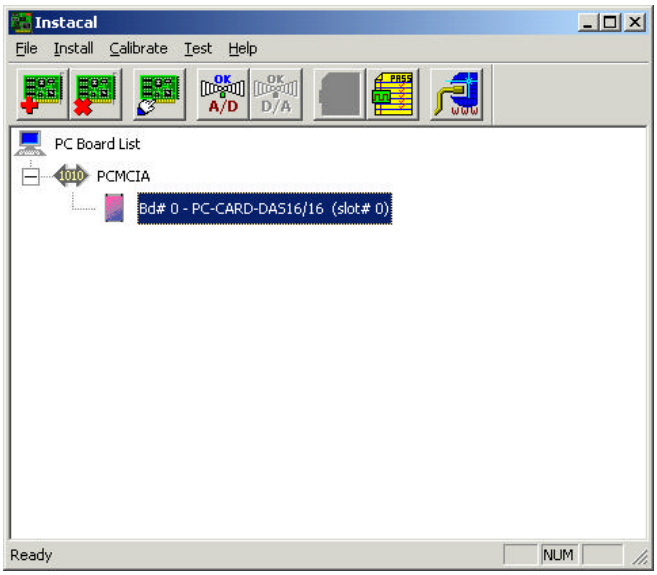
1. See technical note K20.302-6e PC-CARD-DAS16.pdf contained on the installation CD-ROM for detailed information.
2. With the power on and Windows running, insert the PC-CARD-DAS16/16 into a PCMCIA type II slot.
3. Windows will recognize this device as a new device and will prompt you to enter the disk with the manufacturers drivers. This is the CD-ROM with the

Dynoware installation program and containing the file CBI95.INF. Place the disk in the drive and continue.

4. Windows will load the necessary PC-CARD drivers and configure the PC-CARD-DAS16/16.

Installation Note:
Any time the PCMCIA or PCI cards are remove and reinserted, the INSTACAL program will need to be run.

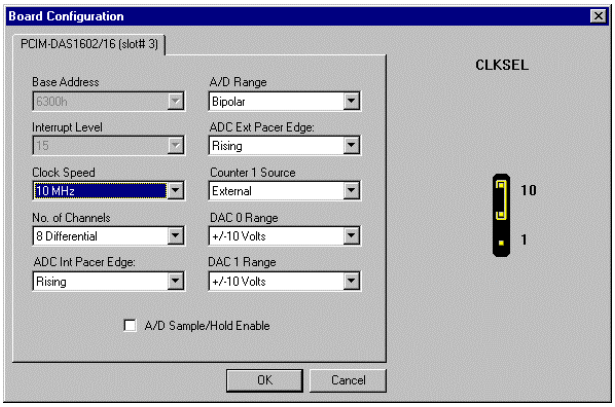
4.4 Data Acquisition Board Software Configuration



The Data acquisition board driver software needs to be configured using the board configuration program Instacal (found in the Measurement Computing program group). This program will configure the data acquisition drivers for the board. Locate the Measurement Computing program group and select the Instacal icon to start the data acquisition board configuration program.

Figure 4.3: Instacal board configuration program

Note:
The Instacal board configuration program will automatically identify and plug-and-play capable data acquisition boards. Manually add any non-plug and play boards.



Instacal will automatically identify any installed plug and play boards. Any non plug-and-play board will have to be manually added by selecting the Install menu option and then selecting the desired board from the list. Instacal should be run any time a board is removed from a computer (even for PCMCIA card boards).

Figure 4.4: Configuration for the PCIM-DAS1602/16

Note:
Dynoware will use the board configured in Instacal as board zero. By default, the "DEMO-BOARD" is installed as board zero. Remove the "DEMO-BOARD" and reconfigure the desired board to be zero. (See section 4.5 below)

Once the board is installed it will need to be configured. Right click on the board and select **Configure…** or double click the board.

4.4.1 PCIM-DAS1602/16

See technical note K20.302-4e PCIM-DAS1602.pdf contained on the installation CD-ROM for detailed information.

The following parameters should be set:

Channels	Select 8 channels, differential mode (note: Instacal setting must match hardware switch setting).
Input Mode	Bipolar (note: Instacal setting must match hardware switch setting).
Clock Speed	Select 10 MHz (note: Instacal setting must match hardware switch setting).

4.4.2 PC-CARD-DAS16/16

See technical note K20.302-6e PC-CARD-DAS16.pdf contained on the installation CD-ROM for detailed information.

The following parameters should be set:

Channels	Select 8 channel differential mode (note: Instacal automatically controls hardware setting).
Input Mode	Bipolar (note: Instacal automatically controls hardware setting).
Clock Speed	Select 10 MHz (note: Instacal automatically controls hardware setting).

4.5 Set the board number to zero

Dynoware operates using the Instacal board configured as board number zero. By default, "DEMO-BOARD" is installed as board number zero. Right click the board zero "DEMO-BOARD" and select either D**elete** (to remove it completely) or **Change Board#** to reconfigure it at a different board number. Then Right click the desired board

and select **Change Board#** to reconfigure it as Board zero. Your board is now properly configured to operate with Dynoware.

The A/D bits, Available channels, Acquisition mode and Maximum Channels will be automatically set reflecting the board type selected. The gain can be selected in Dynoware to your specifications. The gain setting changes the scale on the board itself, so the lower the scale means the better the resolution. However, it also means a lower overall measurement force range, so the user must be careful not to choose too high of a gain such that saturation occurs (i.e., be sure the forces to be measured do not exceed the measuring range of the system. If this occurs, choose a lower gain such as ±10 V).

4.6 Executing Dynoware

To execute Dynoware, open the newly created Kistler Group in the Programs extension of the Start Menu and click on the **Dynoware** icon.
It is possible to change the program language, see section 7.2.

4.7 Connecting the Cables

There is one (1) 37-pin cable that connects the junction box or amplifier to the data acquisition board. To properly connect the cable:

1. Shut down the computer and Turn off the power to the computer and the amplifier.
2. Connect the 37-pin cable from the A/D board to the junction box or amplifier.
3. Be sure to tighten any cable-fastening screws by hand to secure the cable connections and prevent slippage (do not over tighten).
4. Turn the amplifier and computer on.

If the cables are not long enough, additional cables could be connected to the original ones to extend their lengths. Excessively long cables are not recommended because insulation may not be adequate to prevent interference and loss of signal.

4.8 Important Issues Regarding Piezoelectric Force Dynamometers

Please take care to follow these rules applying to installation and handling of dynamometers and connections:

- Protect the signal conditioner and cable connector ends from dust and moisture. Close end caps.
- Dynamometer mountings must be level and properly secured.
- Use caution connecting and removing the cables. Also take care to not step on the cable connections to avoid shearing off the cable.

4.9 Charge Amplifiers

Dynoware automatically controls the range selection, filter selection and operate/reset functions of several types of Kistler charge amplifiers. Charge amplifiers should be allowed to warm up sufficiently for most accurate measurements, with 30 minutes being a minimum. Unplug the amplifier if it is not to be used for a very long time.

5. Quick Start

This section will help familiarize the new user with Dynoware.
Data cannot be acquired until the hardware is properly configured. This section is meant as an overview to the features of Dynoware that will be applied to acquired trials and graphs once the proper configurations have been performed. For more information on configuring Dynoware, refer to section 6.2.

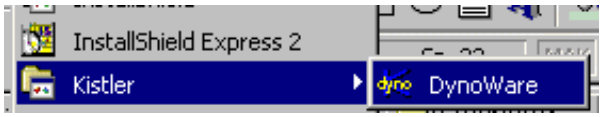


Figure 5.1: Running Dynoware from the **Start** menu

Start Dynoware by choosing:
Start ® **Programs** ® **Kistler** ® **DynoWare**.

The splash screen appears briefly. The splash screen (Figure 5.2) shows current application version and product type information.

Figure 5.2: The Dynoware Splash Screen

The File menu allows you to open stored trials, print, save, export, manage configurations and exit the program. The print setup can be customized here also. Feel free to open some of the supplied trials and manipulate them to help familiarize you with the program's capabilities.

The Acquisition menu is where hardware is configured and where acquisition is performed. Choosing Acquisition → Hardware will bring up the Hardware Dialog Box (Figure 5.3) showing the configuration settings. Choosing Acquisition → Setup allows the user to configure data acquisition specific parameters (Figure 5.4). Acquisition → Start will begin the acquisition process.

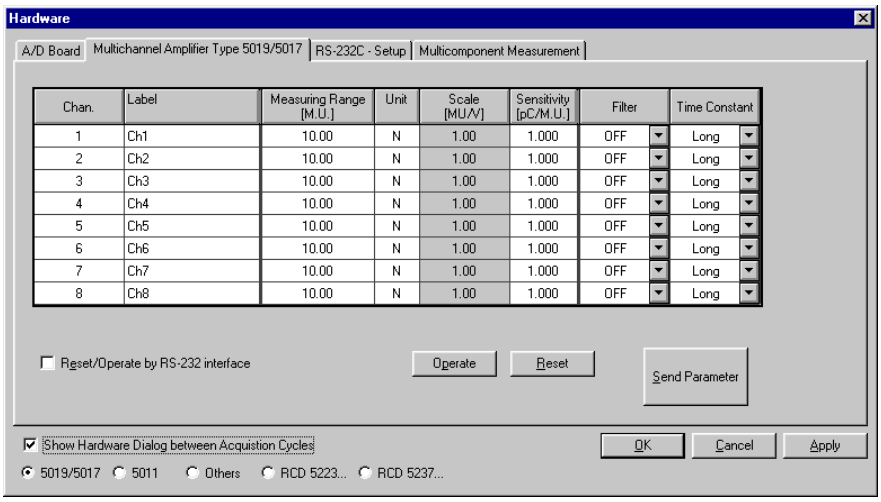


Figure 5.3: Hardware Configuration Dialog

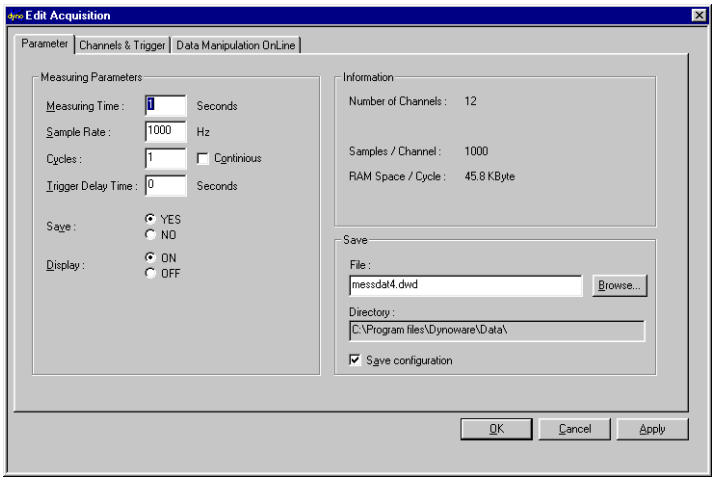


Figure 5.4: Acquisition Edit

The **View** menu allows the user to configure Dynoware graphic preferences and to edit the trial documentation. Selecting **View → Setup** (section 6.3.3) allows configuration of the default graphs that appear when a file is opened or a trial is acquired. With **View → Edit** the content of an individual graph can be changed (6.2.2).

Double clicking on a specific feature of the graph (title, legend or axis title) provides editing capability.

The view can be changed at any time without adversely affecting the data in any way. A user may also zoom the displayed area, enable/disable grid lines, display a moving cursor, and edit labels and documentation information from the View menu.

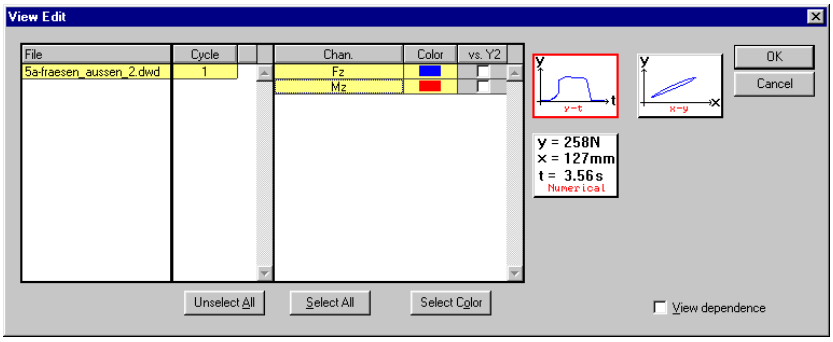


Figure 5.5: View Edit

The Analysis menu gives options for filtering data and removing signal drift. Refer to the online help system for detailed information on these topics.

The Tools menu provides two methods for displaying real-time voltage data: Oscilloscope and Voltmeter. These tools are designed for simple troubleshooting of the system.

The other menu that appears when a graph is shown is the Window menu. The Window menu uses standard Microsoft Windows commands to arrange active windows.

6. Reference

This section describes the menus used in Dynoware.

6.1 File...

Depending on whether or not a graph is open on the screen, the File menu will have a different appearance. If no graph is open, there will only be commands to open, load/save configurations, export data and exit Dynoware.

6.1.1 Open...

This will bring up a open file open dialog box (Figure 6.1: File Open) where the desired trial can be selected for viewing. The default directory is the data directory, though the dialog box can be easily navigated using standard Windows techniques to browse other drives, directories, and network computers. The extension for the trials are "*.dwd". Files stored in Dynoware 1.x format will automatically be converted and loaded.

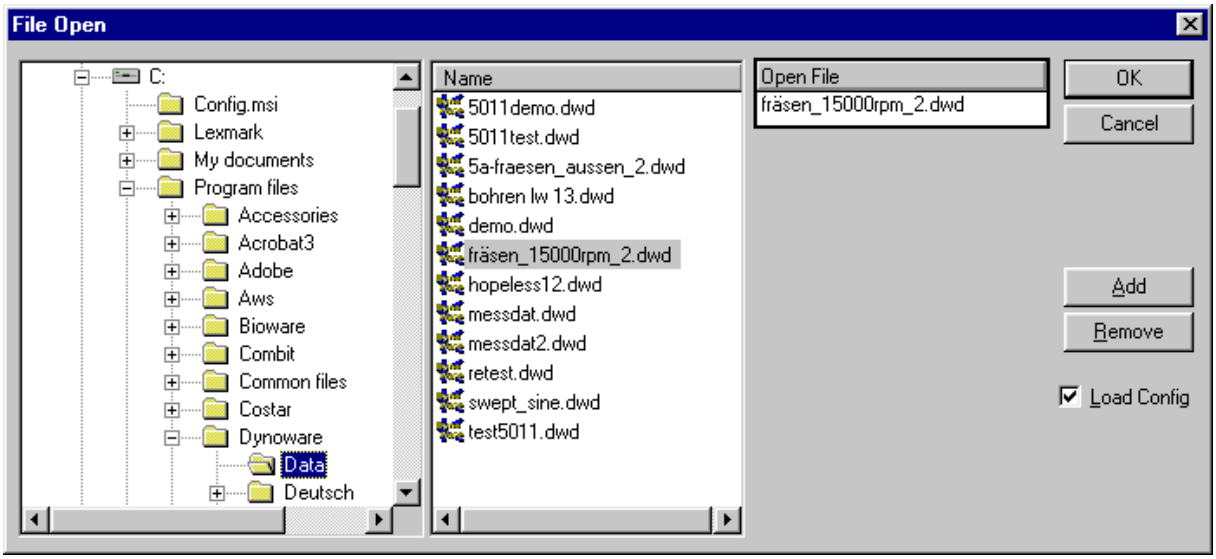


Figure 6.1: File Open

The **Add** button will add the selected file (as will double clicking it in the Name list) to the Open File selection. The **Remove** button will clear the Open File selection.

If a valid configuration file exists, the **Load Config** check box will be available and the user can choose to load the configuration options associated with the file (hardware setup, data acquisition, and view setups). If a configuration was not stored for the data file, this option will be disabled and appear grayed out.

6.1.2 Configuration...

The Hardware, Data Acquisition and View settings can be loaded or stored to a file. The default extension for configuration files is "*.cfg".

6.1.2.1 Load...

To load the Hardware, Data Acquisition and View settings from a configuration file select Configuration Load. This will overwrite the existing Dynoware configuration settings. A standard Windows file open dialog box (Figure 6.2) will be presented to select the appropriate configuration file to load. To load a configuration file automatically when a data file is opened enable the **Load Config** option in the File Open dialog box (See section 6.1.1 above).

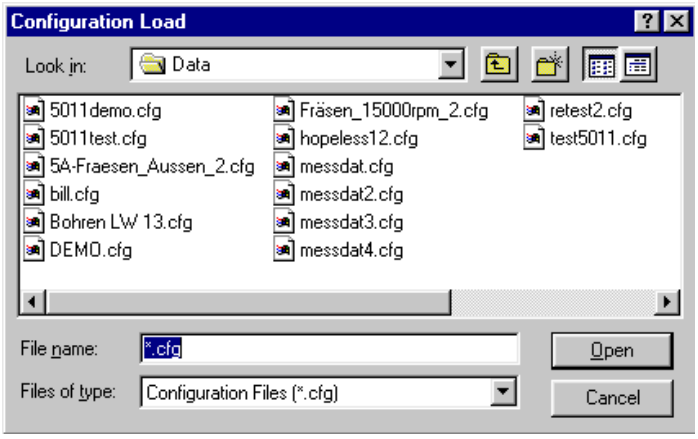


Figure 6.2: Configuration Load

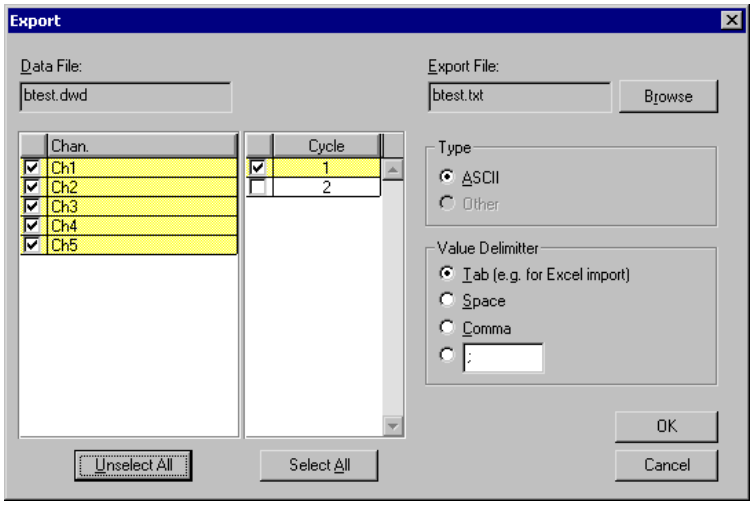
6.1.2.2 Save...

To store the Hardware, Data Acquisition and View settings to a configuration file select Configuration Save. A standard Windows file save dialog box will be presented to select the appropriate configuration file name to save the current settings to. The default extension of configuration files is "*.cfg". Configuration files can be saved automatically by checking the **Save configuration** option in the Acquisition Edit dialog box (See section 6.2.2)

6.1.3 Export...

Files may be exported to ASCII delimited text files by selecting File Export (e.g. for further evaluation in Microsoft EXCEL). The Export Dialog (Figure 6.3) allows for the selection of the cycles to export, and the channels to export. The user can also select the data delimiter or enter a user-defined delimiter.
The Browse button allows the user to use the standard windows file chooser dialog box to select the destination Export file name. Another box pops up to display export

progress. An example of an exported file is shown below. Use the **Select/Unselect All** buttons to select or clear export selection for channels and cycles in the trial.



Note, if the tab delimitation is selected, the file can be imported directly by Microsoft Excel using the default import options of Excel.

Figure 6.3: Export Dialog

Example of an exported file:

File Header Information

File Header Information

File Data

FILE TYPE:		
Path:	C:\DynoWare_Data\IPL-Tagung\	
Filename:	5A-Fraesen_Aussen_2.dwd	
Config ID:	5A-Fraesen_Aussen_2.cfg	
Setup ID:	0	
Manipulated:	0	
Filename 1:		
Filename 2:		
Date:	Monday, 12 September , 2000	
Time:	13:43:19	
Sampling rate [Hz]:	3000	
Measuring time [s]:	90	
Delay time [s]:	0	
Cycle time [s]:	0	
Cycles:	1	
Samples per channel:	270001	
Cycle interval:	0	
Channel enabled:	1	1
Cycle No:	1	
Time [s]	Fz	Mz
0	-2.83203	2.44E-03
3.33E-04	-3.11523	-4.88E-03
6.66E-04	-3.11523	-2.44E-03
1.00E-03	-3.11523	-2.44E-03
1.33E-03	-2.83203	-2.44E-03
1.67E-03	-2.54883	-2.44E-03
...	...	...
2.67E-03	-2.54883	-2.44E-03

6.1.4 Print...

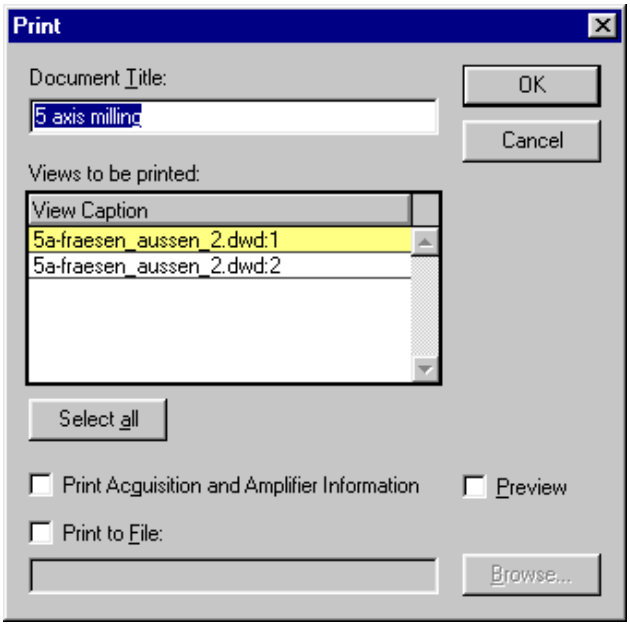


Figure 6.4: Print Dialog

Shortcut: **Ctrl+P**

Print brings up the Print dialog box (Figure 6.4: Print Dialog) using the default print settings. The user selects the views to be printed by clicking on the views in the list and highlighting them yellow. The Document title appears as the default graph title but the user can change the text here. Pressing the Select All button will highlight all open views to be printed. Other options enable the printing of the Amplifier and Acquisition configuration at the bottom of the printout, previewing the printout on screen prior to making a hardcopy, and printing to a file for later viewing.

Some printout information will be disabled if the selected view contains Multiple cycle data.

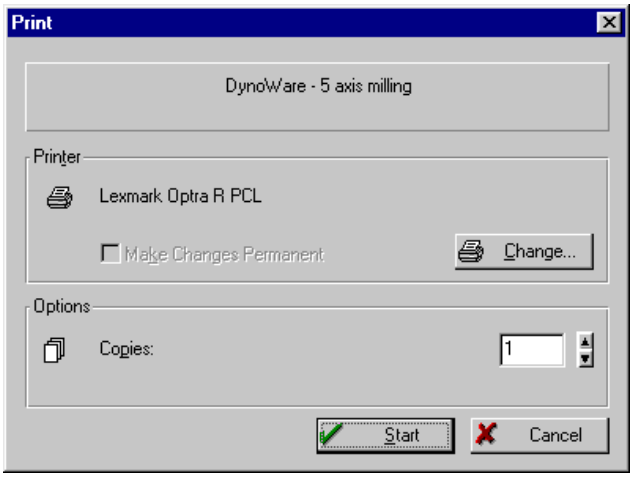


Figure 6.5: Printer Selection

After selecting OK, the Printer selection dialog will appear allowing the user to change the printer and select the number of copies to print.

If the Preview option was checked the print preview screen will appear (see section 6.1.5).

6.1.5 Print Preview

The Print Preview is identical to the Print function above except the output appears on the monitor. This allows the user to see what the printout will look like on the prior to printing (Figure 6.6: Print Preview Screen) so that any necessary changes can be made before the print function is carried out. From this dialog box you can zoom in on the image for a closer look, create a **print file**, directly email a **print file** and execute the hardcopy Print function.

A print file is a special "*.ll" file that can be viewed with a special viewer. The special viewer, LLViewer, is available on the installation CD-ROM in the LLViewer subdirectory or in

the installation directory - by default C:\Kistler\Dynoware\. Run the LLView.exe installation program and follow the onscreen instructions. Files directly emailed will need the LLViewer to view the email contents.

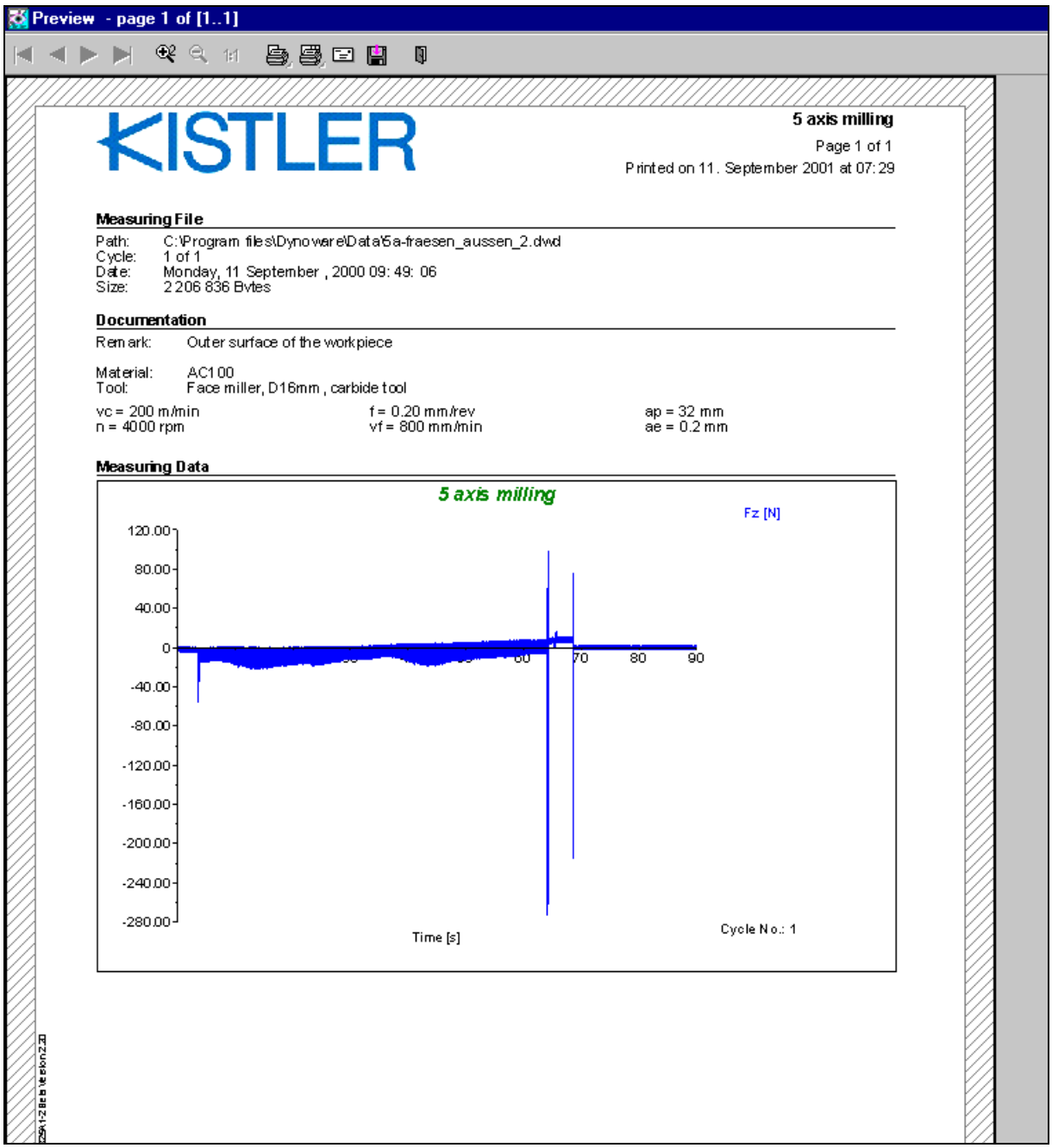


Figure 6.6: Print Preview Screen

6.1.6 Print Setup...

Print Setup... allows the user to configure the printing specifications. Standard setup functions are to select the printer, paper size and tray (if applicable), and the paper

orientation. A Properties button allows to further customize printer settings.

6.1.7 Copy to Clipboard

This will copy the active window contents to the Windows clipboard. The graph can then be pasted into a word processing or spreadsheet application as a graphic.

6.1.8 Exit

Exit closes Dynoware. Since changes to the data are continuously stored in the file, no extra question is necessary about saving changes.

6.2 Acquisition...

The Acquisition menu is where all data acquisition and hardware configuration is performed.

6.2.1 Hardware...

Shortcut: **Alt+H**

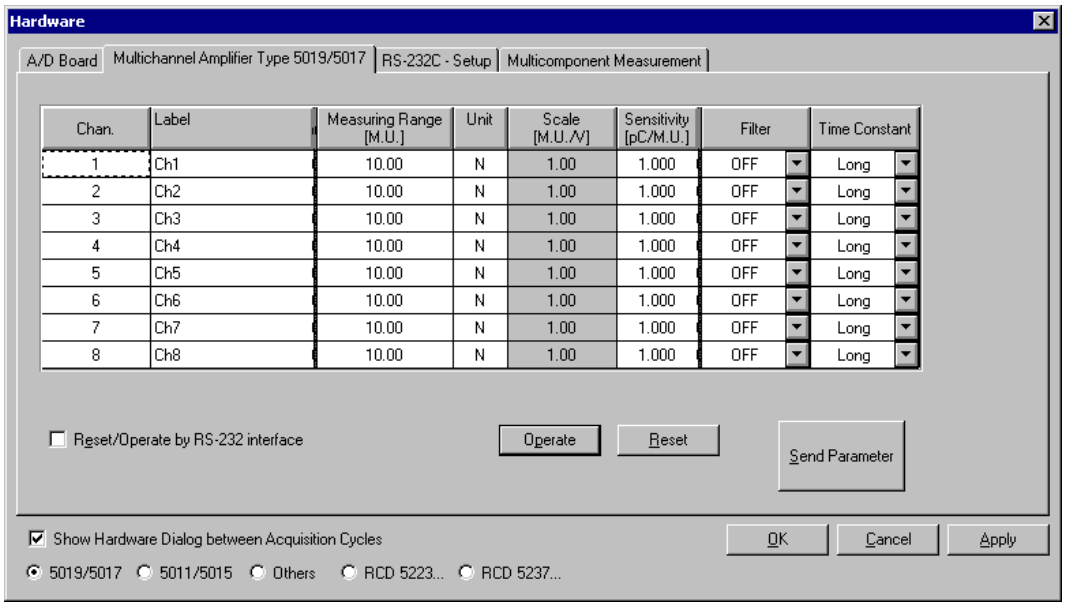
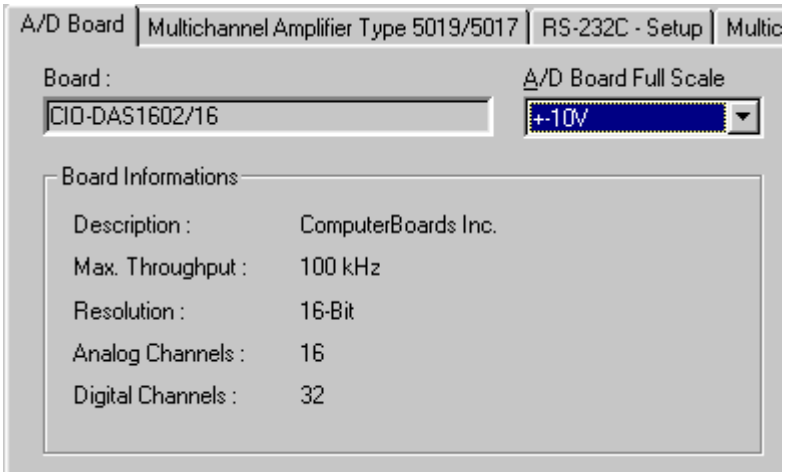


Figure 6.7: Hardware configuration

The Hardware dialog box (Figure 6.7: Hardware configuration) allows the user to customize specific equipment used in the system. The dialog has several different tabs dependent upon the specific amplifier configured in the system. There are five major items that can be configured: The A/D board, The amplifier, The amplifier communication interface, The dynamometer, and

the specific calculations to be performed with dynamometer data.

6.2.1.1 A/D Board



The A/D board is automatically selected from the Instacal board configuration program from Measurement Computing (see section 4.4). This tab (Figure 6.8: A/D Board) shows the configured A/D Board (board 0 in Instacal) and allows the user to edit the A/D board gain selection (A/D Board Full Scale measurement range in volts).

Figure 6.8: A/D Board

Information displayed is:

Board	Displays the A/D Board that is configured in the Instacal program.
Full Scale	The Full Scale input defines the resolution of the A/D Board: Small Full Scale = more resolution per volt, Note: All input voltage signals to the board must be smaller than the defined Full Scale.
Description	Description of the A/D Board manufacturer.
Max. Throughput	Displays maximum throughput of the A/D Board.
Resolution	Displays resolution of the A/D Board.
Analog Channels	Displays the maximum number of the analog channels available.
Digital Channels	Displays the maximum number of the digital channels available.

6.2.1.2 Show Hardware Dialog between acquisition cycles

If enabled, the hardware dialog will appear prior to acquiring data for a cycle. The checkbox enables or disables this option. Only changes to the amplifier settings, and operate reset state are allowed once placed into the data acquisition mode. Select the **Acquisition → Hardware option** to re-enable this option, or to make extended changes to the configuration.

6.2.1.3 Amplifier Selection

The user should first choose the amplifier selection (Figure 6.9: Amplifier Selection) from the bottom of the dialog, Supported amplifiers are the 5017/5019, 5011/5015,

Rotating Cutting Dynamometer 5223, High Speed Rotating Cutting Dynamometer 5237 and Other user defined amplifiers. This selection will modify the available tabs for setting other specific hardware settings.

Figure 6.9: Amplifier Selection

6.2.1.4 Configurations using Amplifier 5017/5019

Selecting 5019/5017 in the amplifier selection (see section 6.2.1.3 above) will enable the multichannel 5017/5019 tab, the RS-232C Setup tab, and the Multicomponent Measurement tab.

6.2.1.4.1 Multichannel Amplifier 5017/5019

The multichannel configuration tab allows for customization of the 5017 or 5019 multichannel charge amplifier. There are several configurable parameters associated with this amplifier:

Chan	Channel number displays the specific channel number ranging from 1 up to 8.
Label	Enter a label of each channel. This label will appear on graphs and reports.
Measuring Range	Enter the Measuring Range (Maximum measurable amount) [M.U.] of each channel (M.U. = Mechanical Unit).
Unit	Enter the display units of each channel.
Scale	The Scale setting for the amplifier is automatically determined from the Measuring Range and the full scale output capability of the amplifier. Scale [M.U./V] = Measuring Range [M.U.] / 10.0 V
Sensitivity	Enter the sensitivity of a sensor (see calibration sheet).
Filter	Select the desired Low Pass filter (internal filter in the signal conditioner) to be used.
Time Constant	Select the desired High Pass filter Time Constant (internal signal filter in the signal conditioner) to be used.
Operate	Transmit the command to place the amplifier into the operate mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for Sensitivity, Range, Filter, and Time constant settings.
Reset/Operate	Enable the automatic control (via RS-232C interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this

automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.4.2 RS-232C Setup

The RS-232C configuration should be properly configured using the RS-232C Setup Tab for the 5017 or 5019 to function properly.

Serial Port	Selects the COM port used to control the signal conditioner. This is the port on the pc where the serial cable is connected.
Baudrate	Selects the data transmission rate used to communicate with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Data Bits	Selects the number of data bits used in the data communication protocol. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Stop Bit	Selects the number of stop bits in the data transmission protocol. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Parity	Selects the parity checking used during communication with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.
Handshaking	Selects the handshaking method used during communication with the signal conditioner. This setting must be identical to the setting in the signal conditioner. Refer to the signal conditioner manual to determine the proper setting.

Note:
Typically the communication is configured for COM1, 9600 baud, 8 data bits, 1 stop bit, no parity, and Hardware handshaking.

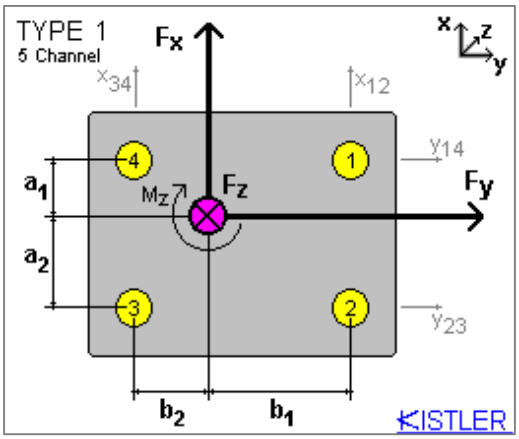
6.2.1.4.3 Multicomponent Measurement

With the multichannel Amplifier Type 5017 and the appropriate hardware, additional software calculations can be performed. These calculations can provide resultant forces and moments for various types of dynamometers, in a variety of applications. If a multichannel calculation is enabled, the user cannot enable/disable channels in the configuration (Section 6.2.2.2). Select the multicomponent calculation type from the list presented corresponding to your specific hardware dynamometer.

6.2.1.4.3.1 Mode Off

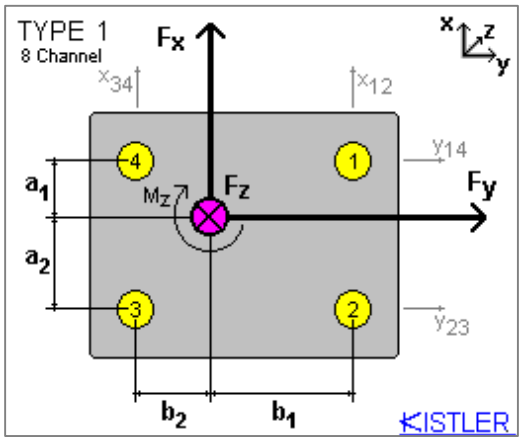
Multicomponent calculations are disabled.

6.2.1.4.3.2 Type 1



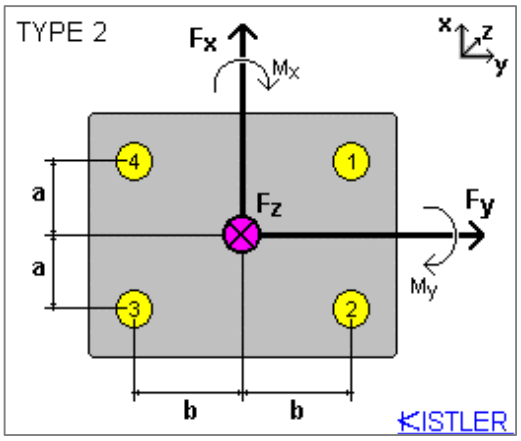
The type 1 dynamometer measures 4 shear components and 1 vertical component. From the raw components F_x, F_y, F_z and M_z are calculated. The user must configure the a_1, a_2, b_1, and b_2 distances.

6.2.1.4.3.3 Type 1a



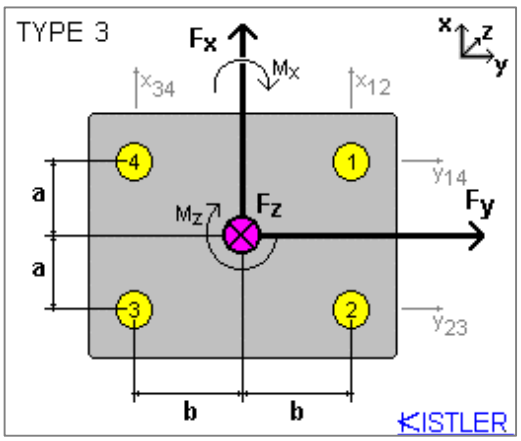
The type 1a dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_z are calculated. The user must configure the a_1, a_2, b_1, and b_2 distances.

6.2.1.4.3.4 Type 2



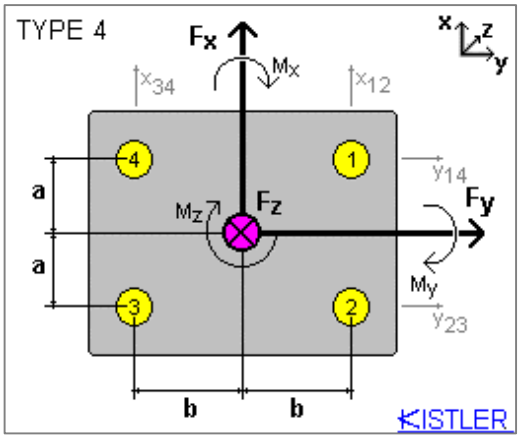
The type 2 dynamometer measures 2 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y are calculated. The user must configure the a and b distances.

6.2.1.4.3.5 Type 3



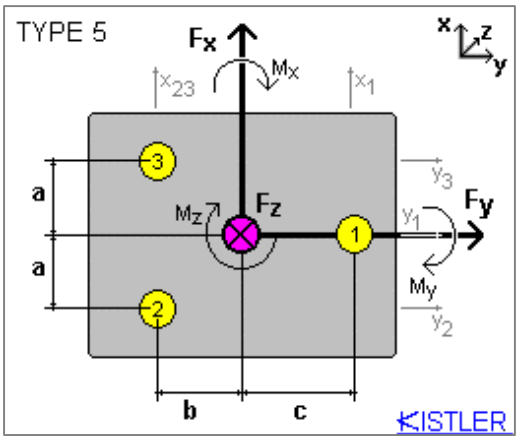
The type 3 dynamometer measures 4 shear components and 2 vertical components. From the raw components F_x, F_y, F_z and M_x, M_z are calculated. The user must configure the a and b distances.

6.2.1.4.3.6 Type 4



The type 4 dynamometer measures 4 shear components and 4 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the a and b distances.

6.2.1.4.3.7 Type 5



The type 5 dynamometer measures 5 shear components and 3 vertical components. From the raw components F_x, F_y, F_z and M_x, M_y, M_z are calculated. The user must configure the a, b and c distances.

Sensor Distances	Enter the appropriate distances between sensors from the drawing given for the appropriate dynamometer type. All distances are entered in Millimeters [mm].
Dynamometer View	This window shows a drawing defining the coordinate system, and sensor layout for the selected dynamometer. Use this as a guide when entering sensor distances, configuring your system, and interpreting data.
Resultant Window	The resultant window shows channel allocation for acquired and calculated channels. This should be used as a guide when configuring graphs.

6.2.1.5 Configurations using 5011/5015 amplifiers

Selecting 5011/5015 in the amplifier selection (see section 6.2.1.3 above) will enable the Charge Amplifier Type 5011/5015 tab.

6.2.1.5.1 Charge Amplifier Type 5011/5015

The following parameters should be set when using 5011/5015 charge amplifiers in Dynoware:

Communications Selection	The user can select the remote control mode, either via RS-232C (in which case only channel one can be remotely controlled) or via IEEE-488 (in which case all channels can be remotely controlled). If RS-232C is chosen, a RS-232 Setup tab will appear to allow custom configuration of the communication parameters.
Channel	Channel number. Channels range from 1 to 8.
Label	Enter a label of each channel. This label will appear on graphs and reports.
Measuring Range	Enter the Measuring Range [M.U.] of each channel (M.U. = Mechanical Unit).
Unit	Enter the display units of each channel.

Scale	The Scale setting for the amplifier is automatically determined from the Measuring Range and the full scale output capability of the amplifier. Scale [M.U./V] = Measuring Range [M.U.] / Amplifier Full Scale Output [V]; (M.U. = Mechanical Unit)
Sensitivity	Enter the sensitivity of a sensor (see calibration sheet).
Filter	Select the desired Low Pass filter (internal signal filter in the signal conditioner) to be used.
Time Constant	Select the desired High Pass filter Time Constant (internal signal filter in the signal conditioner) to be used.
IEEE Address	Enter the IEEE-488 address of the selected 5011/5015. The selected channel address must match the address configured in the 5011/5015. Please refer to the 5011/5015 users manual for information on configuring the IEEE-488 address. Each device must have a unique address. This applies only if IEEE communication mode is selected.
Operate	Transmit the command to place the amplifier into the operate mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameter	Transmit the command to set the appropriate per channel configuration for Sensitivity, Range, Filter, and Time constant settings.
Reset/Operate	Enable the automatic control (via RS-232C or IEEE-488 interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.5.2 RS-232C Setup

(See section 6.2.1.4.2) – This tab will only appear if RS-232C interface is selected.

6.2.1.6 Configurations using Other amplifiers

Selecting Others in the amplifier selection (see section 6.2.1.3 above) will enable the Other tab.

6.2.1.6.1 Others

The other adapter tab allows for generic amplifier configuration. In this setup no specific equipment is controlled. The data provided allows Dynoware to convert data from measured voltages to real mechanical units. The information configured in this tab is:

Channel	Channel number used for configured devices and connections.

Label	Enter the label for each channel. Labels will appear on graphs and reports.
Measuring Range	Enter the measuring Range of each channel (if not activated, use double click or F4). You can either enter an overall measuring range, or an individual range and sensitivity. Measuring Range [M.U.] = Sensor Range [pC] divided by Sensitivity [pC/M.U.] (M.U. = Mechanical Unit).
Unit	Enter the unit of each channel. The configured units will appear on graphs and reports
FS	Enter the full scale (FS) of each channel.
Range 1	Enter the range of the adapter for each channel (activate with double click or F4).
Sensitivity	Enter the sensitivity of a sensor (activate with double click or F4).

6.2.1.7 Configurations using Rotating Cutting Dynamometer 5223

Selecting RCD 5223 in the amplifier selection (see section 6.2.1.3 above) will enable the RCD 5223 tab, the RS-232C Setup tab, and the RCD Calculations tab.

6.2.1.7.1 RCD 5223

The rotating cutting dynamometer requires the configuration of the following parameters:

Channel	Channel number. Channels range from 1 to 6.
Label	Assign labels for each channel. These labels appear in graphs and reports.
Measuring Range	The measuring range is automatically assigned based on the Scale and Sensitivity settings. Measuring Range [M.U.] = Full Scale Output [mV] divided by Sensitivity [mV/M.U.]; (M.U. = Mechanical Unit).
Unit	Assign units to each channel. These labels appear in graphs and reports.
Full Scale Output (FSO)	Assign the full scale setting for the amplifier in [mV].
Sensitivity	Enter the sensitivity of a sensor in [mV/M.U].
Range Selection	Select the desired measurement range.
Zoom Channel	Select the channel to appear as the zoom output channel. You can select F_x, F_z or M_z.
Operate	Transmit the command to place the amplifier into the operate mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for Sensitivity and Range settings, and the zoom channel selection.

Reset/Operate

Enable the automatic control (via RS-232C interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.7.2 RS-232C Setup

(see section 6.2.1.4.2)

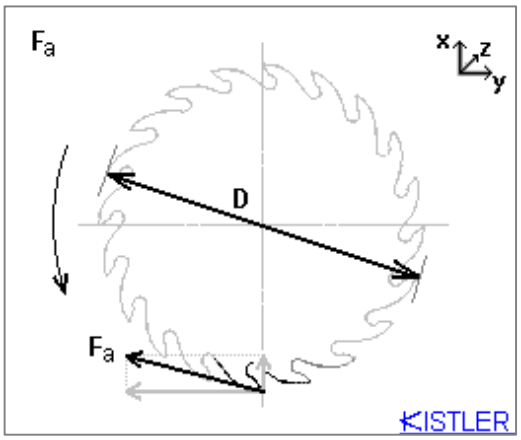
6.2.1.7.3 RCD Calculations

With the RCD 5223... additional software calculations can be performed. These calculations can provide radial and tangential forces or active force in a variety of applications. If a RCD calculation is enabled, the user cannot enable/disable channels in the Channels & Trigger configuration (see section 6.2.2.2).

6.2.1.7.3.1 Off

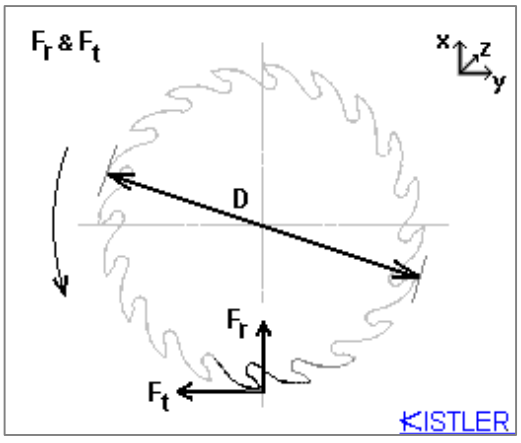
RCD Calculations are disabled

6.2.1.7.3.2 Type 1



The type 1 RCD Calculation computes the F_a (active force) cutting force parameter. The user must configure tool diameter, D.

6.2.1.7.3.3 Type 2



The type 2 RCD Calculation computes the F_r (Radial Force) and F_t (tangential force) cutting force parameters. The user must configure tool diameter, D.

Tool Diameter	Enter the tool diameter for the appropriate tool under test. All distances are entered in millimeters, "mm".
Tool View	This window shows a drawing defining the coordinate system, and tool measurement layout for the selected dynamometer.
Resultant Window	The resultant window shows channel allocation for acquired and calculated channels. This should be used as a guide when configuring graphs.

6.2.1.8 Configurations Using Rotating Cutting Dyno 5237 (High Speed RCD)

Selecting RCD 5237 in the amplifier selection (see section 6.2.1.3 above) will enable the RCD 5237 tab, and the RS-232C Setup tab.

6.2.1.8.1 RCD 5237

To configure the 5237 high speed rotating cutting dynamometer, configure the following:

Channel	Channel number. Channels range from 1 to 2.
Label	Assign labels for each channel. These labels appear in graphs and reports.
Measuring Range	The measuring range is automatically assigned based on the Scale and Sensitivity settings. Measuring Range [M.U.] = Full Scale Output [mV] divided by Sensitivity [mV/M.U.]; (M.U. = Mechanical Unit)
Unit	Assign units to each channel. These labels appear in graphs and reports.
Sensitivities	Range I, Range II and Range III – enter the sensitivity of a sensor in [mV/M.U.] for each of the calibrated ranges.
Range Selection	Select the desired measurement range from the pull-down choice box.
Operate	Transmit the command to place the amplifier into the operate mode.
Reset	Transmit the command to place the amplifier into reset mode.
Send Parameters	Transmit the command to set the appropriate per channel configuration for the Range settings.
Reset/Operate	Enable the automatic control (via RS-232C interface) of the Operate/Reset commands during a typical acquisition cycle. Amplifier will be automatically set to operate at the start of a cycle, and will return to reset after the acquisition has completed for any given cycle. In some cases, this automatic control of Reset/Operate is not desired and the selection box should remain unchecked.

6.2.1.8.2 RS-232C Setup

(see section 6.2.1.4.2)

6.2.2 Edit...

Shortcut: **Alt+E**

Selecting **Acquisition** ® **Edit** (Figure 6.10: Edit Acquisition Parameters) allows configuration of the data acquisition process for DynoWare. The parameters tab provides configuration of the basic sampling and storage criteria. The Channels and triggers tab provides selection of the trigger method and the channels available. The Data Manipulation Online tab allows for user customized data calculations to be performed on acquired data.

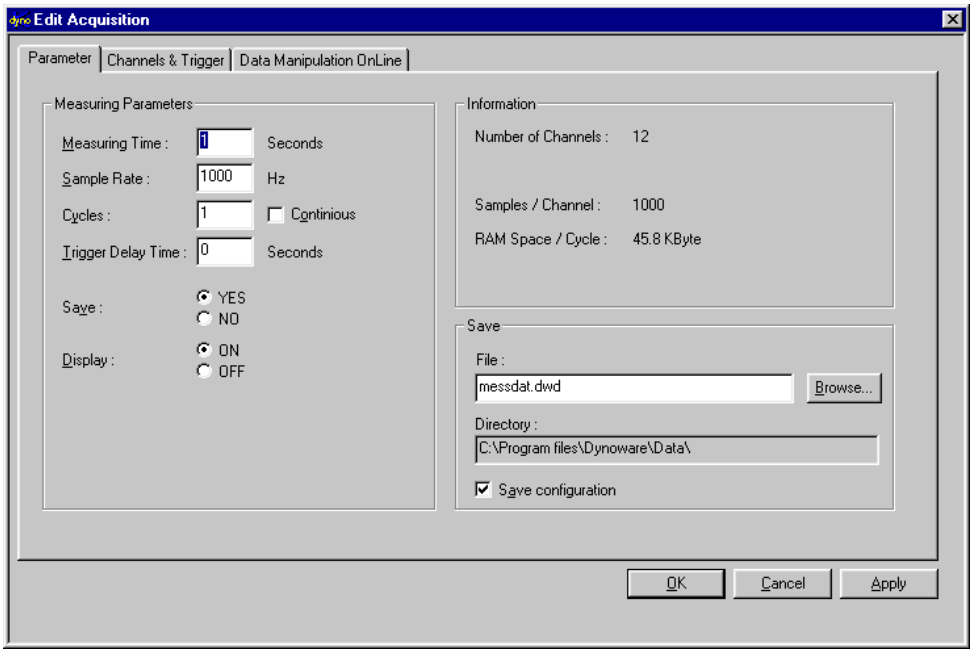


Figure 6.10: Edit Acquisition Parameters

6.2.2.1 Parameter

The Parameter tab (Figure 6.10: Edit Acquisition Parameters) allows for configuration of the following:

Measuring Time	Definition of the actual duration of acquisition measured in seconds.
Sample Rate	The Sample rate defines the number of measurements per second and per channel.

Note:
The higher the sample rate, the better is the resolution of the measuring signal.

Note:
Because of the huge amount of data a high sample rate is automatically equivalent to slow data processing and a slow building up of the graphical display. According to experience a sample rate of 250 Hz could be sufficient for monitoring purposes. For detailed analysis however 2'000 Hz or higher might be necessary.

Note:
High sampling rates and long acquisition duration can create large files. Ensure that there is enough disk space available when using continuous monitoring.

Cycles	This defines the number of measuring cycles (machine cycles) to be acquired.
Continuous	If checked the number of cycles is unknown. The acquisition has to be stopped manually.
Trigger Delay Time	The delay time between the trigger signal and measurement start.
Save	Enable saving the acquisition data into a file after each cycle is acquired.
Display	Enable displaying acquired data on the screen after each cycle is acquired.
Information	Displays information about the number of Channels used for the measurement, the number of Samples/Channel, and the approximate memory storage size needed for one cycle. This depends on the number of channels, the sampling time, and the sampling rate.
File	the name of the file. The file extension is '*.dwd' .
Browse	Browse enables visual selection of a directory and a file name, use the Browse function to find and overwrite an existing file or to browse for a directory (folder).
Directory	Displays the selected directory or folder on a disk where the file will be stored.
Save configuration	Enable the check to save the configuration when starting the measurement. Dynoware uses the same file name as for the data file, but with the extension '*.cfg' for configuration files. See Section 6.1.2.2 Configuration Save… for more information about configurations.

6.2.2.2 Channels & Trigger

The Channels and Trigger tab (Figure 6.11: Edit Acquisition Channels & Trigger) is configured with the following options in the table and trigger sections:

On (Enable)	Activates/Deactivates a channel if multicomponent measurement mode is not activated.
Trigger	Activate a channel as a 'trigger channel' in case of analog trigger mode.
Channel	Displays the number of the channel.
Label	Enter the label of the channel (e.g. drilling moment).
Trigger: On enter key	The measurement is started by pressing the enter key.
Trigger: Digital	The measurement is started by an external trigger signal (e.g. start machine).
Trigger: Analog	The measurement is started if the defined channel has reached a certain level.
Trigger: Rising/Falling	Start of the Trigger at rising or falling edge.
Trigger: % or Absolute	The analog trigger threshold is defined as a percentage or an absolute value.
Threshold	specifies in M.U. (mechanical units) or volts the analog trigger threshold.

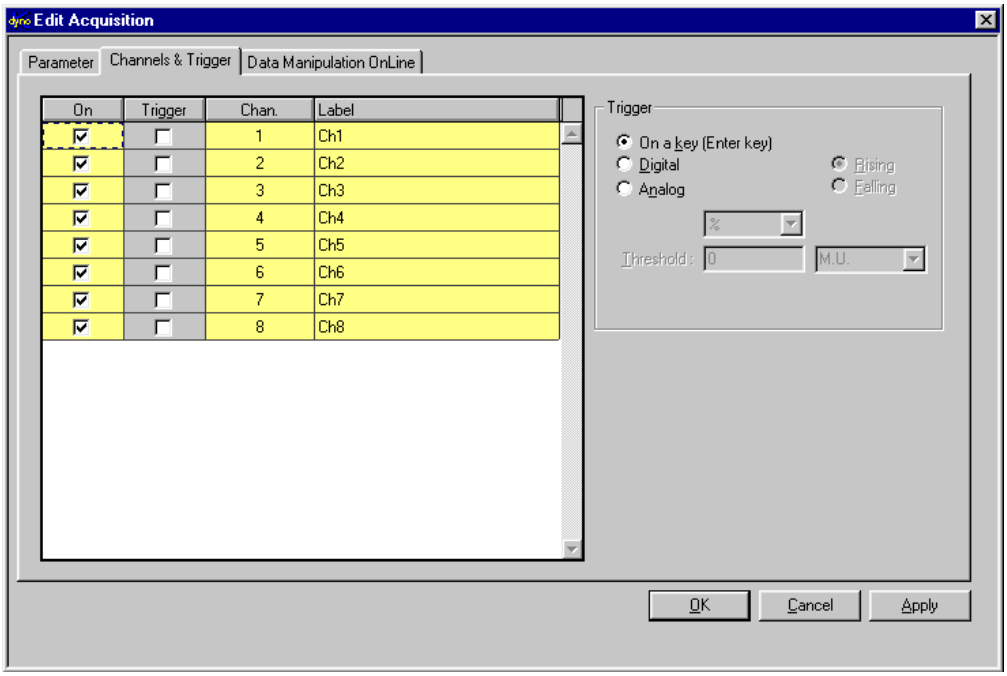


Figure 6.11: Edit Acquisition Channels & Trigger

6.2.2.3 Data Manipulation Online

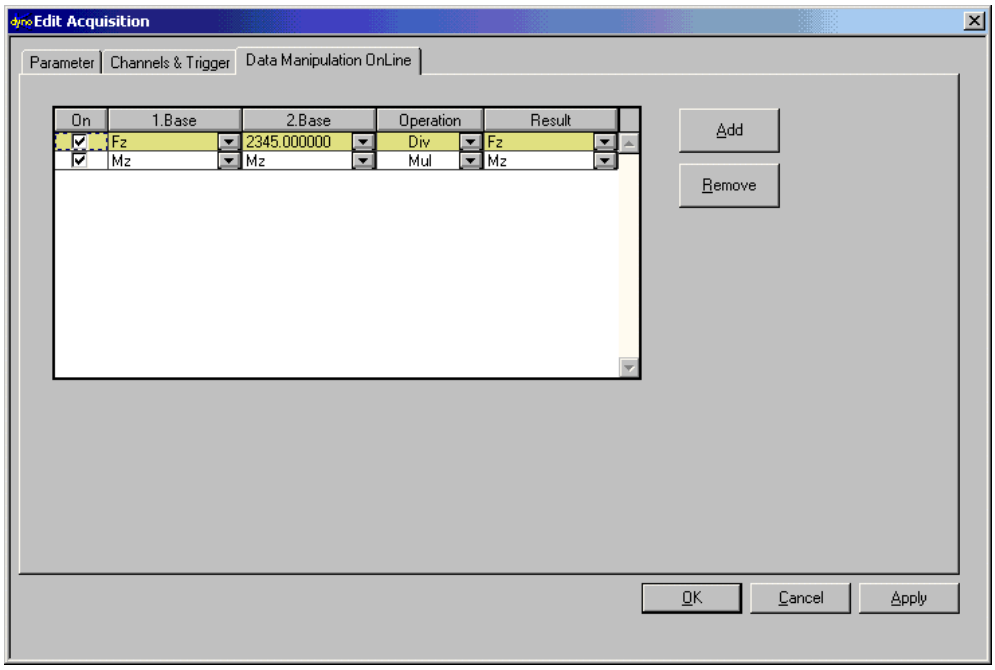


Figure 6.12: Edit Acquisition, Data Manipulation Online

Data for any specified channel can be modified with standard mathematical functions immediately after the data is acquired. The source channels and operation to be performed must be specified as well as the destination of the calculation.

Warning:
The destination channel data is permanently destroyed. Use the data manipulation functions with extreme caution. To create a new data set, enable acquisition of an additional channel (placeholder).

On (Enable)	Activate the function for the data manipulation.
1. Base	First channel for the data manipulation.
2. Base	Second channel for the data manipulation. Here you may also enter constant values. Note: Confirm numerical entries with RETURN.
Operation	The mathematical operation to be performed. The following functions are available: Addition, Subtraction, Multiplication, Division, log[a], ln[b], exp(e)[c], exp(10)[d].
Result	Channel to place the result.
Add	Add a new function.

[a] base 10 logarithm
[b] natural logarithm
[c] natural exponential
[d] base 10 exponential

Remove	Remove the selected function.

6.2.3 Start...

Shortcut: **Alt+S**

To begin the data acquisition process, select the **Acquisition** ® **Start** menu choice. If the specified storage file already exists (as specified in section 6.2.2.1 Acquisition Parameter) a prompt will appear (Figure 6.13: Overwrite File Prompt) to overwrite the existing file.

Warning:
If you choose to overwrite the file, all existing data in the file will be lost.

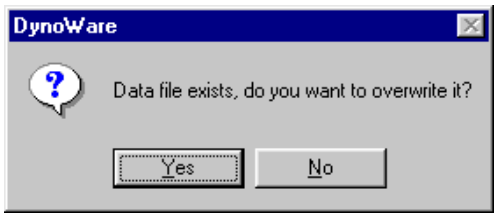


Figure 6.13: Overwrite File Prompt

First, if the enabled, the Comments dialog (see Section 6.3.4.1) will appear. Here notes about the given cycle can be added or changed to document the trial cycle.

Next, if **Show Hardware dialog between Acquisition Cycles** is enabled (see Section 6.2.1.2 Show Hardware Dialog between acquisition cycles), the Hardware configuration dialog will appear allowing changes to the amplifier configuration.

Finally, the main data acquisition dialog box (Figure 6.14: Begin Acquisition Prompt) will appear showing the current cycle number. If analog or digital triggering is required, the system will go into the wait for trigger state. If Key triggering is enabled pressing the **Go** button or the Enter key will start acquisition. Once a trigger has occurred, or Go has been selected, the progress bar will update to indicate acquisition status.
To abort acquisition (or stop a continuous cycle acquisition), press the **Stop** button.

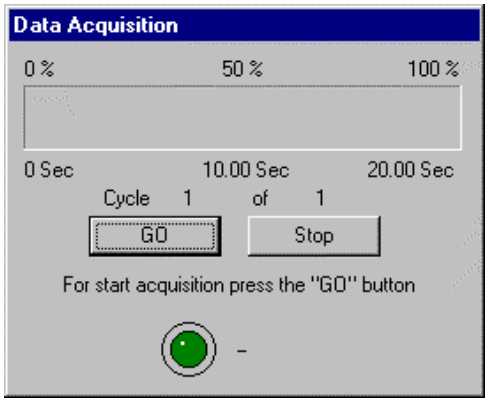


Figure 6.14: Begin Acquisition Prompt

Warning:
The data acquisition process may take several seconds to abort before the next acquisition interval can begin.

6.3 View...

The view menu provides for complete control of the graphical output of Dynoware. Graph types and data content can be selected for individual views and for configuration of a default view set.

6.3.1 New...

With a specific window open, selecting **New...** will create a new duplicate window with the identical configuration as the current active window. This new view can now be configured individually.

6.3.2 Edit...

Shortcut: **Alt+V**

The View Edit configuration provides for control of the current windows graph type and contained items (Figure 6.15: View Edit). The user can also customize the colors of a specific graph item from this dialog box, and set view dependence (link to other open views of this file).

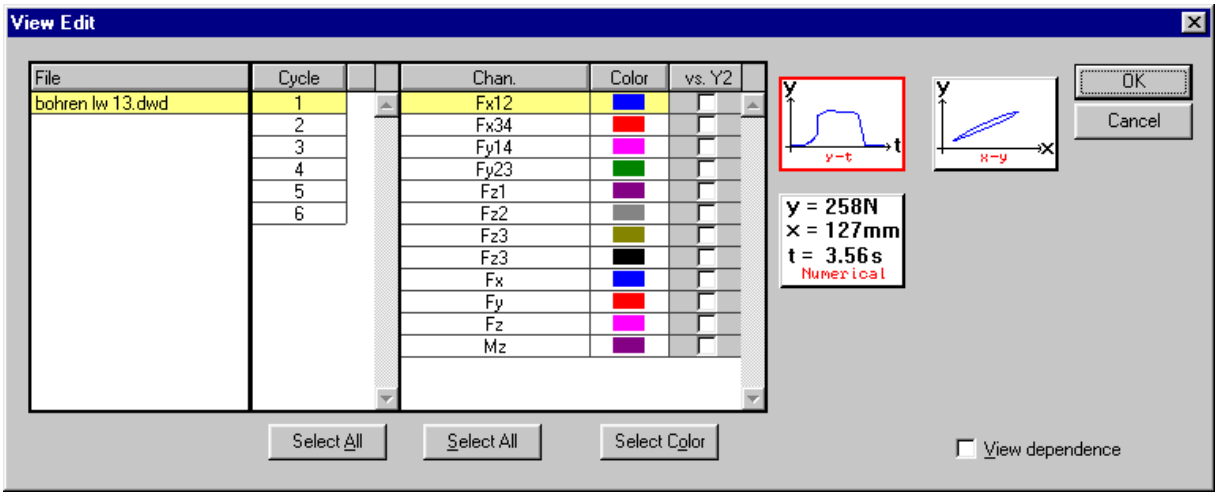


Figure 6.15: View Edit

Selected Cycles and Channels are highlighted in yellow. Click on an item to highlight (or select) it, click on a highlighted item to unselect it. There are three types of graphics: y(t), y(x), and numerical. In order to select or change the x-axis in a y(x) graph, click on the y-x icon.
The following describes additional items in the View Edit dialog:

File	Displays the files to be selected.
Cycle	Selects the cycles to be displayed in the view. If more than two cycles are selected, they will be superimposed.
Channel	Select the channels to be displayed.
Color	Shows the color selection for each channel. Press the Select Color button to change the color.
vs. Y2	Selecting **vs. Y2** allows graphing vs. two vertical axis scales. One scaling will appear on the left of the graph, the second scale will appear on the right of the graph. The legend will indicate the corresponding axis that applies to each line. **vs. Y2** applies to time based graphs y(t) only.
Select all/Unselect all	Selects/Unselects all cycles or channels to view.
Select Color	Change the color for each channel.
View dependence	Links two or more windows. Changing in one window from one cycle to the next will update the other windows accordingly.

6.3.3 Setup...

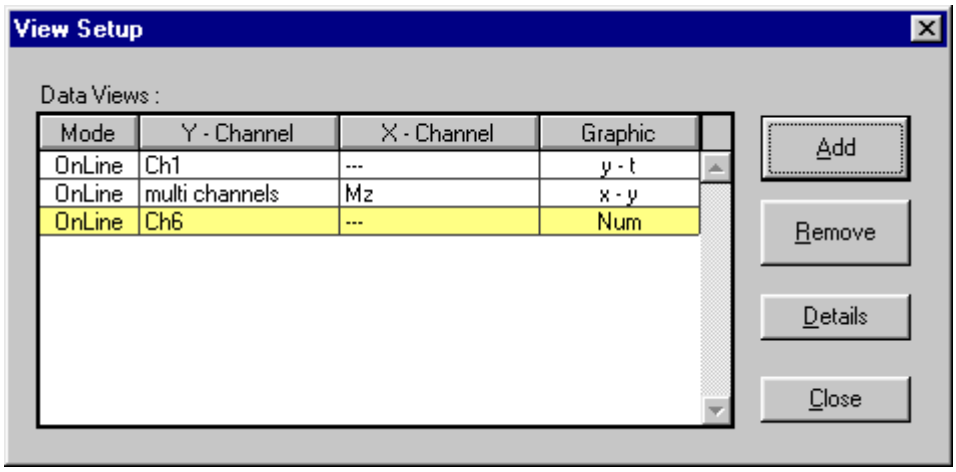


Figure 6.16: View Setup

With **View** ® **Setup** you can configure the windows and default graphs that will appear when a file is opened or when data is acquired. A user can configure several default windows by repeatedly pressing the **Add** button and following the onscreen wizard for creating a new view window. To remove an existing view, highlight the view in the Data Views window and select the **Remove** button.

To find more information about a view, highlight it in the Data Views window and press the **Details** button.

6.3.4 Documentation

Shortcut: **Alt+D**

Each individual cycle can have additional documentation associated with it. There are two tabs in the documentation dialog, **Comments** and **File, Date, Time**.

6.3.4.1 Comments

The comments tab (Figure 6.17: Documentation) allows user entered text data to be associated with each cycle. The changes are updated immediately in the file.

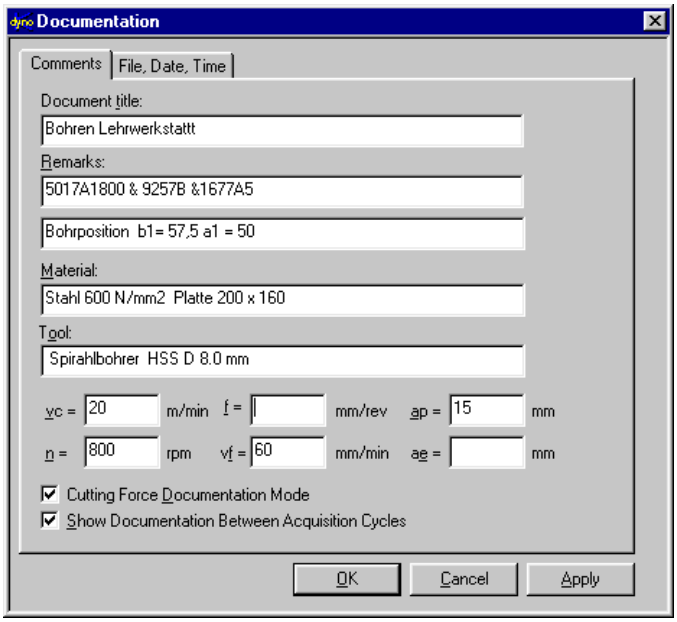


Figure 6.17: Documentation

Document title	Allows for customization of the graph titles
Remarks	General text comments can be entered in the remarks section
Material	In cutting force documentation mode, the user can supply a material type comment
Tool	In cutting force documentation mode, the user can enter specific information about the cutting tool under test.
Cutting Force Parameters	v_c = cutting velocity [m/min] F = feed [mm/rev] a_p = depth of cut [mm] n = speed [rpm] v_f = feed velocity [m/min] a_e = cutter engagement [mm]
Documentation Mode	specify to document specific cutting force parameters, or to document the file using general comments.
Show Documentation	between acquisition cycles enable the automatic display of the documentation dialog box immediately prior to acquiring a cycle.

6.3.4.2 File, Date, Time

The File, Date, Time tab documents the temporal and storage data associated with the original acquisition.

Folder	The directory where the file was initially created
File	The initial name of the file
Date	The original date of the acquisition
Time	The original time of the acquisition

6.3.4.3 Edit Labels

The user can edit the channel labels or unit labels of specific channels at any time using the **View ® Edit Labels** selection. The channel label or unit entered for any one specific channel will be applied to all of the stored cycles within the file. The changes are updated immediately in the file.

6.3.5 Zoom

The zoom function provides for changing the x-axis and y-axis scaling parameters for an active graph. The user can manually zoom by entering the axis minimum and maximum values or graphically zoom using the right mouse button.

6.3.5.1 Manual Zoom

By default all graphs are scaled to best fit the minimum and maximum values of the contained graphs. Selecting View → Zoom (Figure 6.18: Manual zoom) presents a dialog box which can be used to set the x-axis minimum and maximum values and the y-axis minimum and maximum values. The dialog box will remain active (button Apply) so that the user can switch to other open windows and change the zoom settings. New settings will be activated when the **OK** or apply buttons are selected. The **Zoom Off** button will restore the graph to the original auto scaled values.

Note:
A zoomed graph will have the word 'zoom' in the upper left corner of the window.

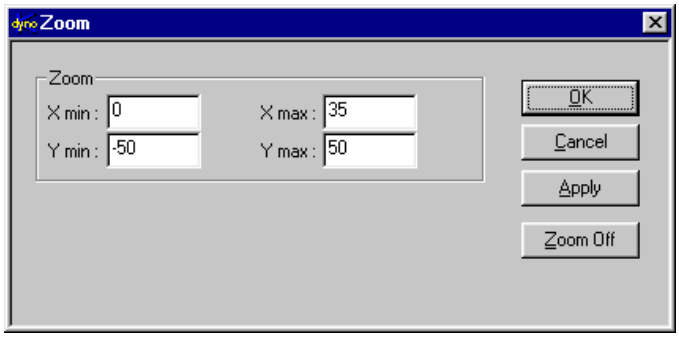


Figure 6.18: Manual zoom

6.3.5.2 Graphical Zoom

It is possible to zoom by clicking the right mouse button and dragging to create a **Window** over the desired zoom area of a graph. When the right mouse button is released, the graph will be redrawn with the new coordinates.

6.3.6 Zoom Out

Zoom Out will restore the graph to the original auto scaled values. Also, by double clicking the right mouse button, the graph will return to the original coordinate scaling. Zoom Out is deactivated if the graph is currently not zoomed.

6.3.7 Cursor

For the analysis of data it is helpful to display the x- and y-coordinates. Pressing the toolbar icon

or selecting **View** ® **Cursor** from the menu will enable the cursor tool. The dashed vertical cursor line can be moved with the mouse or with the keys.
1.) Move the mouse over the dashed vertical cursor line. The mouse cursor will change to  .
2.) Click the left mouse button and drag the line to a new position (cursor will change to when dragging)
3.) Release the mouse, the data in the cursor box will be updated.

Alternatively:

1.) Move the vertical cursor one sample by pressing the left or right arrow keys: 

2.) Move the vertical cursor 5% by pressing the page up or page down keys.

The cursor window can be moved anywhere on the desktop by left clicking the mouse on the toolbar, and dragging to a new location. Dynoware will remember the last active state and last active location of the toolbar each time it is started.

When activated, the cursor tool will apply to all time base graphs y(t) and tables (numerical graphs). Numerical graphs will have the cursor identified by a highlighted row.

If the graphs have view dependence enabled (Section 6.2.2 View Edit) all graphs based on the same document will have the cursor adjusted to the same time.

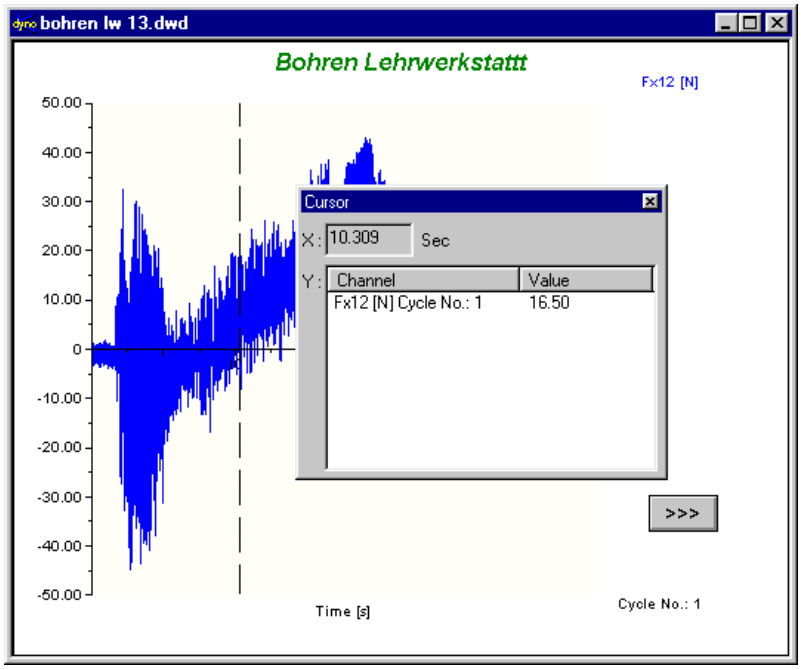


Figure 6.19: Cursor Tool

6.3.8 Horiz. Grid

Selecting **View** ® **Horiz. Grid** from the main menu, or selecting the

icon on the toolbar will redraw the active graph with horizontal grid lines enabled. Selecting the option again will disable the horizontal grid lines.

6.3.9 Vert. Grid

Selecting **View** ® **Vert. Grid** from the main menu, or selecting the

icon on the toolbar will redraw the active graph with vertical grid lines enabled. Selecting the option again will disable the vertical grid lines.

6.3.10 Toolbar

Selecting **View** ® **Toolbar** will toggle the visible state of the system toolbar. The functional descriptions are:

File Open
Hardware
Edit Acquisition

Cycle Documentation
Setup View
Start Acquisition
New View
Edit View
Cursor
Mean Value (Stats)
Drift Compensation
Horizontal Grids
Vertical Grids
Zoom Out
Voltmeter
Oscilloscope
Cascade Views
Tile Vertical
Tile Horizontal
Help

6.3.11 Status Bar

The status bar can be enabled/disabled from the **View** ® **Status Bar** menu selection. The status bar runs along the lower edge of the Dynoware screen. It is separated into two sections. The left side of the status bar offers information on a topic selected when the mouse is moved over a menu bar or tool bar item. The right section of the status bar and shows the status of the Caps Lock key, the Num lock key, and the Scroll lock key.

Figure 6.20: Status Bar

6.4 Analysis...

6.4.1 Mean Value

By selecting **Analysis** ® **Mean value** from the main menu or by clicking the

icon on the toolbar statistical data can be displayed on an active y(t) time based graph.

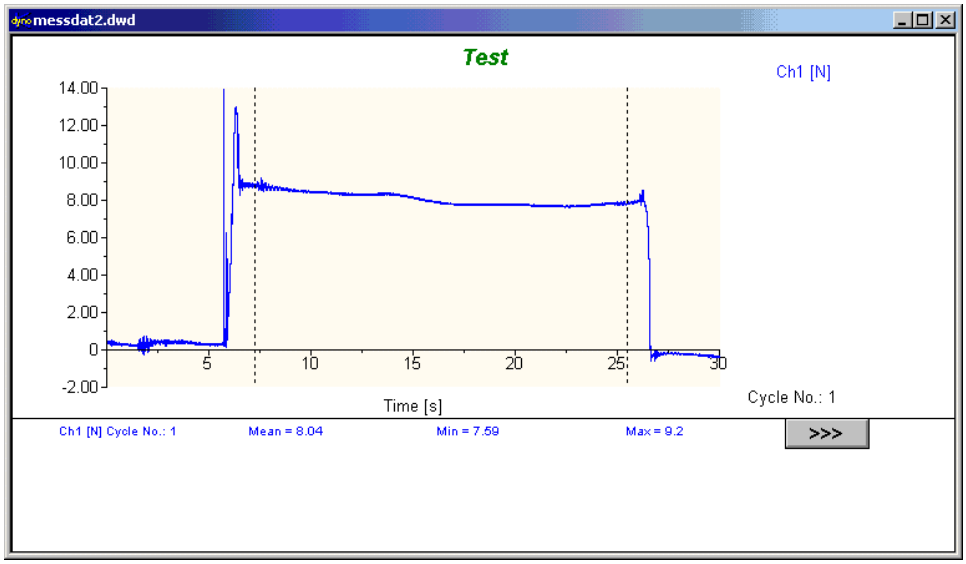


Figure 6.21: Mean value

The statistical data will appear on the bottom of the graph (stats on up to 8 curves can be displayed). Statistical data will include: Maximum value, Minimum Value and Mean (average) value between two user identified points.

Ch1 [N] Cycle No.: 1	Mean = 7.9	Min = 7.64	Max = 8.3

Figure 6.1: Sample statistical data

A dashed vertical bar will first appear on the graph along with the ↔1 cursor. This vertical line will track the mouse movement to set the starting point for the analysis. Move to the desired starting position then left click the mouse.
Next, a dashed vertical bar will appear on the graph along with the ↔2 cursor. This vertical line will track the mouse movement to set the ending point for the analysis. Move to the desired ending position then left click the mouse.

To change either the starting position or ending position and update the statistical data:
1.) Move the mouse over the dashed vertical cursor line. The cursor will change to
2.) Click the left mouse button and drag the line to a new position (cursor will change to ↔ when dragging)
3.) Release the mouse, the statistical data will be updated.

The Mean value analysis can be disabled and the graph restored to normal by reselecting the menu choice, or the toolbar icon.

6.4.2 Signal Drift Compensation

By selecting **Analysis ® Signal Drift Compensation** from the main menu or by clicking the


icon on the toolbar, data can be adjusted to remove the effect of long-term thermal drift and offset. This is accomplished by computing a straight line between a starting and ending point, then subtracting this line from the selected portion of the data set. All data sets on the current time series graph will be compensated.
This function is especially designed for resolving the problems of drift in piezoelectric measurement systems. In the Operate mode, the signal drifts away with a constant slope, however the direction (if negative or positive) is unpredictable. In short measurements or in measurements with high forces this drift is usually negligible. After very long measurements however this drift is clearly visible. The measurement is started before applying the force and continues until there is no force applied to the tool anymore, the drift is visible as the signal that does not fall back to the zero line.

Note:
The selection of the starting and ending points are critical to the accuracy of the compensation.

Note:
The words 'Drift Compensation On' will appear in the upper left corner the graph to identify the data set as modified.

When selecting drift compensation:
A dashed vertical bar will first appear on the graph along with the cursor. This vertical line will track the mouse movement to set the starting point for the compensation. Move to the desired starting position then left click the mouse.
Next, a dashed vertical bar will appear on the graph along with the cursor. This vertical line will track the mouse movement to set the ending point for the compensation. Move to the desired ending position then left click the mouse.
The first vertical line should be placed right before the rising edge of the force curve - where the signal still lies on the zero line. The second line has to be placed where there is no force application anymore, i.e. where the measured signal should lie again on the zero line.

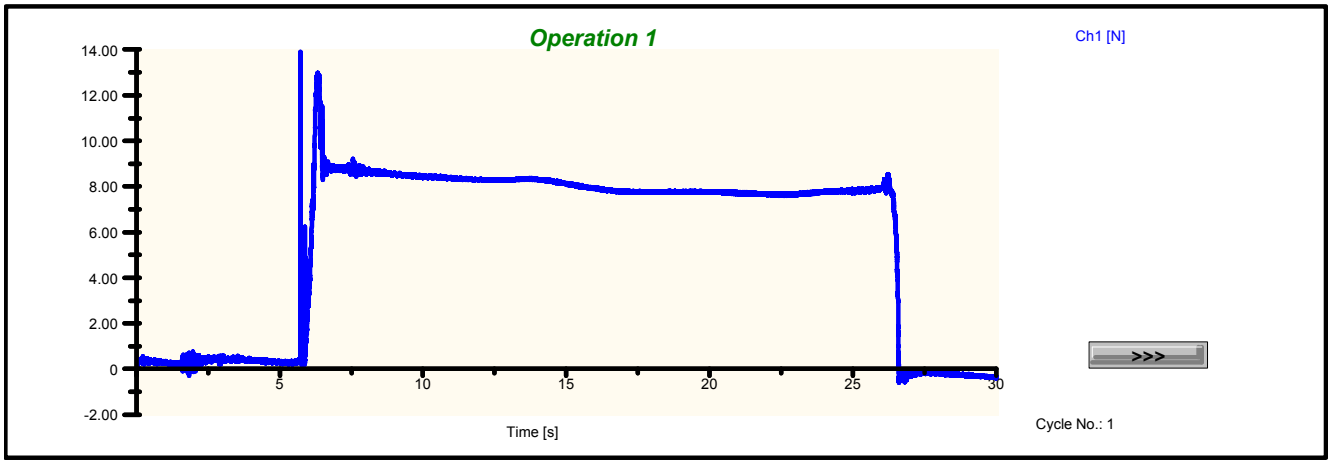


Figure 6.22: Original Signal

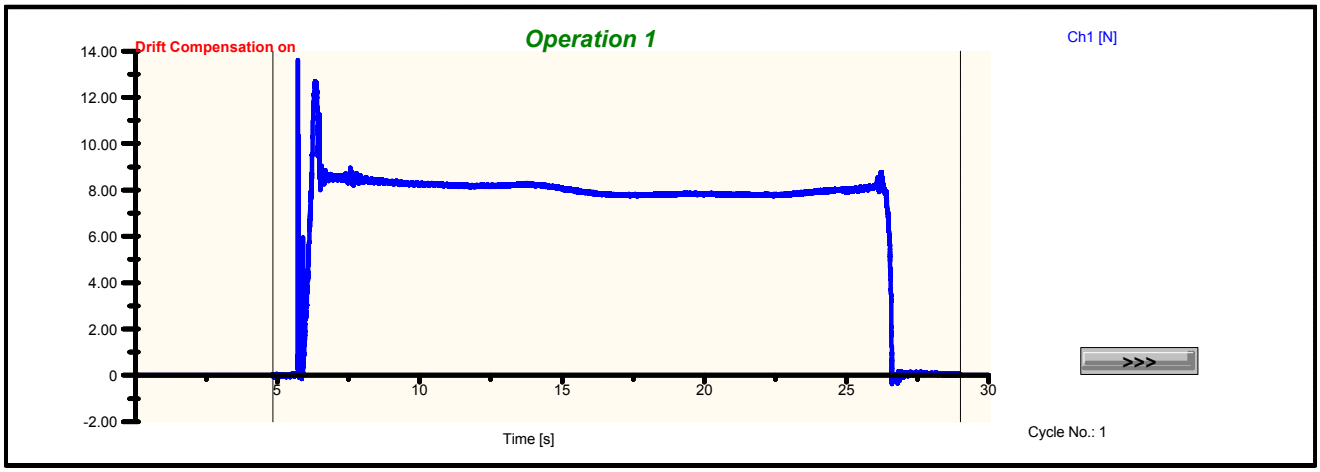


Figure 6.23: Drift compensation applied

To change either the starting position or ending position and update the compensation:

1.) Move the mouse over the dashed vertical cursor line. The cursor will change to

2.) Click the left mouse button and drag the line to a new position (cursor will change to ⟷ when dragging)

3.) Release the mouse, the data set will be updated and the graph redrawn.

The change is only temporary and can be disabled by reselecting the menu choice, or the toolbar icon. Select Overwrite File Cycle Data (see Section 6.4.5) to permanently apply the changes to the data set.

6.4.3 Smoothing on...

Smoothing is used to filter a data set or to remove defined frequency content. The type of filter to use depends upon the type of modification required. The filtering options are: Moving Mean, Moving Median, Digital Low Pass, and Digital High Pass. Each is discussed in the following paragraphs. Select the channels to apply the filter from the list presented or press the **All Channels** button to select all available channels.

Note:
The words 'Smoothing On' will appear in the upper left corner of the graph to identify the data set as modified.

6.4.3.1 Moving Mean

A moving mean filter is used to smooth an entire data set when no particular frequencies are to be filtered out. This type of filter generates a moving average data set from the original one, based on a user-specified **Window size**. The window size specifies how many values to the left and right of the current value are averaged. The window size must be an **odd** number, because the current value must fall in the exact center of the window, with an even number of points to the left and right of it (if you enter an even number, the calculation is made with the next higher number). The average of all values in the window is calculated, and this number is used to replace the current value. The larger the window size, the more the resulting data set is smoothed. The Figure below illustrates both the moving mean and the moving median filters.

Note:
At the beginning and the end when the window size would exceed the sampled values, the window size is reduced, starting and ending with a window size of CEIL(WindowSize/2).

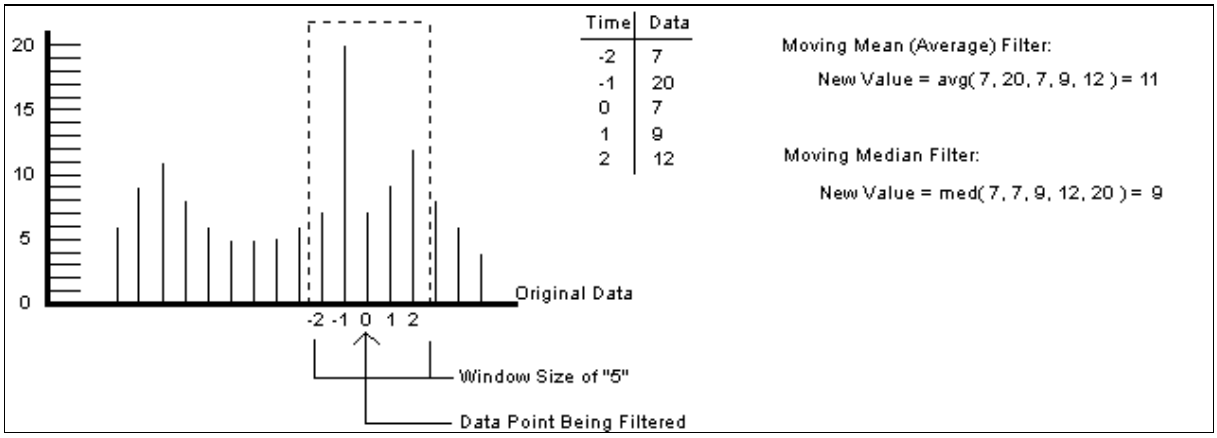


Figure 6.24: Moving mean and moving median filters

6.4.3.2 Moving Median

The moving median filter is similar to the moving mean in that it also uses a moving window. However, this method sorts the values within the window and replaces the current value with the median value (i.e., the middle value in the sorted data window). The moving median type filter is good for removing sharp spikes in the data.

6.4.3.3 Digital Low Pass

For a **low pass** filter, the cutoff frequency is the frequency above which all frequencies are attenuated to some degree, and below which all frequencies pass unfiltered. Essentially, all low frequencies are allowed to pass, and all high frequencies are removed. The specified cutoff frequency is the –3db (half power) attenuation point of a 13 tap Finite Impulse Response (FIR) filter.

6.4.3.4 Digital High Pass

For a **high pass** filter, the cutoff frequency is the frequency below which all frequencies are attenuated to some degree, and above which all frequencies pass unfiltered. Essentially, all high frequencies are allowed to pass, and all low frequencies are removed. The specified cutoff frequency is the –3db (half power) attenuation point of a 13 tap Finite Impulse Response (FIR) filter.

Smoothed data is not stored permanently and can be undone by selecting **Analysis ® Smoothing Off** (Section 6.4.4 Smoothing off) from the main menu. Select Overwrite File Cycle Data (see Section 6.4.5) to permanently apply the changes to the data.

Warning:
Kistler measurement equipment is very sensitive. Sometimes what appears to be noise can be "real" measured phenomena. Care should be exercised in filtering so as not to remove important data.

Below is an example of a "noisy" data set Figure 6.25: Original data set (no smoothing), on which a Moving Median filter (Windows Size = 13) has been applied, Figure 6.26: Smoothing on, moving mean (window size = 13).

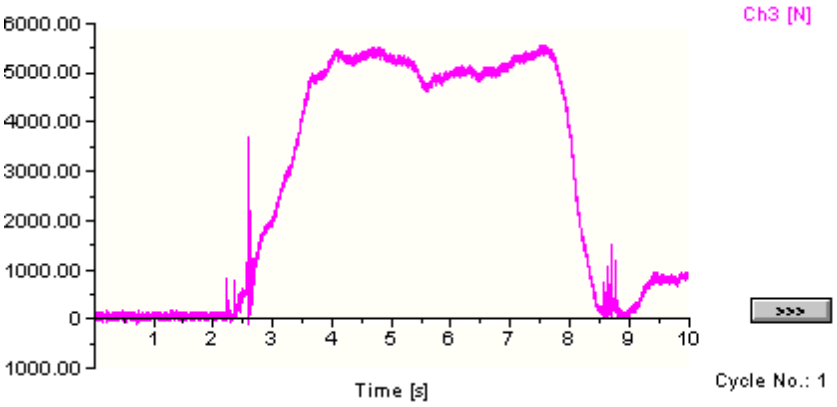


Figure 6.25: Original data set (no smoothing)

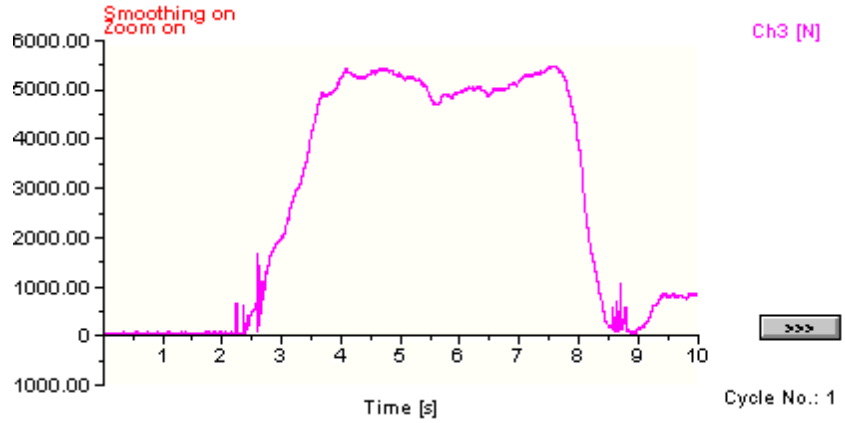


Figure 6.26: Smoothing on, moving mean (window size = 13)

6.4.4 Smoothing off

Selecting **Analysis** ® **Smoothing Off** will disable any filters currently applied to the data set. A check mark on the menu will indicate if smoothing is currently on or off.

6.4.5 Overwrite File Cycle Data

The operations Smoothing and Signal Drift Compensation display temporary changes to a data set. These operations

do not permanently affect the data stored in a file. To permanently archive these changes, select Overwrite File Cycle Data from the Analysis menu.

This operation allows the user to apply several different functions to a data set. For instance, data can be compensated for drift; the changes save in the file, and then Mean value analysis can be done. Normally the drift compensation and mean value functions are mutually exclusive (cannot be done at the same time).

Warning:
Overwritten changes cannot be undone and permanently modifies the data in the file. Be sure to make a backup of the original file prior to selecting Overwrite File Cycle Data.

6.5 Tools...

6.5.1 Voltmeter...

The Voltmeter (Figure 6.27: Voltmeter) is a trouble-shooting tool that numerically displays the voltages at the inputs to the A/D board. Selecting Voltmeter from the Tool menu starts the meter. Any configured amplifiers are placed into operate mode automatically at the start of the voltmeter, and are returned to reset when the tool is exited. To stop the acquisition press the **Stop** button, to restart the acquisition press **Run**.

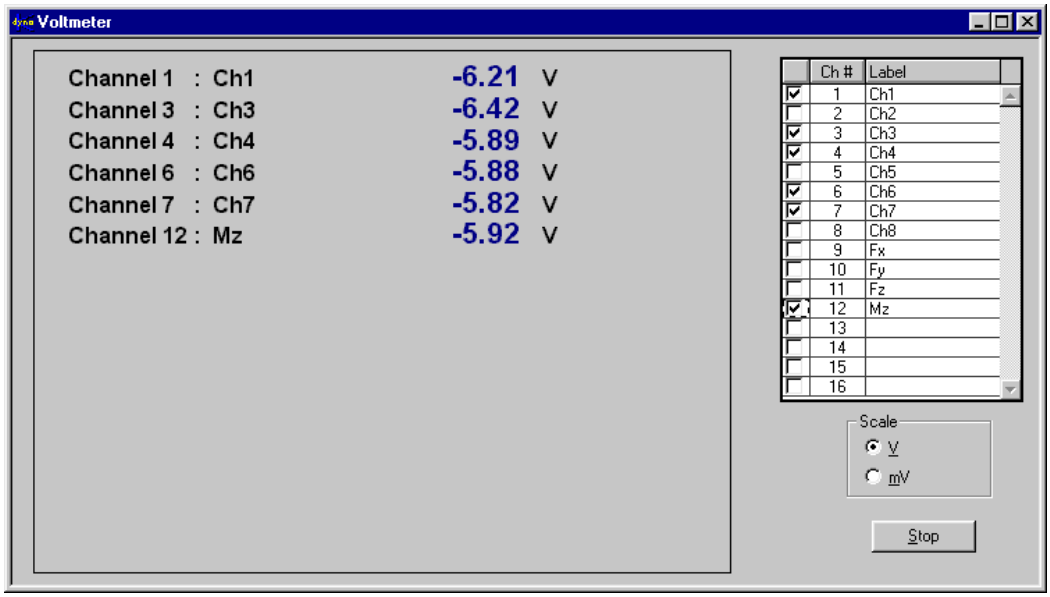


Figure 6.27: Voltmeter

The grid shows the channels configured in the system, their active state, and the configured label. To enable/disable a channel use the **On** column check box.

The voltage data can be selected to appear in Volts [V] or Millivolts [mV].

The Voltmeter can be run at the same time as the Oscilloscope function, but other data acquisition functions are disabled while the Voltmeter is active.

6.5.2 Oscilloscope…

The Oscilloscope (Figure 6.28: Oscilloscope Tool) is a troubleshooting tool that graphically displays the voltages at the inputs to the A/D board. Selecting Oscilloscope from the Tool menu starts the scope. Any configured amplifiers are placed into operate mode automatically at the start of the oscilloscope, and are returned to reset when the tool is exited. To stop the acquisition press the **Stop** button, to restart the acquisition press **Run**.

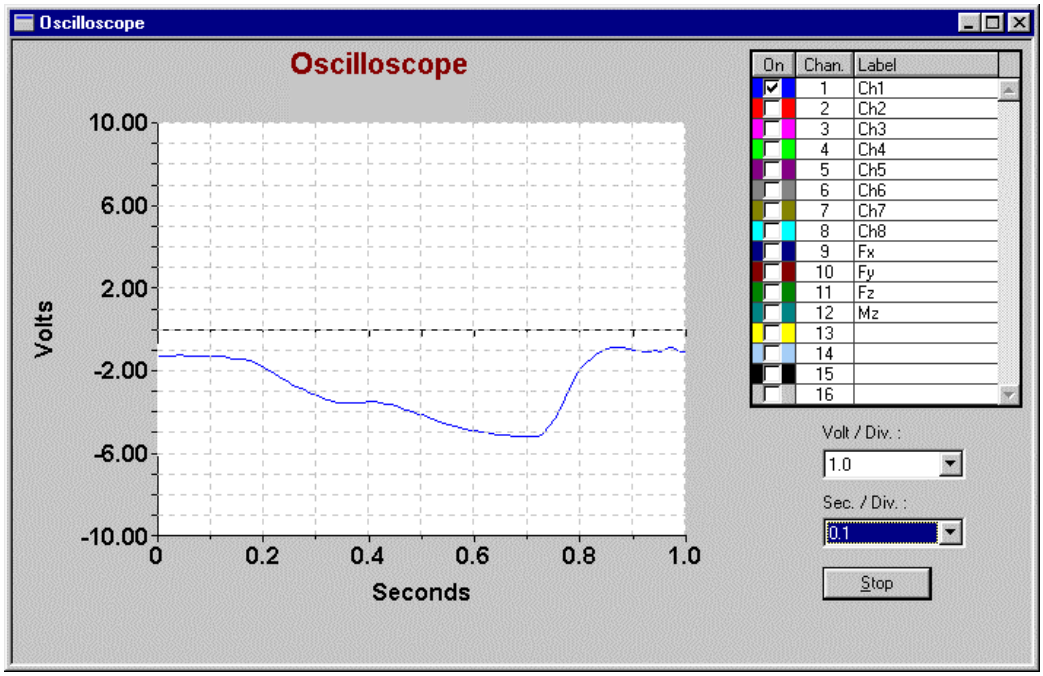


Figure 6.28: Oscilloscope Tool

The grid shows the channels configured in the system, their active state, and the configured label. To enable/disable a channel use the **On** column check box. The channel color is displayed in the **On** column.

The voltage scale, and time scale can be selected from the Volt/Div. and Sec./Div. Boxes.

The Oscilloscope can be run at the same time as the Voltmeter function, but other data acquisition functions are disabled while the Oscilloscope is active.

6.6 Options...

6.6.1 User Mode

The User Mode allows the software operation to be restricted. The default user mode is **Supervisor**.

6.6.1.1 Supervisor

No operation restrictions are made in the Supervisor mode. To restrict access to software and device configurations, select the operator mode. The default password is "DynoWare" (capital 'D' and 'W', lower case for other letters!).

6.6.1.2 Operator

No functional settings can be made in this mode (Changes to devices configurations, etc. can only be made in the supervisor mode). To switch from User mode to Operator mode a password is required.

6.6.1.3 Change Password

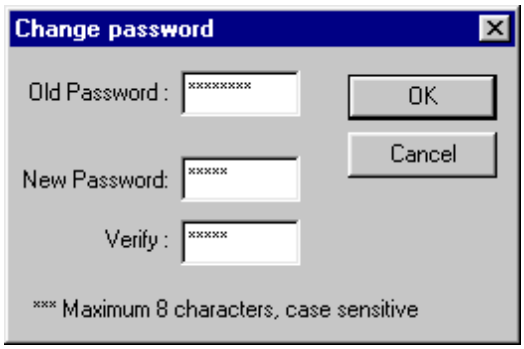


Figure 6.29: Changing Password

To change the Operator/Supervisor mode password select the **Options ® User Mode ® Change Password** menu choice. You will need to enter the old password, and enter the new password twice identically for the new password to be accepted. Passwords are case sensitive. The default password is "DynoWare" (capital 'D' and 'W', lower case for other letters!).

6.7 Window...

When a graph is open, the Window menu appears in the menu bar. The Window menu is for controlling the position of the graphs, and is useful when many different graphs are open on the screen.

6.7.1 Cascade

Arrange all open graphs staggered and overlapping each other.

6.7.2 Tile Horizontal

Arrange all open graphs to be non-overlapping tiled horizontally.

6.7.3 Tile Vertical

Arrange all open graphs to be non-overlapping tiled vertically.

6.7.4 Arrange Icons

Arranges all minimized graphs icons in the lower left corner of the application.

6.7.5 Close All

Closes all open graphs and files.

6.7.6 <open windows list>

Shows a list of open graphs. Select an item in the list to active a specific graph.

6.8 Help...

6.8.1 Help Topics

The Dynoware help menu is available by selecting Help Topics from the Help menu, or by pressing F1 at any time. Dynoware uses standard HTML help format through the default-configured browser (see section 1.1 for more information).

6.8.2 About Dynoware

The Dynoware about box provides information about the running version of the application, the build number, and the product type number. Be prepared to provide this information when requesting technical support.

7. Appendix

7.1 Graphs

Manipulating data using graphs is simple and quick with Dynoware. When a trial is opened one or more graphs appear using the default configuration (see Section 6.3.3 Setup…). The graphs can be edited for content, display, and titles.

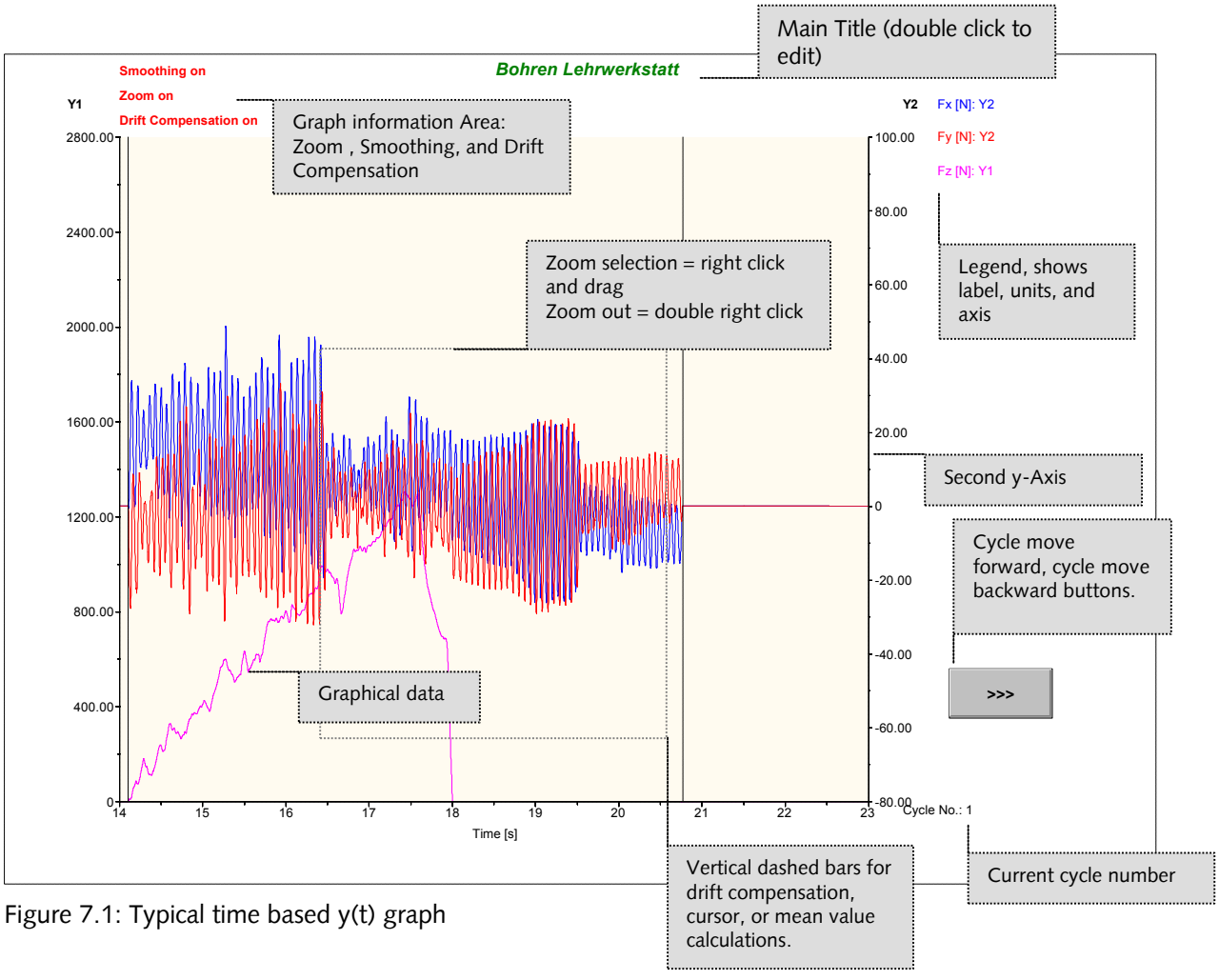


Figure 7.1: Typical time based y(t) graph

7.2 Language Selection

Each supported language that is installed is available to the user by pressing **Ctrl+Alt+S** then selecting the language

from the choices presented. The new language is loaded next time the application is started.

7.3 Shortcut Key Summary

Key	Command
F1	Help
Alt+D	View → Documentation
Alt+E	Acquisition → Edit
Alt+H	Acquisition → Hardware
Alt+S	Acquisition → Start
Ctrl+Alt+S	Select Language
Ctrl+P	Print Report
Ctrl+L	Report Layout (not documented)
Ctrl+TAB	Cycle through Open Windows (forwards)
Ctrl+SHIFT+TAB	Cycle through Open Windows (backwards)
Right Mouse Drag on graph	Zoom In on graph
Right Mouse Double Click on graph	Zoom Out (if previously zoomed in)

7.4 Modifying the Report Logo

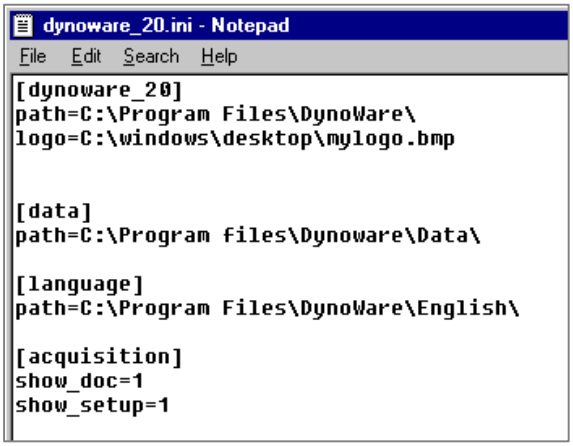


Figure 7.2: Adding the report logo file

If you want to modify the report print-out to have your companies logo perform the following steps:

1.) Use Notepad to Edit the "DynoWare_20.ini" file. Open the file C:\Windows\dynoware_20.ini (for Windows 95 or Windows 98) or C:\Winnt\dynoware_20.ini (for Windows NT or Windows 2000), respectively.

2.) Add the logo image file to Dynoware.
In the [dynoware_20] section, add (or edit) the logo={drive:\path\file} command to add the image file you to appear on the report. In the example below, mylogo.bmp will appear on the report.

Notes:
The image file extension does not need to be entered. DynoWare will search for "bmp", "wmf", "pcx", "tif" and "jpg" image extensions automatically (and supports these types of images). The recommended image size is 362 (width) by 67 (height) pixels. Images will be scaled to fit

and centered in the logo area of the report. The default logo "prnlogo.bmp" that appears in the DynoWare directory can be used as an example logo. Copy the file and edit for the desired logo.

7.5 Example Files

Filename	Description
Bohren LW 13.dwd	
Messdat2.dwd	
Swept_sine.dwd	1 channel Swept sine wave for filter experimentation
Frasen_15000rpm_2.dwd	
5A-Fraesen_Aussen_2.dwd	

7.6 Index

T

U

V

W

Z