



DEWETrans

Software Users Manual



ISO 9001



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DEWETrans

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Software version

DEWETrans software user manual corresponds with version 6.0

Printing notice

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Specifications subject to change without notice.

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Limited warranty

DEWETRON warrants that

(a) the Software will perform substantially in accordance with the accompanying written materials for a period of ninety (90) days from the date of receipt.

(b) the medium on which the software is recorded will be free from defects in material and workmanship under normal use and service for a period of ninety (90) days from the date of receipt.

General information

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If you are using the evaluation version:

Note that one of the nicest features of DEWESoft is the "active" exporting of captured data to Excel and FlexPro. The licensed version of DEWESoft includes the data viewing, or "light" version of FlexPro, so you can visualize any or all our your data and make high quality printable hard copy reports, charts, and graphs. The evaluation version does not include FlexPro, so please do not try to export data to this format! Also, if you try to export captured data to Excel format, please make sure that Excel is installed on this computer, or else it will hang up. If Excel is not installed on this computer, please save your data to delimited ASCII format, then you can open it from within Excel on any other computer. Not all functions will work properly unless you are using a Dewetron system with an A/D card and DEWE-Modules!

1 Initial Setup

1.1 About DEWETrans

DEWETrans can be used in two ways:

- **Demo mode** - Standard installation, no additional hardware required.
The demo mode is designed for software verification and also for offline postprocessing on other systems than the acquisition system.
- **Real mode** - Only available with licence key and requires a DEWETRON transient recorder hardware.

1.1.1 DEWETrans functions and options

DEWETrans consists of two acquisition software packages and offers several options:

Standard functions and expansions	
Standard version	
DEWETRANS-BASIC	The basic package consists of two programs: DEWETrans: Transient recorder mode; hardware trigger with pre-/posttrigger, different trigger conditions, internal or external clocking and trigger DEWESoft: Stream-to-disk mode; no trigger, but gapfree data recording up to 8 MS/s
Options	
DEWETRANS-OPT-MB	Multiboard option; supports up to 5 transient recorder boards per system with different sampling rates and different recording length
DEWETRANS-OPT-RC	Remote control software; manage setup and data transfer between one client and up to 8 transient recorders (servers) based on VNC (Virtual Network Client). Each transient recorder (server) requires it's own DEWETRANS-BASIC licence!
FLEXPLO-6-STANDARD	Powerful analysis package with mathematical functions and statistic analysis, report generator, import and export filters, ActiveX interface to DEWETrans and DEWESoft

Functions summary of DEWETrans and DEWESoft:

Functions	DEWETrans	DEWESoft	Demo mode	Functions	DEWETrans	DEWESoft	Demo mode
Measure				Analysis			
Data acquisition	✓	slow acq.	simulated	Offline display	✓	✓	✓
Stream-to-disk	-	✓	simulated	Cursor functions	✓	✓	✓
Setup	✓	✓	simulated	Zoom	✓	✓	✓
Input calibration	✓	✓	simulated	Printout	✓	✓	✓
Preview	✓	✓	simulated	Export data	✓	✓	✓
Trigger settings	✓	✓	simulated	Drivers			
Cursor functions	✓	✓	simulated	DEWE modules	✓	✓	-
Remote control	option	-	✓	Spectrum	✓	✓	-
Remote control	option	-	✓	Multi-board driver	option	slow acq.	-

This manual just describes the functions of DEWETrans. For any questions about DEWESoft, please refer to the current DEWESoft Software Users Manual. It will be shipped together with the transient recorder system, but can be also downloaded in the current version from the DEWETRON FTP server:
<ftp://ftp.dewetron.com/public/dewesoft/manual>

1.1.2 System requirements

To achieve a good performance, we recommend the following system:

- WINDOWS 2000 for acquisition system
WINDOWS 2000 / XP for data analysis
- Intel Pentium III 700 MHz processor or higher
- 256 MB RAM or higher
- Approx. 15 MB free harddisk space for DEWETrans
Additional 20 to 200 MB for drivers and post processing software packages
- A/D board for using real mode (requires licence key)

1.2 Installation

1.2.1 Hardware driver installation

Before installing DEWETrans for working in real mode, you have to install the Spectrum A/D board drivers.

The current driver version is also available to download from the DEWETRON ftp server:

<ftp://ftp.dewetron.com/public/software/dewetrans/spectrum>

Detailed information about the installation procedure is available in the drivers documentation. For hardware details, see also *appendix D*.

1.2.2 FlexPro analysis software

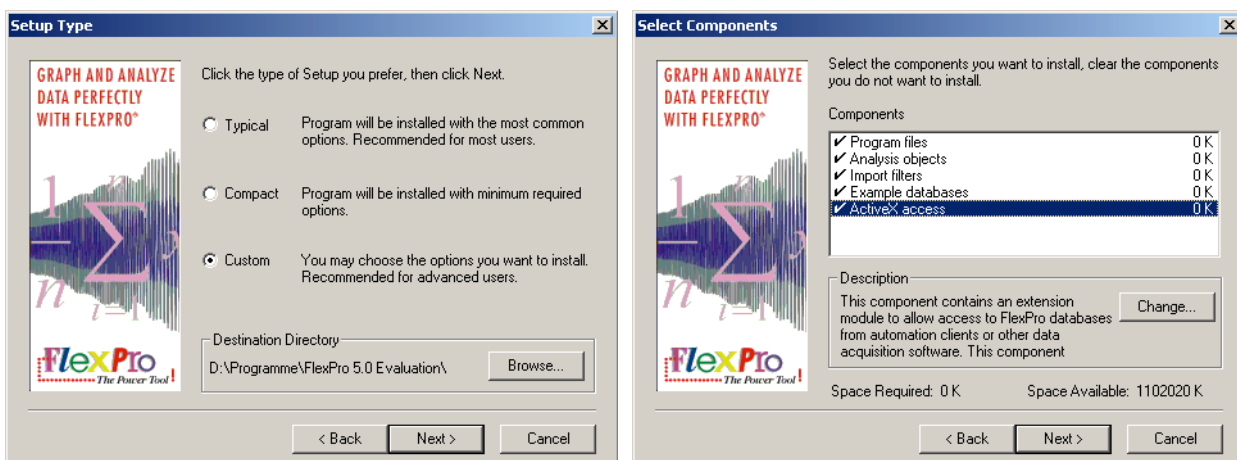


FlexPro 6.0 FlexPro is a very powerful, popular analysis software, well supported in DEWETrans. The integrated ActiveX features allow the direct data transfer from DEWETrans into FlexPro.

When you have ordered FlexPro, it will be automatically installed on your DEWETRON system.

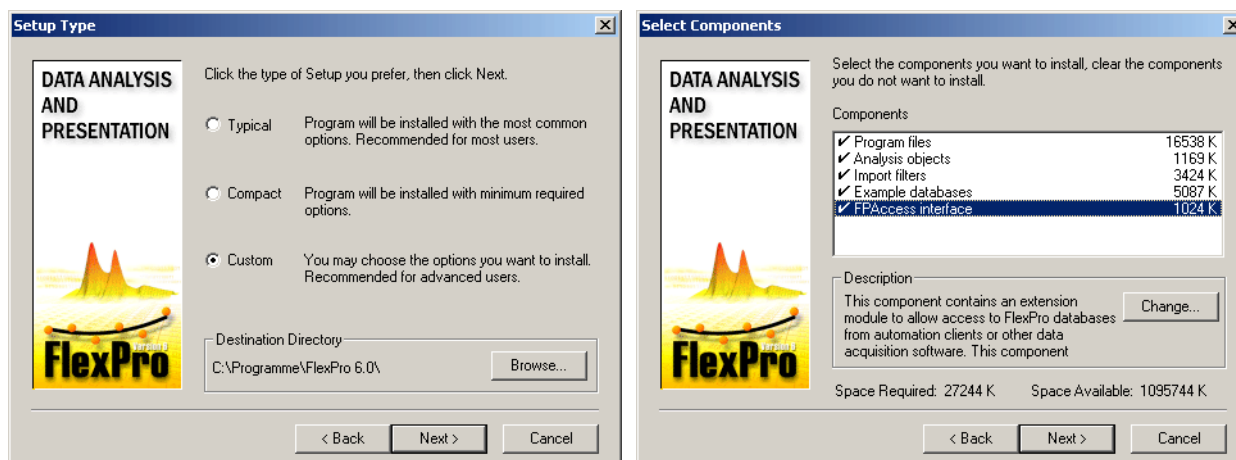
DEWETrans 6.0 supports both FlexPro versions 5 and 6. If you want to use your own system or install a FlexPro demo version (also included on the DEWEDAq CD), install the software using **Custom** setup and activate the **ActiveX access** in FlexPro 5 or **FPAccess interface** in FlexPro 6 during the installation.

Installing FlexPro 5



SELECT 'CUSTOM' AND ACTIVATE 'ACTIVEX ACCESS' DURING INSTALLATION PROCEDURE

Installing FlexPro 6



SELECT 'CUSTOM' AND ACTIVATE 'FPACCESS INTERFACE' DURING INSTALLATION PROCEDURE

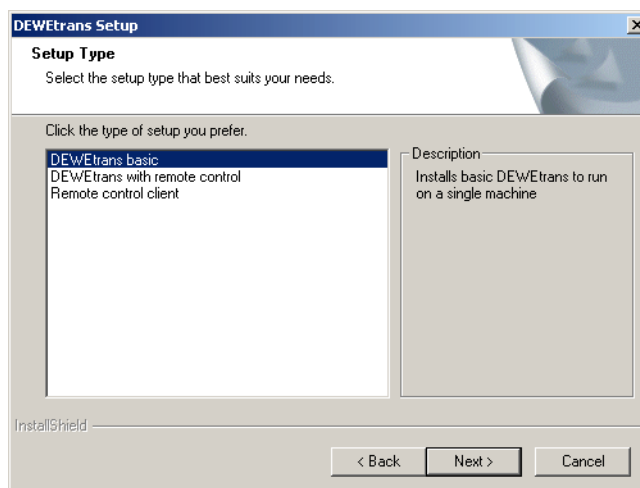
Attention: Before you can export any data from DEWETrans to FlexPro via ActiveX, you have to start FlexPro once and close it. Otherwise you might get an error message.

DEWETrans does not support FlexPro 5 VIEW and FlexPro 6 VIEW as a standard!

1.2.3 DEWETrans installation

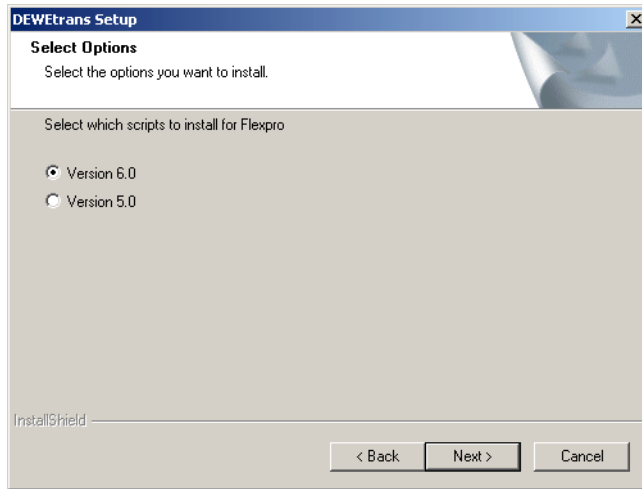


DEWETrans 6 To install DEWETrans, just follow the instructions of the installation shield. You will be asked which DEWETrans version you would like to install:

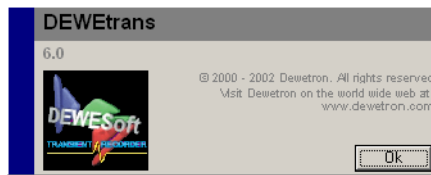


- DEWETrans basic: Single system installation
- DEWETrans with remote control: System installation with remote control option
- Remote control client: Client installation for DEWETrans remote control

The installation shield will also ask you which version of FlexPro you are using. This is required to install the correct FlexPro scripts for your version.



After installation, you may start DEWETrans directly from the WINDOWS desktop using the DEWETrans icon shown above. During the startup, you will see the following window showing the current software version:



KEEP PATIENT - DEWETRANS IS LOADING..

1.2.4 Installing WinVNC

If you are working with the remote control version of DEWETrans, the WinVNC will be automatically installed. After installation, you have to reboot the system!

1.2.5 Installing DEWETrans updates

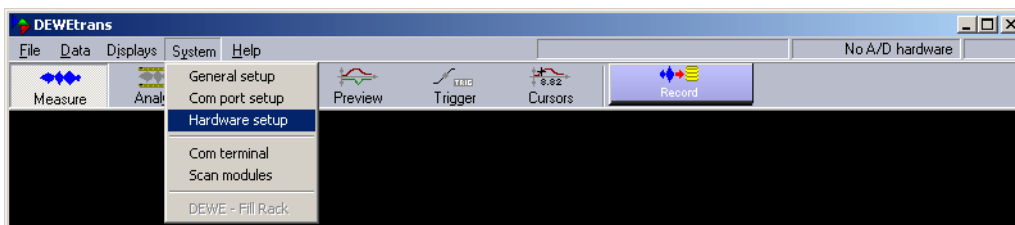
Please follow the installation instructions in the readme files, which are included with any update version. Updates are available on the DEWETRON web server <http://www.dewetron.com>, but you can also download them directly from the FTP server <ftp://ftp.dewetron.com/public/software/dewetrans>.

This directory contains the latest DEWETrans version, drivers, manuals and sample data.

1.3 Hardware settings

1.3.1 Selecting the A/D hardware or "No hardware mode"

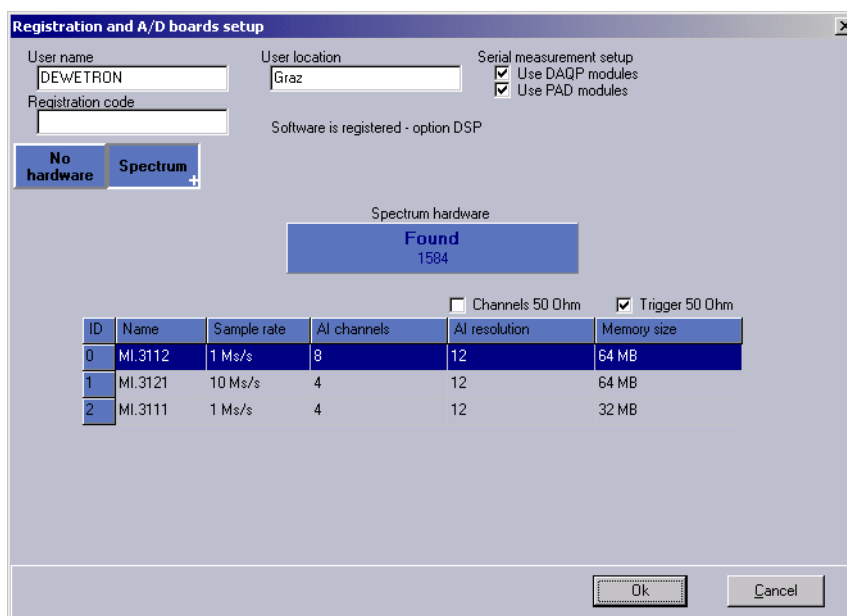
When you first run DEWETrans, it does not know which transient recorder boards you intend to use it with, so this is what we must set first.



THE SYSTEM MENU IS WHERE YOU DO INITIAL SETUP OF HARDWARE AND COM PORT

However, if you are running this software on a computer that does not have a transient recorder board, you can select the "No Hardware" mode, which will cause the software to generate waveform data for you, to allow the software behave realistically.

After starting DEWETrans, if the program does not automatically show this dialog box (it should the first time you run it), please use the **System menu** and select **Hardware setup**:



HARDWARE SETUP DIALOG BOX

If you want to run the software in purely demo mode (i.e., if you need the software just for data analysis), select "No Hardware," and then choose how many signals the system should generate for you. 8 or 16 are popular numbers.

If you want to run the software with real transient recorder boards, you must get a license key from DEWETRON, as the screen will ask you to input it. DEWETrans will automatically identify the A/D card(s) that you have installed and set it up for you - there will be nothing special that you need to do!

In the hardware setup two important input settings can be defined:

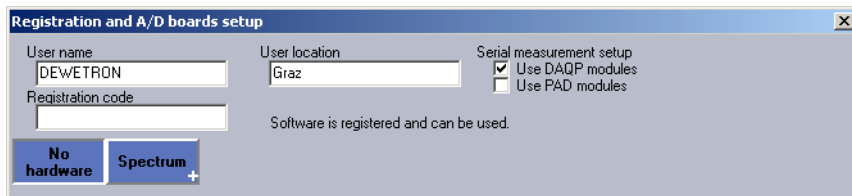


- Channels 50 Ohm: Check this selection box to activate the 50 Ohm input for all channels. Please don't use this function when you connect your signals to DAQx amplifiers. Use it only when you connect the signals directly to the transient recorder board (and it is required by your application).
- Trigger 50 Ohm: Check this selection box to activate the 50 Ohm input for the external trigger.

1.3.2 Select the COM PORT used for module communication

The next thing you need to tell the system is which COM PORT your DEWE-Modules are communicating on. If you do not have any plug-in DEWE-Modules connected to this computer, then please skip this step.

First activate DAQP modules to be used in the **Hardware setup**



If you are using any DEWETRON transient recorder hardware, like a DEWE-3010-TR, DEWE-2010-TR or DEWE-4000-TR, then you should tell DEWETrans which COM PORT these modules are communicating on.

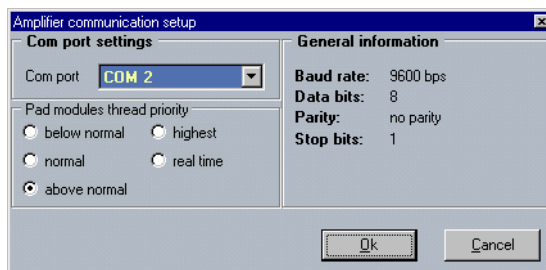
Attention: please check this to ensure that you have the correct com port, as incorrect settings can cause your system to hang up, or disable other devices that are already using the same com port.

The COM port selection varies according to which DEWETRON system you have:

DEWETRON System	DEWE-Module Com Port*
DEWE-3010-TR, DEWE-4000-TR	COM 2
DEWE-2010-TR	COM 1

** THIS IS A GENERAL GUIDE. PLEASE VERIFY USING YOUR ACTUAL SYSTEM CONFIGURATION.*

From the **System menu**, please select **Com port setup**, and this dialog will appear:

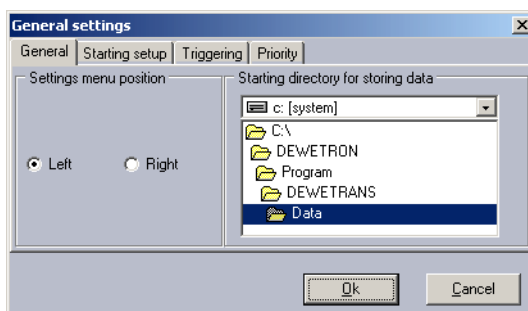


COM PORT SELECTION DIALOG BOX

You only need to select the COM PORT. As PAD modules are not supported within the DEWETrans software, you don't have to worry about the priority settings. The other parameters are defined automatically.

1.4 General setup selections for the display and options

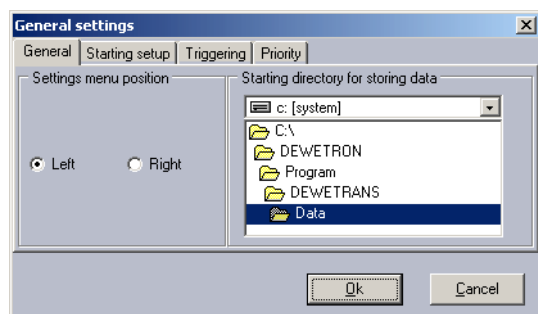
From the **System menu**, please select the **General setup** item to call up this dialog box:



DISPLAY SETTINGS ON THE GENERAL SETTINGS DIALOG BOX

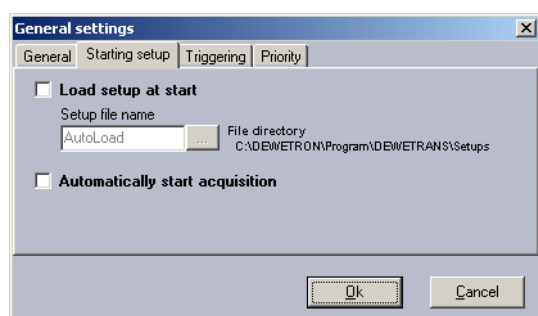
You will see that there are four tabs. Here is a brief description of each:

1.4.1 General



- Allows you to select whether the mode-dependent panels appear on the left or right side of the display
- Select the standard directory path for your data files, the recommended path is:
C:\DEWETRON\Program\DEWETRANS\Data

1.4.2 Starting setup



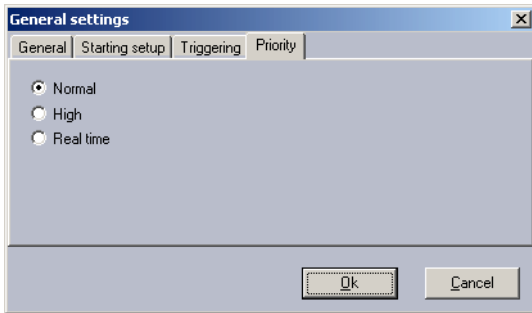
- Allows to load your defined setup automatically at startup (otherwise the system defaults are used)
- Allows to select autostart for the measurement

1.4.3 Triggering



- Allows you to activate external hardware trigger
- Allows to set the memory depth in MB / channel

1.4.4 Shown displays



- Allows you to set the priority for the acquisition

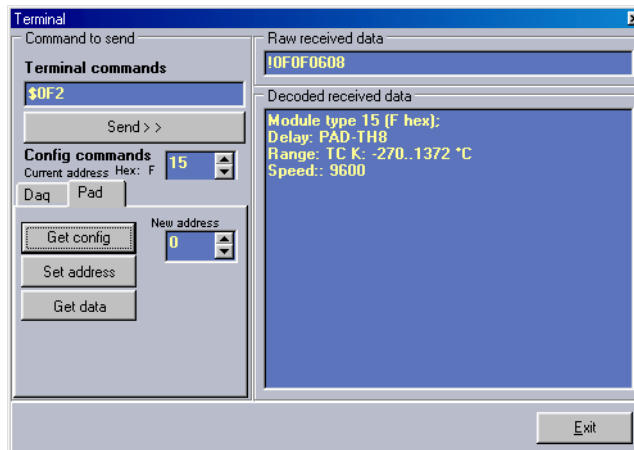
1.5 Additional system tools

Four additional system tools are embedded in the DEWETrans package, mainly for administration and support. You find them in the **System menu**.

1.5.1 Com terminal

The **Com terminal** allows to send commands to all DAQP and PAD amplifiers. Any commands mentioned in the DEWE-Modules technical reference manual can be entered here for direct communication with the amplifiers.

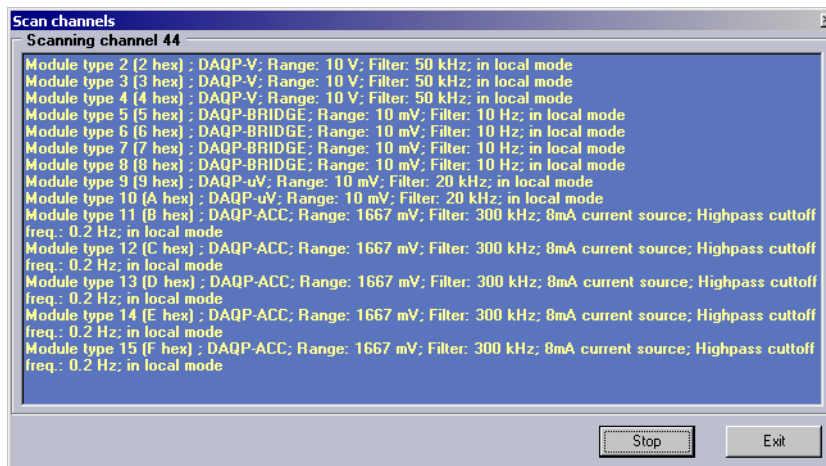
ATTENTION: Wrong commands can disturb the whole system!



COM TERMINAL EXAMPLE SHOWING INFORMATION OF A PAD-TH8-P MODULE

1.5.2 Scan modules

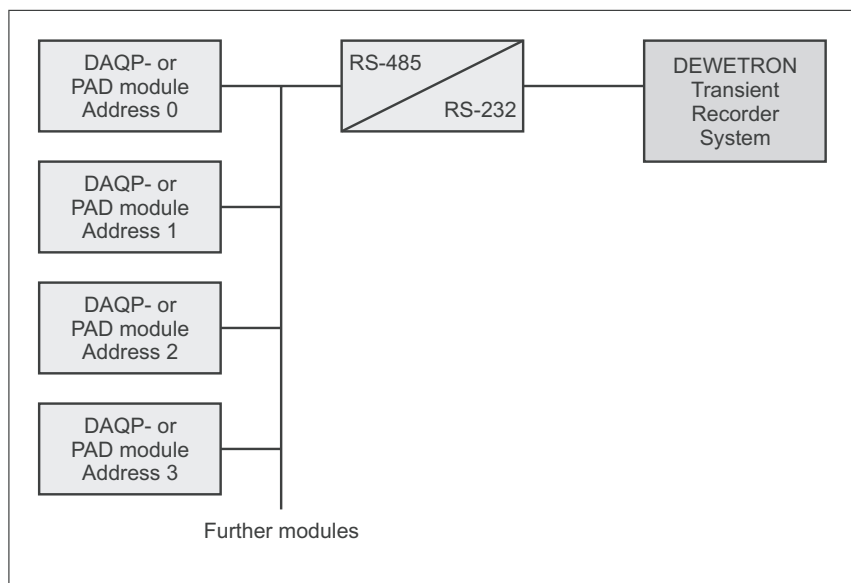
With the **Scan modules** command, DEWETrans is looking through the whole system for any amplifiers, connected to the system. The result is a nice overview of the current modules and settings.



SETTINGS SUMMARY OF ALL DEWETRON MODULES IN THE SYSTEM

1.5.3 Fill rack

All DAQP and PAD modules are communicating with DEWETRON systems through a RS-485 interface. To identify the modules, each module receives an own address, which matches normally to the mainframe slot number (e.g. module in slot 3 receives address 3).



SCHEMATIC OVERVIEW OF THE ADDRESS CONCEPT

With the **DEWE - Fill rack** menu, you can define the amplifiers very easy. Just plug in the amplifiers and follow the instructions on the screen. This feature is only available in **Measure - Setup** mode. More information about amplifier settings is also available in chapter 2.6

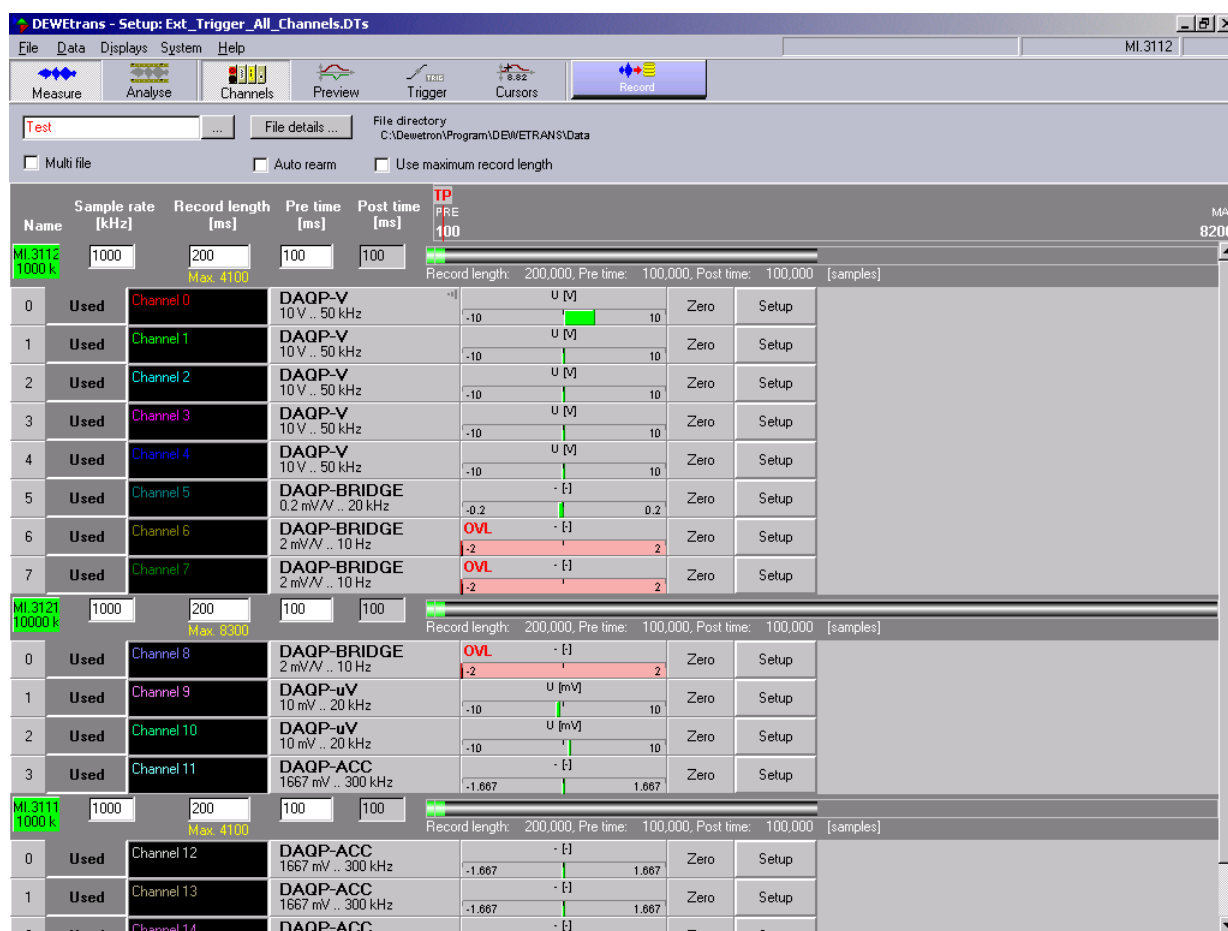
ATTENTION: If you use PAD modules in slot number 0, the address will be set to 255 (FF hex)!

Notes

2 Input settings, DEWE-Module installation and calibration

One of the most powerful and useful functions of DEWETrans is its ability to directly control all of your DAQP series plug-in modules. If you are running this software on an actual DEWETRON system that has DEWE-Modules, you will be able to see just how convenient and useful this feature is. Otherwise, please read this section and look at the pictures to see how this works in an actual Dewetron system.

First, make sure that you are in the **Measure** mode (not the **Analyse** mode, which is used only for data replay and exporting). There are two large buttons near the top-left of the display. Press the **Measure** button, and the **Channels** screen will automatically appear:



BASIC SETUP IS PERFORMED HERE ON THE CHANNELS SCREEN

Starting at the top, you will see that you can enter the base filename which will be used for data storage, the sample rate (expressed in PER CHANNEL), and several other important parameters.

In the screen above, all available channels are active. You can see that the **Used** button is pressed in for all input channels. You can activate any combination - or all - of your input channels just by pressing the **Used** button. Press it again to deactivate any input - then it changes the label to **Unused**.

To learn how to record data, please refer ahead to section 4 - *Recording Data*.

2.1 Sample rate selection

The maximum allowed sample rate will vary according to which transient recorder board you have installed. The green box on the left side displays the board model and the maximum sampling rate for each channel.



EXAMPLE: MI.3112 BOARD WITH 1000 KS/S (= 1 MS/S) MAXIMUM SAMPLING RATE

To change the sampling rate, just enter the desired value in the **Sample rate [kHz]** field. This sampling rate will be used for each channel, different sampling rates for each channel on one transient recorder board are not possible. But it is possible to set different sampling rates for each transient recorder board.

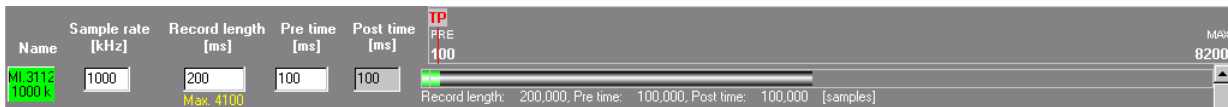
Be aware that there might be a small time shift between the A/D boards when they are running with different sampling rates. Detailed information is available in the Spectrum drivers documentation.

Be aware that the most transient recorder boards have a minimum sampling rate. Find more details about sampling rate specifications of your transient recorder board in appendix D.

The right choice of the sampling rate is a very sensitive part of the system. You will find additional information in appendix B.

2.2 Recording length

In the **Recording length [ms]** field you can define the recording duration for each acquisition shot in milliseconds. In the screen below, we have defined an acquisition window of 200 ms.



200 MS RECORDING DURATION - PLENTY OF FREE MEMORY SHOWN IN THE BAR GRAPH

The right part of this section displays the available and the used memory in a bar graph. The pre and post time is mentioned, the trigger position is displayed with the TP marker.

To change the value, just enter a value in the **Recording length field [ms]**. Below the field, you can see the maximum allowed duration. Entered values above this limit will be rounded down automatically.

Check the **Use maximum record length** checkbox (located in the file settings section above) to set the transient recorder to the maximum record length. This function will lock the Recording length field.

2.3 Pre and post trigger time

The last setting for the transient recorder board is the definition of pre and post trigger time. The value for the pre time can be set from zero to the maximum record length. In our example, the value can be anything between 0 ms and 200 ms.



PRE TIME SET TO 50 % OF RECORD LENGTH

The entered value depends on your application. If you want to see anything happened before your trigger event, enter a higher value in the **pre time** field. If you want to see a longer time after the trigger event, enter a low value.

The **post time** value will be automatically calculated from maximum record length minus pre time.

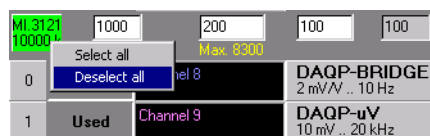
2.4 Activating / deactivating inputs

In our example, all inputs are already active (it says "Used" beside them). Click on input slots 1 and 2 to deactivate them. Click on the input slots 1 and 2 again to activate them. Now (at least) the first three inputs are active for recording, and the screen looks like this:

0	Used	Channel 0	DAQP-V 10 V .. 50 kHz	-10	U [V]	10	Zero	Setup
1	Used	Channel 1	DAQP-V 10 V .. 50 kHz	-10	U [V]	10	Zero	Setup
2	Used	Channel 2	DAQP-V 10 V .. 50 kHz	-10	U [V]	10	Zero	Setup

FOUR CHANNELS ACTIVATED FOR DATA ACQUISITION

A nice feature allows to activate / deactivate all channels at the same time. Just click on the green block which mentions the transient recorder type and the following selection window appears:



Now use **Select all** to activate or **Deselect all** to deactivate all channels.

2.5 Columns in the channel list explained

First let's look at the columns that are shown in your channel list, and describe what each is for:

0	Used	Channel 0	DAQP-V 10 V .. 50 kHz	-10	U [V]	10	Zero	Setup
1	Used	Channel 1	DAQP-V 10 V .. 50 kHz	-10	U [V]	10	Zero	Setup
2	Used	Channel 2	DAQP-V 10 V .. 50 kHz	-10	U [V]	10	Zero	Setup

CHANNEL LIST AND COLUMNS - SETUP SCREEN

- Slot number or input channel number
- Used / Unused button to activate / deactivate channels
- Channel name
- Amplifier type and ranges
- Online display for current input values
- Zero to remove offset
- Setup button for input settings and calibration

2.5.1 Slot number

This column is a direct reference to the slots within your DEWETRON system. If you have a DEWE-3010 or DEWE-3000, the first 8 (0 through 7) slots are the one on the mainframe itself, and the second group of 8 slots pertain to either the BNC inputs or RACK-8/3010 expansion rack, depending on the configuration of your system. If you have a DEWE-2010, DEWE-4000, DEWE-RACK-16, or DEWE-BOOK-16, then each slot pertains to one of the 16 on the system itself.

This field has also a copy / paste function. When you click on a slot number, a window will appear:



COPY / PASTE FUNCTION FOR CHANNEL SETTINGS

Example: channel 0, 1 and 5 contain the same DEWE-Module, e.g. a DAQP-V module with the same sensor connected. If you click now on slot 0 and select **Copy**, the system will remember all important settings from channel 0, like amplifier type, input and filter ranges, units, calibration and zero settings. Now click on slot 1 and select **Paste** - this will copy all settings from channel 0 to channel 1. Click on slot 5, select **Paste** and the settings will also be copied to channel 5.

ATTENTION: This function is only working with amplifiers of the same type. Channel names will not be copied.

2.5.2 Used / Unused button

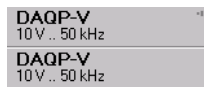
This is a button that you click to toggle this input on/off (**Used / Unused**). If it says USED, then it will be available. Click on the green transient recorder board field to activate / deactivate all channels (see also 2.4).

2.5.3 Channel name

Free text field for naming this input channel. Just click into the field and you can enter the channel name. You can also enter this text on the input calibration screen (see section 2.7, called *Input calibration*).

2.5.4 Amplifier

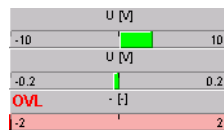
Shows the DEWE-Module currently installed in this slot. If it is a DAQP module, it will show the name of the module and the range selected. If it is a DAQN or DAQ series (non-programmable) module, the name alone is shown. If is a PAD series module, the name and range are also shown (PAD modules are not supported for measurements in DEWETrans). A small arrow on the right side of the field is running through all fields, indicating that all channels are scanned for new amplifiers or settings.



AMPLIFIER, SETTINGS AND SCANNING INFO

2.5.5 Online physical values

Contains a dynamic representation of this input channel, as well as the units of measurement and description, and your scale. When the input signal exceeds the possible range, a red indicator OVL will be displayed - if this happens, check your sensor and / or select another input range.



OVERVIEW OF THE CURRENT INPUT SIGNALS

2.5.6 Zero

Zero This is a button that you can click to perform a mathematical zeroing of this input, to offset small variations in the zero position of the input. Click on the the **Zero** button with the left mouse button to activate zeroing, and use the right mouse button to deactivate (reset to default input range).

2.5.7 Setup

This is a button that calls up the *Input Calibration* dialog box for this input. You will learn all about this in the next section 2.7.

2.6 Module installation tips

You can install your DAQP modules (and any DAQN module that has a small black button near the top of the module) all at once, or if you replace just one module, you can also replace just one module in the software without installing them all again.

Let's look at the initial installation of all modules. Please note that this is done for you when you receive your Dewetron system, but if you change modules around frequently, this procedure will be very useful for you to know.

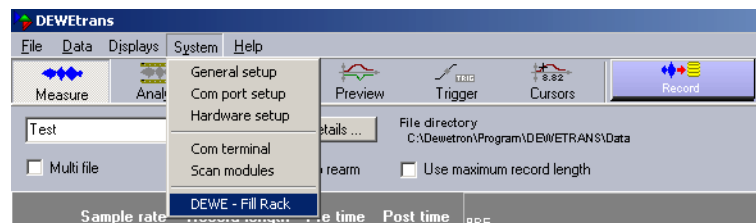
First, please do not try to do this unless you:

- 1) Really have DAQP or certain DAQN modules connected to this system!
- 2) Have set up the com port properly in accordance with the instructions in this manual (see *Select the COM PORT used for module communication*)

The reason for this precaution is simple: when you tell DEWETrans to scan for your modules, it will use the com port previously defined. If there are no modules on that port, or some other device in your computer is currently using that com port, it will hang up your computer! Please proceed only if you are really using a DEWETRON system with DEWE-Modules.

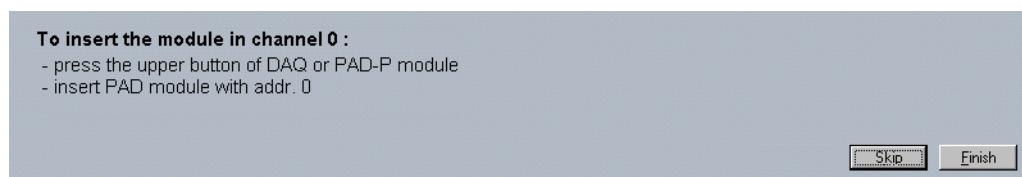
2.6.1 Using the Fill Rack function to add modules

When your com port is properly set as described above, move to the **Channels** screen, and then select the **DEWE - Fill Rack** option from the System menu (you must be on the **Channels** screen in order for this menu item to be available - otherwise it will be grayed out).



THE FILL RACK COMMAND IS AVAILABLE ONLY FROM THE CHANNELS SCREEN

When ready, select the **DEWE - Fill Rack** menu item, and DEWETrans will ask you to either press the top black button or reinsert the PAD module into each slot, one at a time, starting with slot 0. A system beep confirms the pressed button.



THIS ON-SCREEN PROMPT APPEARS WHEN FILLING THE RACK...

If you do not have a DAQP module or DAQN module with a small black button near the top of the module in any slot, or if this is an empty slot, simply click the **Skip** button and it will move to the next module. When you have done it, click the **Finish** button.

2.6.2 Replacing just one module

You can replace just a single module without having to run the **FILL RACK** function and start all over again. This is convenient when you have just swapped one or two modules out in order to do a certain test, and you do not want to enter in the input names, scaling, and re-run the calibration on the unchanged channels.

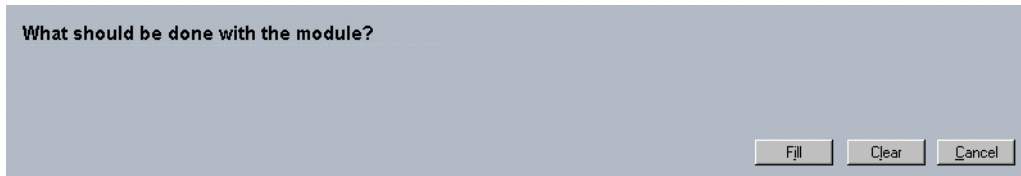
Installing just one DAQP series module

1. Remove the module that you are replacing, or the blank panel from the slot that you wish to plug your new/replacement module into.
2. Install the DAQP series module into this slot.
3. Double-click on the name of the module (e.g. DAQP-V)

0	Used	Channel 0	DAQP-V 10 V .. 50 kHz	-10	U [M]	10	Zero	Setup
1	Used	Channel 1	DAQP-V 10 V .. 50 kHz	-10	U [M]	10	Zero	Setup
2	Used	Channel 2	DAQP-V 10 V .. 50 kHz	-10	U [M]	10	Zero	Setup

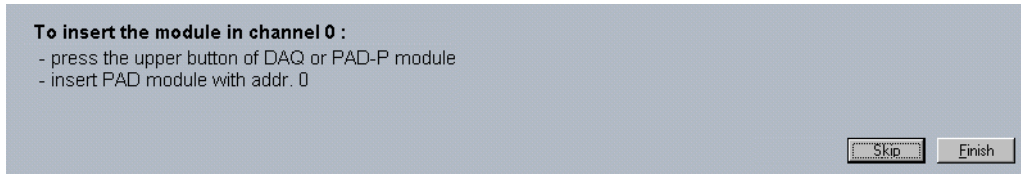
DOUBLE-CLICK ON THE NAME OF THE MODULE, LIKE "DAQP-V" IN THE EXAMPLE ABOVE

4. and the software will ask you a question on the screen: WHAT SHOULD BE DONE WITH THIS MODULE? With three choices: **Fill**, **Clear**, or **Cancel**. **Fill** allows you to add your new module. **Clear** removes any module from this slot. **Cancel** leaves here without making any changes. Click **Fill** to add your new module.



CLICK FILL TO ADD YOUR NEW MODULE...

5. The software will now instruct you to press the top black button on the new DAQP module. When you do this, it will recognize it and add it into this slot on the screen.



PRESS THE TOP BLACK BUTTON ON THE NEW MODULE, OR CANCEL TO LEAVE WITHOUT MAKING ANY CHANGES

6. Now just click the SETUP button for this slot and configure it as you would any other module. Notice that your configuration for the other modules is unchanged!

Installing just one DAQN or DAQ series module, or NONE

If you are replacing a DAQP series module or PAD series module with a non-programmable type, simply double-click the name of the DAQP module that you want to remove/replace, and then select **Clear** from the prompt that will appear. This will remove the programmable module from this slot and will display Direct input. Now just click the **Setup** button for this slot and then manually tell the software which non-programmable module you wish to add to this slot and select the correct input range.

Detailed information about input ranges of the DAQ / DAQN series modules is available in the DEWE-Modules technical reference manual, shipped together with your system.

Installing just one PAD series module

As PAD modules are not supported in DEWETrans, please refer to the DEWESoft or DEWEDaq users manual.

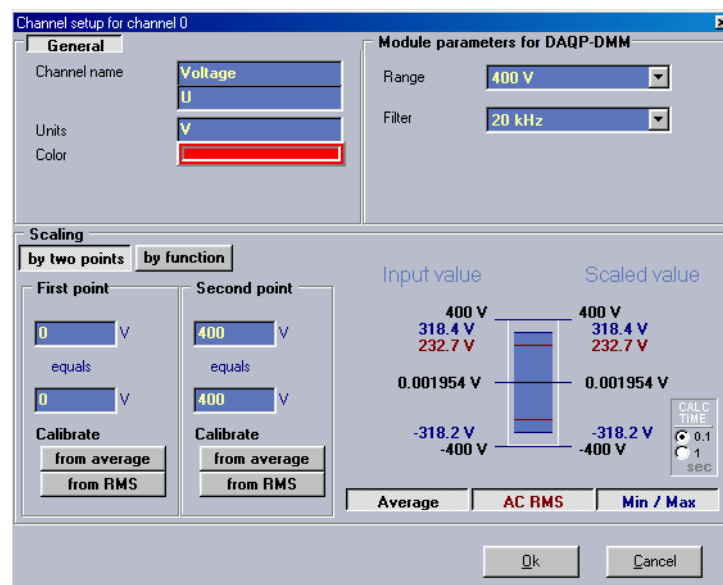
2.7 Input calibration

Now let's look at the calibration. For this exercise you can also use the self-generated signals when DEWETrans is run with the No Hardware option, since most engineers evaluating this software will run it on a computer without a transient recorder board, and without DEWETRON plug-in DEWE-Modules installed. To calibrate any input, just click the **Setup** button all the way on the right side of the table, for that input:

0	Used	Channel 0	DAQP-V 10 V .. 50 kHz	U [V]	-10	10	Zero	Setup
1	Used	Channel 1	DAQP-V 10 V .. 50 kHz	U [V]	-10	10	Zero	Setup
2	Used	Channel 2	DAQP-V 10 V .. 50 kHz	U [V]	-10	10	Zero	Setup

CLICK ANY INPUT'S **SETUP** BUTTON TO OPEN THE INPUT CALIBRATION DIALOG BOX

When you do, this setup dialog will appear:

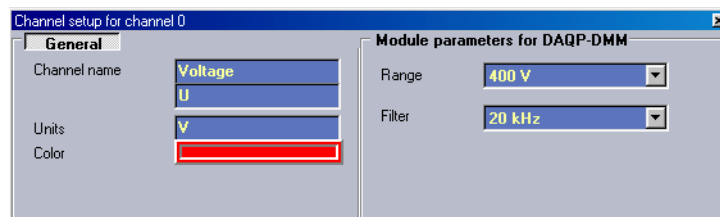


INPUT CALIBRATION DIALOG BOX

2.7.1 Module type, range and filter selection

This is done at the top-right corner of this dialog. If you have actual DEWE-Modules (DAQP or PAD series) in this computer, they will appear here, and you can control their ranges and filters directly from this screen. But in this evaluation unit we will assume no DEWE-Modules. Note that at the top-right you could select any non-programmable DEWE-Module (older DAQN series are supported, making this software backwardly compatible with all modules that we have made).

If a programmable module is installed in this slot, the **Module type** combo box will be replaced with a **Range** selector, and the **Measure range** will be replaced with a **Filter** selector, as shown here:



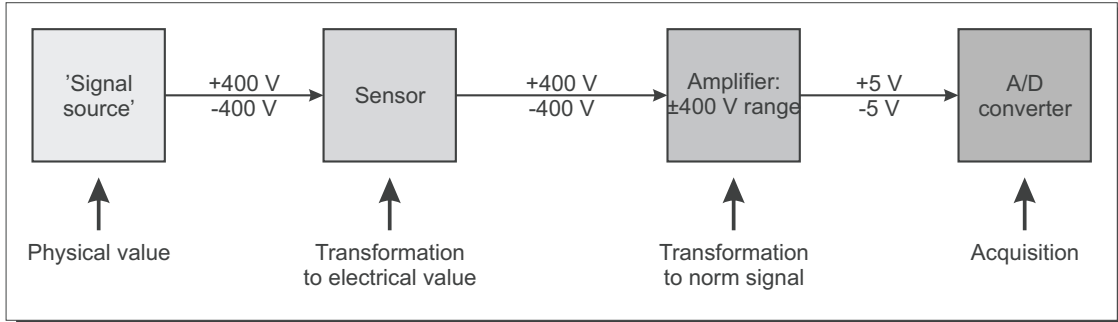
TOP OF DIALOG WHEN A DAQP MODULE IS INSTALLED IN THIS SLOT

The top-left of the dialog you can enter any name for this input, select the type of signal that it is (Dynamic, Static, Tacho, etc.), the measurement value, and then the units of measurement. Click also on the color bar to

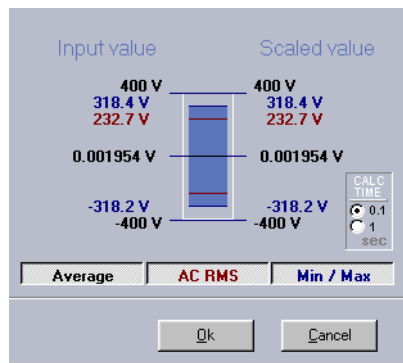
change the color for this input. This color will carry through the text and waveform representations of this input throughout all DEWETrans screens.

Range selection example:

A voltage up to ± 400 V (= signal source) will be measured with cables (= 'sensor') connected to a DAQP-DMM module (= amplifier).



First you have select the right input range for the DAQP-DMM module (= 400 V) and an input filter matching to your application. Don't worry about anything behind the amplifier. Now you can verify the current input signal at the bottom-right corner of the dialog.



CURRENT INPUT SIGNAL AT THE SELECTED CHANNEL

- The bar graph shows the current input signal. In addition, the min / max, AC rms and average values are displayed. If the input signal is higher than the selected input range, you will see a message **OVL** in this screen.
- The values at the left side of the bar graph shows the 'electrical input' value, representing the input range of the amplifier. The right side shows the 'physical input' value of the scaling. In this example, they have to be the same.
- Use the **Average**, **AC RMS** and **Min/Max** button to show or hide the values.
- Change the **CALC TIME** between 0.1 and 1 sec to achieve the best view for your signal.

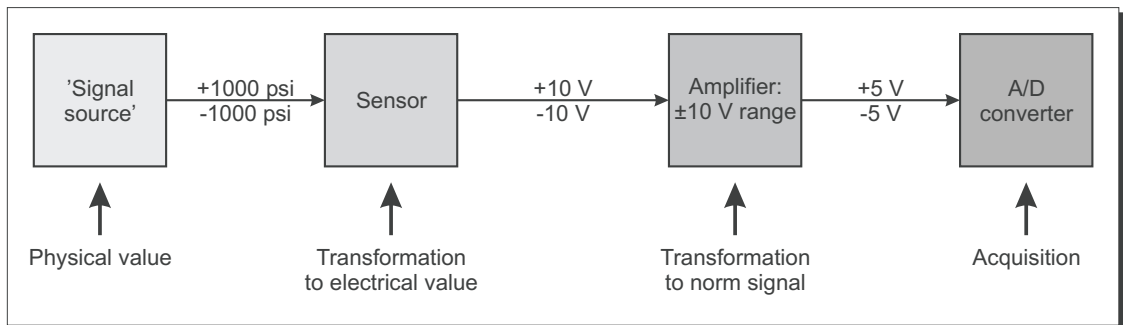
2.7.2 Calibrating an input

The bottom-left corner is where you can perform manual or automated calibration, either on a 2-point basis or a functional basis. The bottom-right portion of the dialog contains a dynamic representation of your signal - the left side are the "electrical" units, and the right side is the scaled engineering units, so you can directly see the effect of your calibration values.

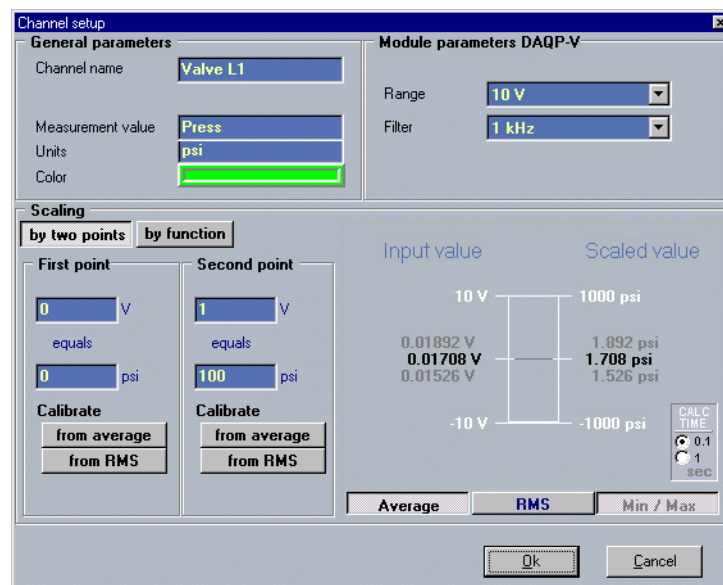
Calibrating input example:

Pressure up to ± 1000 psi (= signal source) will be measured with a 100 psi / V sensor, connected to a DAQP-V module (= amplifier with 10 V range).

Input Setup

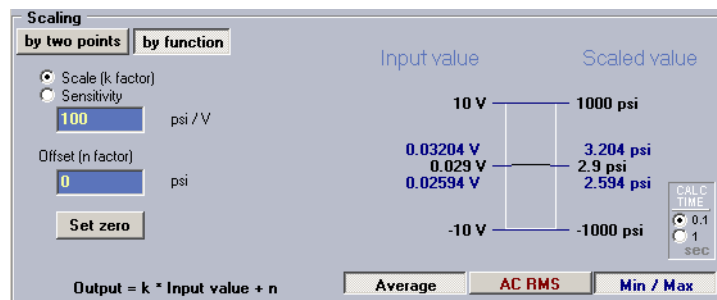


In the example screen, you can see that the default values are entered - the real and engineering units are the same. But what if this was a pressure sensor that had a voltage output, and each volt represented 100 psi of pressure? Here is how we would set it up - starting at the top, we enter our text values for this channel. Then in the bottom-left, we tell the system that 0 real volts equals 0 PSI, and 1 real Volt equals 100 PSI. If you look at the graph on the bottom-right corner of the dialog, you can see that the real input signal has a max of 0.01892 V at this moment, which is being scaled to 1.892 PSI, which is exactly what you would expect:



INPUT CALIBRATION DIALOG BOX

Another way to perform such a simple linear function would be to simply multiply the input by a factor of 100. You can easily do this by clicking the **by function** button, which will change the two-point calibration portion of the dialog to look like this:

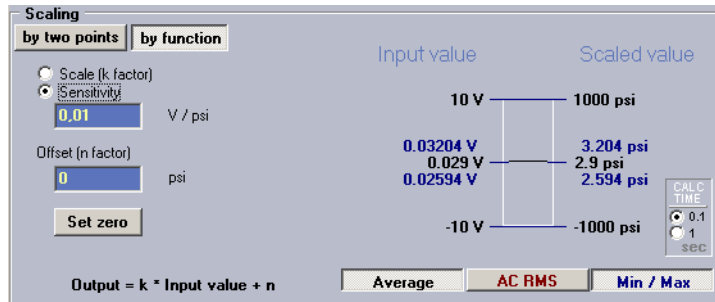


FUNCTIONAL SCALING SECTION OF THE INPUT CALIBRATION DIALOG BOX

Above shows your basic $y = mx + b$ algebraic formula, which makes it easy to input strain gage k factors and offsets, as well as to perform simple offset calcs like the conversion from Celsius to Fahrenheit (enter 1.8 in the top box and 32 below).

There are two ways of entering the value (just a question of the value):

- Scale (k factor); example above: $k = 100 \text{ psi} / \text{V}$
- Sensitivity; example above: $k = 0.01 \text{ V} / \text{psi}$

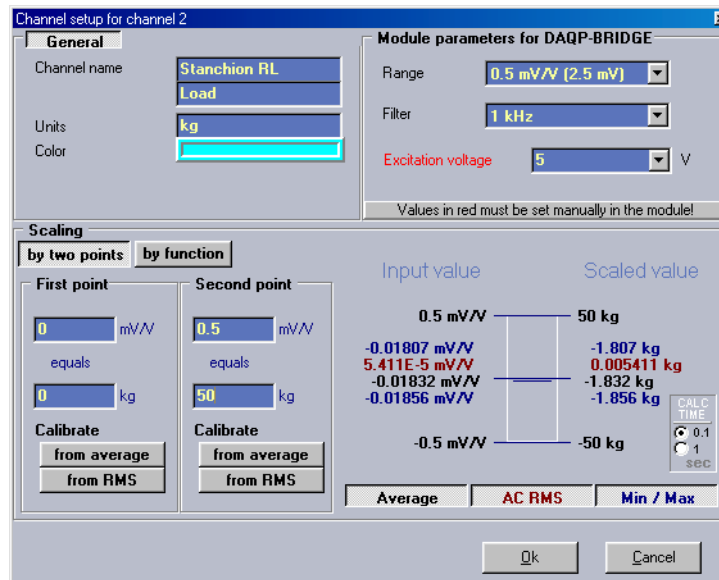


SAME EXAMPLE THAN ABOVE, BUT WITH SENSOR SENSITIVITY

Both methods can cause a small offset. Use the **Set Zero** button in the main setup to conveniently offset the signal to "force" it to zero, when it is not exactly at that value (but should be), due only to small sensor offsets and perhaps long cable lengths causing capacitive coupling and/or line loss.

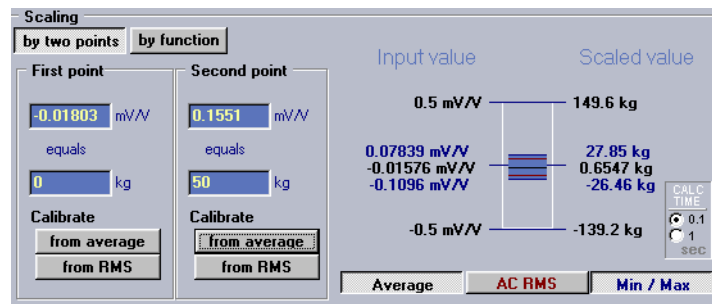
2.5.3 Calibrating to signal sources

Looking back at our 2-point calibration, there are two other sets of buttons that will allow you to perform a more accurate calibration when you have access to a known signal source or load. Let's say that we have a load sensor that we want to calibrate to a known load. We want to enter two points - say zero (0 kg) as our first point, and fifty (50 kg) as our known second point. The first thing to do is simple enter those two values in these boxes as shown:



CALIBRATION DIALOG BOX

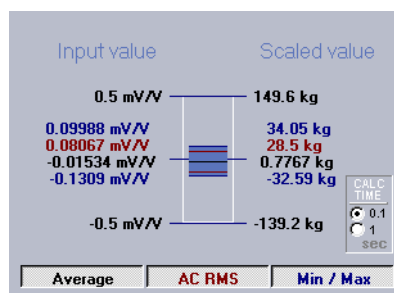
Now, we need to apply the known zero (0 kg) load. When it stabilizes, press the left-most **from average** button, and the software will sample the input for a short time, average the values that it receives, then calculate the required number for the upper left box.



CALIBRATION DIALOG BOX - BOTTOM SECTION

Now apply the known 50 kg load, let it stabilize, and press the right-most **from average** button. That's it - DEWETrans is now perfectly calibrated to your signal based on the known loads that you input. Note in the screen picture above that DEWETrans has automatically input the two values in the upper two boxes that it needed in order to achieve this calibration.

If you have an AC signal source, you should not use the **from average** buttons - use the **from RMS** buttons instead! Also, press the blue-labeled **RMS** button below the graph to add the RMS values to the dynamic display:

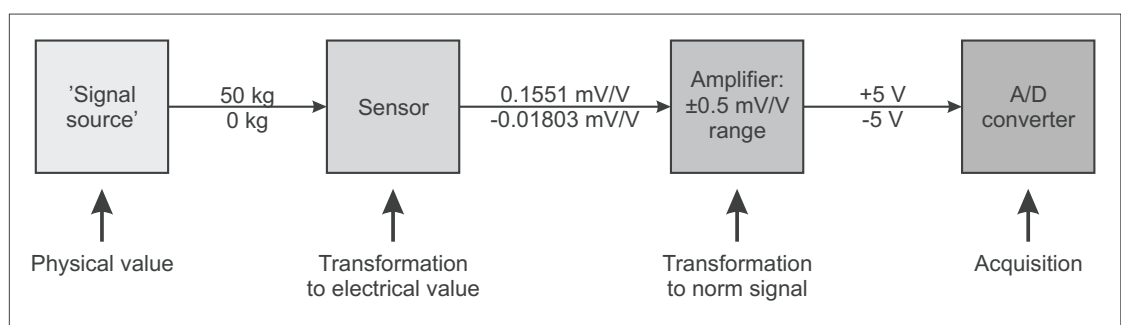


CALIBRATION DIALOG BOX - DYNAMIC DISPLAY

The ability to quickly calibrate directly to DC and AC signal sources is a great advantage of DEWETrans, and will save you much time, and ensure better and more reliable data recording long into the future.

Background to this example:

Defined weight from 0 to 50 kg (= signal source) will be measured with an uncalibrated strain gage sensor (= sensor) connected to a DAQP-BRIDGE module (= amplifier with 0.5 mV/V range).



2.7 Saving your setup

That's all there is to it - all of your modules have now been set to the same address as the slot that they are in! It is prudent to stop right now and save this setup as something called "Default" or "Modules," or something easy to remember, as it can serve as a nice starting point for any number of setups. Setups are automatically stored in the \Setups subdirectory, and given an extension of .DTs. The setup can be stored in the **File - Save Setup** menu. **Save Setup As** can be used if you want to give the current setup a new name.

If you want to make this setup to your default startup setup, define the file in the **System - General settings - Starting setup** menu (see also 1.4.2).

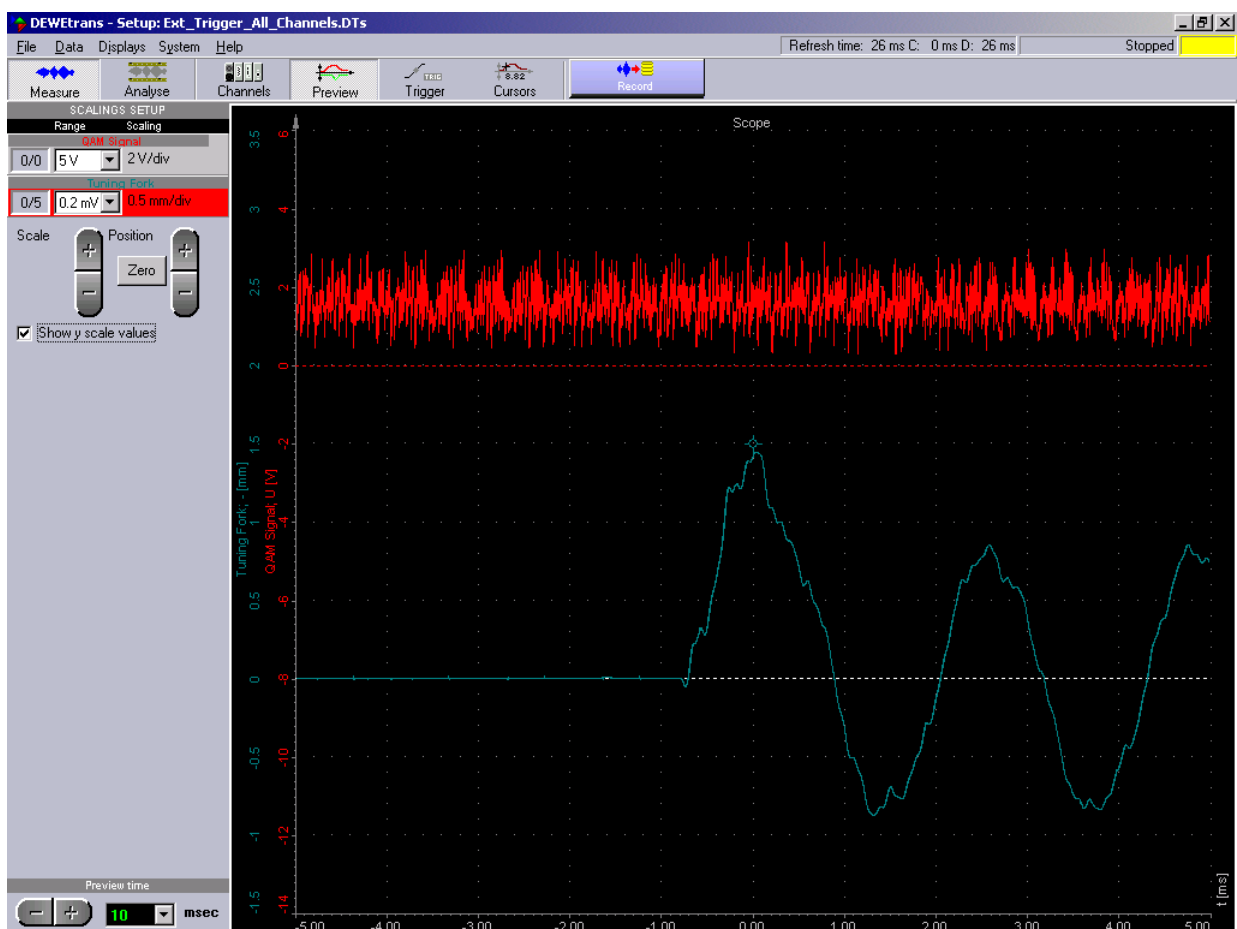
3 Using the online display

For the online display and data acquisition, there are three functions:



- Preview
- Trigger
- Cursors

After you have done all the transient recorder and input channel settings, just click on the **Preview** button. The following window appears (and maybe also a signal...):



ONLINE PREVIEW DISPLAY

If you don't get a display, it may be caused by wrong trigger settings. Therefore we start now with the trigger settings and describe the online display a bit later.

3.1 Trigger settings

The trigger setup in DEWETrans 6 supports two acquisition modes:



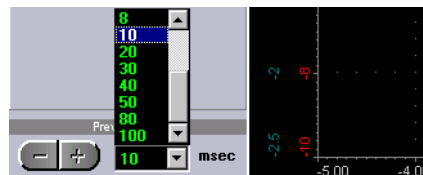
SELECT TRIGGER MODE

- Free run Use the free run mode to get an idea of your signal. The display will be updated continuously, but be aware that there might be gaps in between.
- Normal The normal mode should be the standard setting for triggered acquisitions. Various trigger types can be defined.

3.1.1 Preview time

Before you change the trigger settings, you should set the preview time to a suitable value.

Click on the symbol to zoom out (longer time window), on the symbol to zoom in (smaller time window) or click on the dropdown list and select from the predefined values. The preview time can be set between 0.5 ms (= 50 μ s/div.) and 100 ms (= 10 ms/div.).



SELECT PREVIEW TIME FROM DROP DOWN LIST OR USE \pm BUTTONS

3.1.2 Trigger source

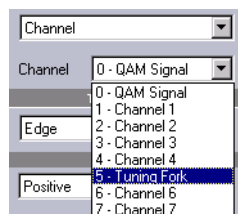
The trigger source in DEWETrans can be any input channel or the external trigger input. Just select the source from the dropdown list.



SELECT EXTERNAL OR INTERNAL TRIGGER SOURCE

When the external trigger is selected, the edge trigger is available for your settings.

When the channel trigger is selected, you also have to specify on which channel the system has to trigger.



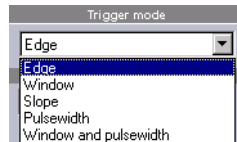
SELECT THE CHANNEL FOR INTERNAL TRIGGER SOURCE

You can also trigger on unused channels! This is a nice function and can be interesting for applications where you have to save acquisition memory for other channels.

When the transient recorder system contains several boards, you can also select the board used for trigger.

3.1.3 Trigger modes

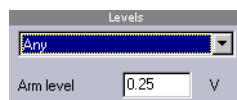
DEWETrans supports several internal trigger modes. In the following section you will learn more about the trigger modes and their settings.



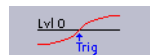
CURRENTLY SUPPORTED TRIGGER MODES

Edge trigger

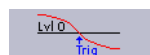
The edge trigger is the standard trigger and allows to trigger at rising, falling or both edges of a signal at a certain **Arm level**.



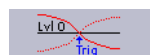
Small icons should help you to understand how the trigger is working:



Trigger on rising edge @ selected arm level



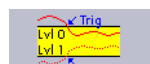
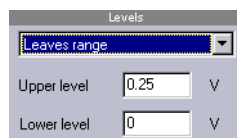
Trigger on falling edge @ selected arm level



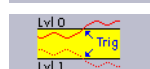
Trigger on both edges @ selected arm level

Window trigger

The window trigger is looking for two levels (upper and lower), which build a window.



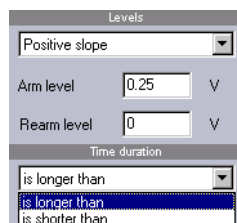
Trigger when the signal enters the window



Trigger when the signal leaves the window

Slope

The slope trigger checks the rise or fall time of a signal within two levels. You can trigger on faster or slower signals than the defined time window. Enter the window time in milliseconds.

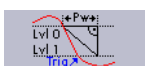




Trigger on rising edge when time between levels is longer than selected time



Trigger on rising edge when time between levels is shorter than selected time



Trigger on falling edge when time between levels is shorter than selected time

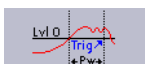


Trigger on falling edge when time between levels is longer than selected time

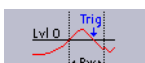
Pulsewidth

Trigger on pulses wider or narrower a certain time. Enter positive or negative slope for the pulse, the arm level the signal has to cross and the time duration in milliseconds.

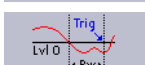
Levels	
Positive pulse	▼
Arm level	0.25 V
Time duration	
is longer than	▼
Time	0 ms



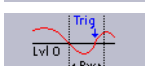
Trigger on positive pulse when pulse is longer than selected time



Trigger on positive pulse when pulse is shorter than selected time



Trigger on negative pulse when pulse is longer than selected time

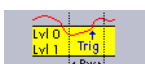


Trigger on negative pulse when pulse is shorter than selected time

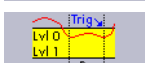
Window and pulse width

This trigger is a combination of pulsewidth and window trigger. It triggers when the signal enters or leaves a defined level and time window.

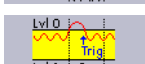
Levels	
In the range	▼
Upper level	0.25 V
Lower level	0 V
Time duration	
shorter than	▼
Time	0 ms



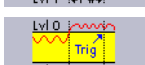
Trigger when signal enters window for a time below the selected time



Trigger when signal enters window for a time above the selected time



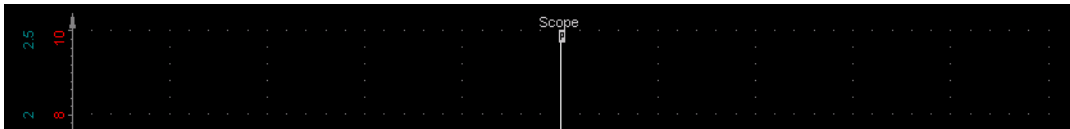
Trigger when signal leaves window for a time below the selected time



Trigger when signal leaves window for a time above the selected time

3.1.4 Trigger position

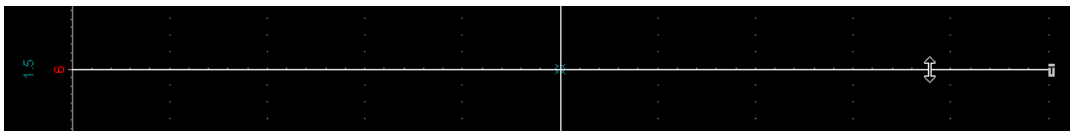
The trigger position in the online display is always in the center of the screen. The trigger position is also marked with a **P** symbol and a vertical line.



THE P SYMBOL AT THE TOP OF THE SCREEN SHOWS THE TRIGGER POSITION

3.1.5 Trigger level adjustment

As described before, you can enter the trigger level in the corresponding fields. But there is also another way: Click on the horizontal line marked with a **T** symbol (the cursor will change to the arrow format \updownarrow), keep the mouse button pressed and move it up or down.



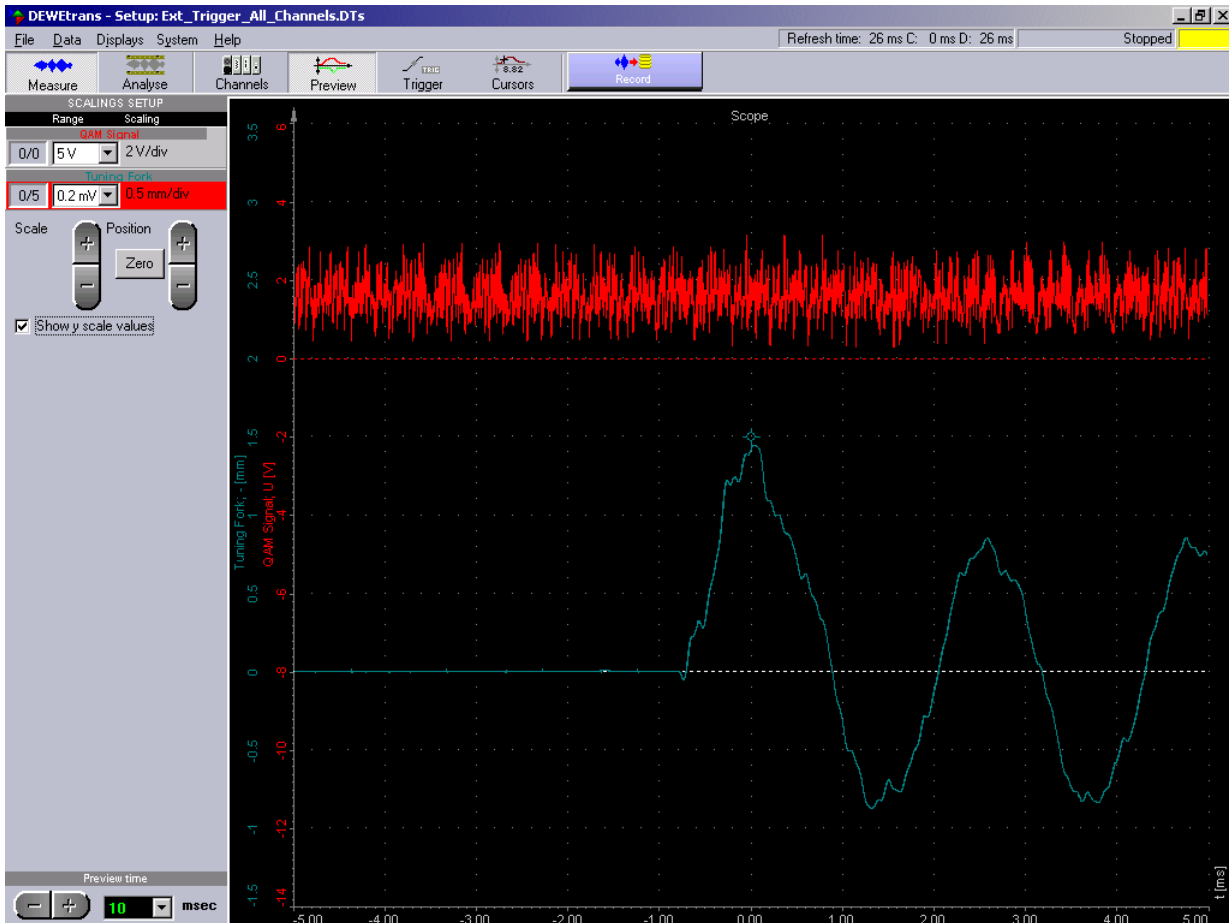
THE T SYMBOL AT THE RIGHT SIDE OF THE SCREEN SHOWS THE TRIGGER LEVEL

For all trigger modes which require two limits, there is a second line marked with a **R** symbol.

3.2 Preview


The preview allows you to get an idea of your signal (like an oscilloscope) and offers the possibility to change the input range and sensitivity for all acquired channels.

Click on the **Preview** button or select **Scope** from the **Display** menu to get the following screen:

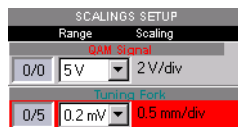


TYPICAL PREVIEW SCREEN

At the bottom of the screen, you can see the preview time selection we already discussed in the trigger section before.

The trigger position is not any more displayed with horizontal and vertical lines, there is just a small target marker .

To change settings of any channel, just click on it. The background of the channel selection will become red.



TUNING FORK CHANNEL READY FOR CHANGES

3.2.1 Show / hide channels

To show or hide channels in the **Preview** screen, just click on the number on the left side of the selection field. The number represents the board and channel number, separated by a slash (e.g. 0/5 is channel 5 of board 0).



3.2.2 Change input range

To change the input range of the amplifiers, you don't have to go back to the **Channel** setup. Just click on the **drop-down list** and select from the amplifiers input ranges.

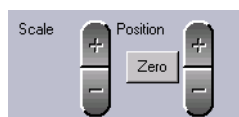


The values are always corresponding with the amplifier type. For example the DAQP-BRIDGE amplifiers show mV/V units, the DAQP-V amplifiers V units.

On the right side you can see the corresponding input range per division, scaled to the physical units. In our example, the electrical mV/V input of the DAQP-BRIDGE module is scaled to mm/div.

3.2.3 Change scale and position

To change the displayed signal range just click on the \pm **Scale** symbols. + increases, - decreases the sensitivity per division.



USE \pm SYMBOLS TO CHANGE SCALE AND POSITION

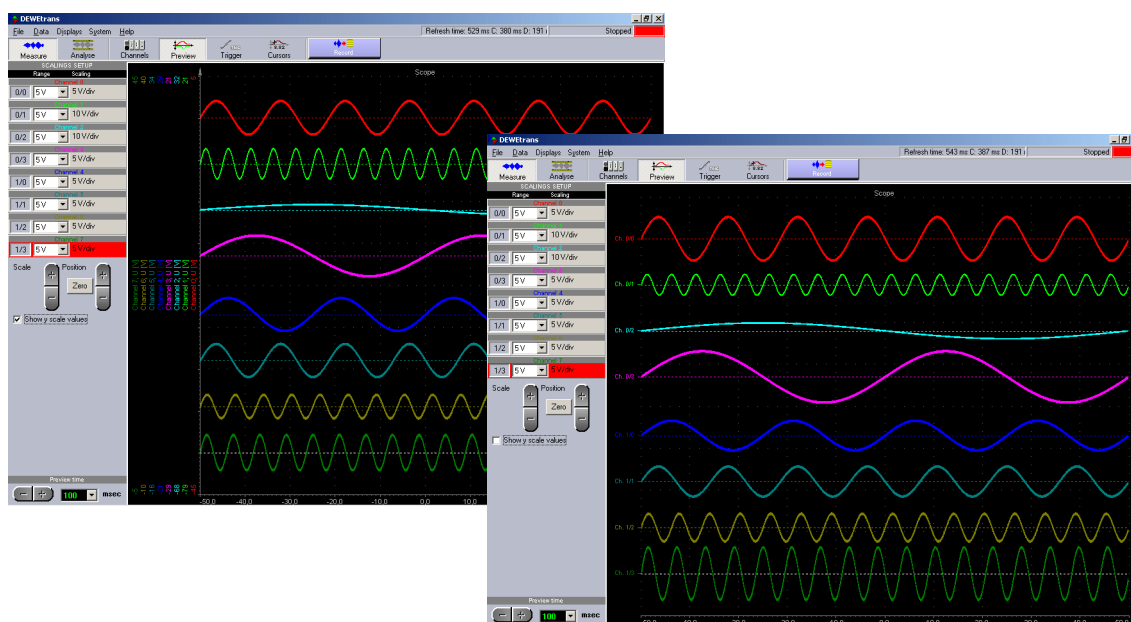
The \pm **Position** symbols can be used to move the signal to the upper or lower part of the screen, the Zero button sets the position back to the middle of the screen.

But you can define the displayed range for each channel also by yourself: Just click on the value at the top or bottom of the Y-axis scale and enter the desired value.



3.2.4 Y-axis scale values

Use the **Show y scale values** to show or hide the Y-axis scale. What's that for? If you have a lot of channels active, the Y-axis scale requires a lot of space.

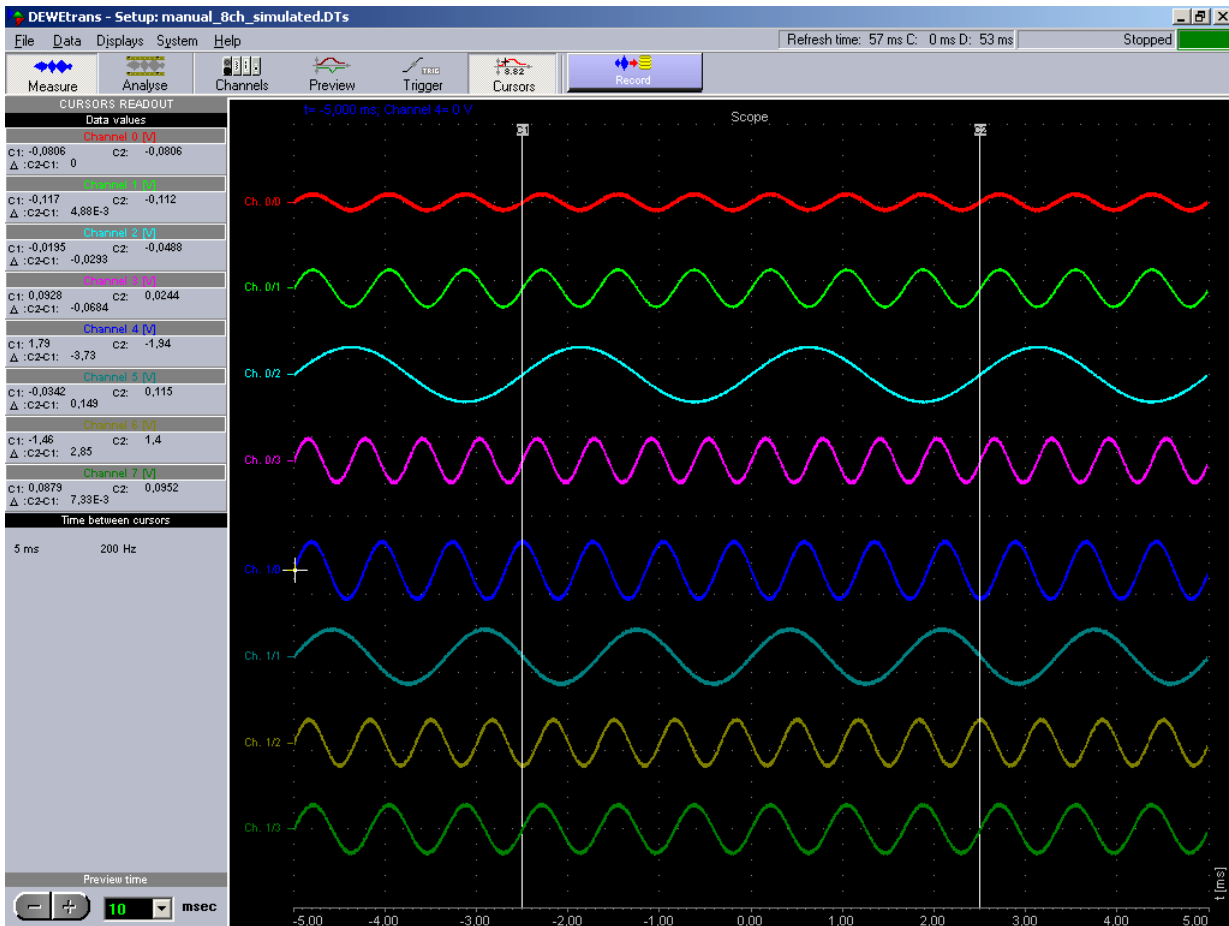


DIFFERENT Y-AXIS SCALE VALUES

3.3 Cursors

DEWETrans offers two online cursors. The following parameters will be displayed in the left bar::

- Amplitude @ cursor position 1 (for all channels)
- Amplitude @ cursor position 2 (for all channels)
- Amplitude between cursor position 1 and 2 (for all channels)
- Time between cursors (only once for all channels)



CURSOR VALUES

To move the cursors to the desired position, just drag the vertical lines.

4 Recording data

In the first section, we already saw that there are several settings for recording data, like pre-define the filename to be used for data recording. This is done on the **Channel** screen (see also section 2).

4.1 Basic recording setup

The recording setup consists of several parts: file name, multifile and auto-rearm selection, and the option to use full memory for acquisition.



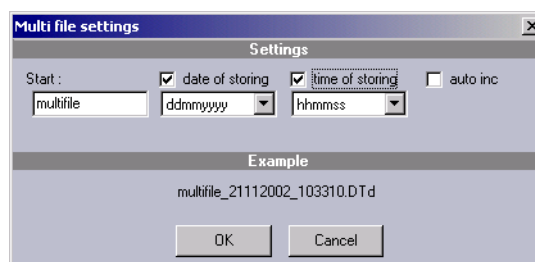
RECORDING SETUP SECTION OF THE SETUP SCREEN

4.1.1 Setting the filename

By default, this field will be set to "Test" as the filename. If whatever file you type in here already exists in the default data directory (normally this is C:\Dewetron\Program\DEWETRANS\Data), its name will be colored RED here. More information can be entered using the **File details** button (described in section 4.2).

4.1.2 Multifile checkbox

DEWETrans is not able to store multiple records into one file. To make your job easier, activate the **Multifile** checkbox and press the appearing **Set multifile options** button Multifile . The following screen will appear:



MULTIFILE SETTINGS

The multifile name can have different formats. First you have to enter the main file name (**Start** field). Then you can check the **date of storing** and/or **time of storing** and select the desired date and time format out of the dropdown list. If you check also **auto inc** (automatic increment), the **time of storing** will be disabled.

Above the **OK / Cancel** buttons you see an example how the file name may look like. If the settings are done, confirm using the **OK** button. **Cancel** will discard changes.

4.1.3 Auto rearm

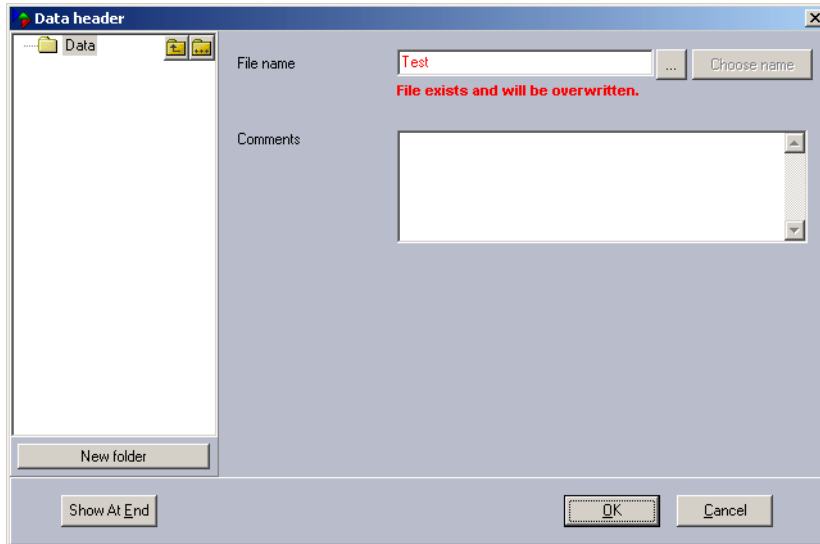
A very nice feature of DEWETrans is the **Auto rearm** function. If this box is checked and you record data, DEWETrans will automatically rearm and record the next data after one record has been finished. To make the handling easier, the **Multifile** function should be enabled (see above).

4.1.4 Use maximum record length

This function has been already described in section 2. If you check this box, the whole transient recorder board will be used for data recording. Keep in mind that the data files might become very big.

4.2 File details / Data header

When you press the **File details** button, the following window will appear:




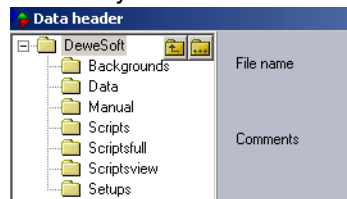
The left section of the window is designed to do the data management. The right section will be used for file details. You can enter the file name, comments, ...


To give you more flexibility, the data header window can be designed according to your own requirements. You find more information how to change in the section *Designing the data header* (4.4).

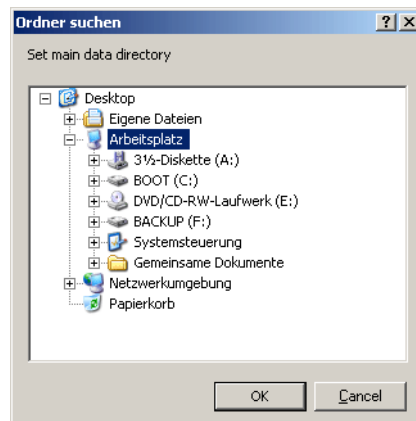
4.2.1 Data management

At the top of the window, you see the current standard directory for your data files and all sub folders. After the first system setup, the standard path is C:\DEWETRON\Program\DEWETrans\Data. Sub directories are not available.

Use the  button to change to the lower directory levels:

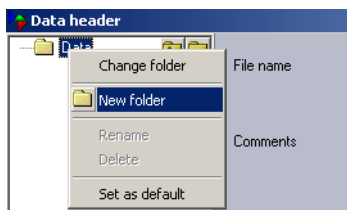


or use the  button (change folder) to get the general Windows selection window:



Recording Data

Within the folders list, you can also to manage your data. Move the cursor over the desired folder (e.g. Data) and press the right mouse button. The window



will appear. It allows you to

- change the folder
- create a new sub directory
- rename a folder (not working with the main directory)
- delete a folder with all data (not working with the main directory)
- set a folder as default

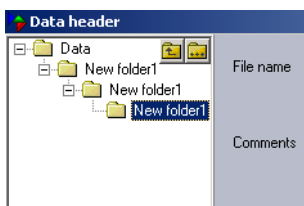
Creating new sub folders

To create new sub folders, just use the method mentioned above or use the **New folder** button at the bottom of the folders selection list. When you do that, a new sub folder of the selected directory will appear.

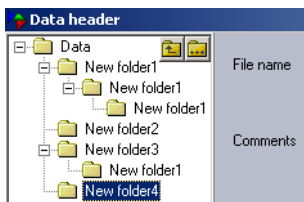


The standard folder name is *New folder xx* and can be changed at any time. The xx in the folder name is used for a continuous number.

When you use the create folder function several times without selecting a new base folder, you will get each time one new sub folder within the sub folder. Example:



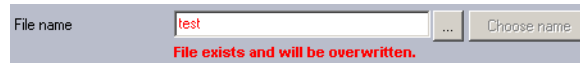
As a standard, any new folder will get a continuous number. When you have desired to create several new sub folders from the Data directory, it may look like this:




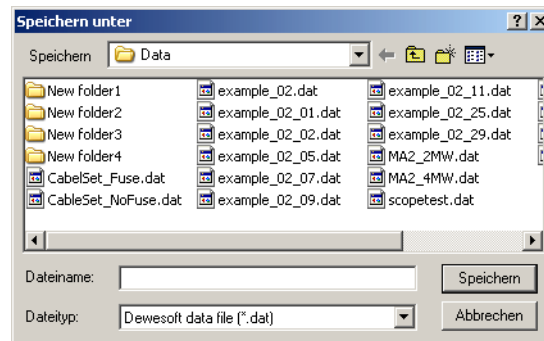
This is already a very powerful data management function. To improve it according to your requirements, please refer also to the section designing the data folder (4.8).

4.2.2 File name

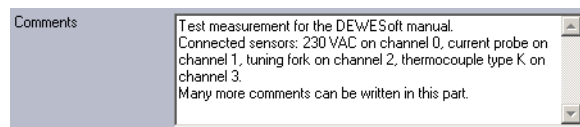
After you have selected the file destination in the left section of the window, you can enter the file name. If the file already exists, the name will be displayed in red color and a warning message will appear. If you want to overwrite the file, keep the file name. When you start storing, a window will appear and ask you if you really want to overwrite or change the filename.



Use the  button to get an overview of the already existing files in the selected folder:



The comments field can be used to note any information about the measurement which can be important for the analysis or to find data again. It can be a location, user names, sensor types, and many more.



4.2.3 Closing data header window

When all settings are done, leave the window with the **OK** button or press **Cancel** to reject all changes.

But there is also another possibility. Press the **Show At End** button to close the window. Then you can start your acquisition and do your measurement. When you stop the acquisition, the window will automatically appear again and you can do the final changes for this file, for example changing the comments according to your measurement. Be aware that location and file name can't be changed - you have to define them before you start your measurement!

Recording Data

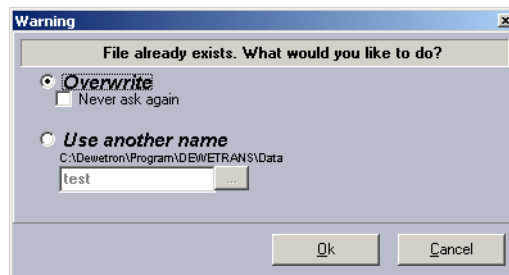
4.3 Started data recording

It is as simple as pressing the **RECORD** button on the toolbar.



PRESS STORE BUTTON TO START DATA RECORDING

If a file already exists of the same name as the one that you are trying to record, the system will warn you with this dialog box before recording begins:

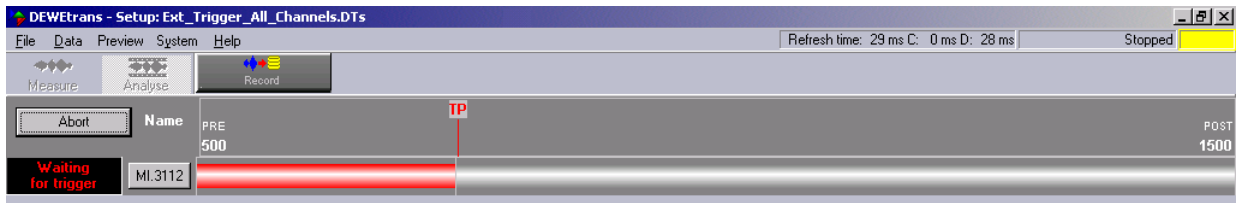


FILE OVERWRITE WARNING DIALOG

You can overwrite the existing file, change the name here, or cancel recording altogether. You can also select via the checkbox to never see this dialog again, which will mean that if a file already exists of the same name, it will simply be overwritten.

Make your choice and then hit **OK** to begin recording.

The top of the screen will show you the current filename, the bar graph will display the current state for each (active) transient recorder board within the system. To cancel the acquisition, press the **Abort** button.



WAITING FOR TRIGGER EVENT

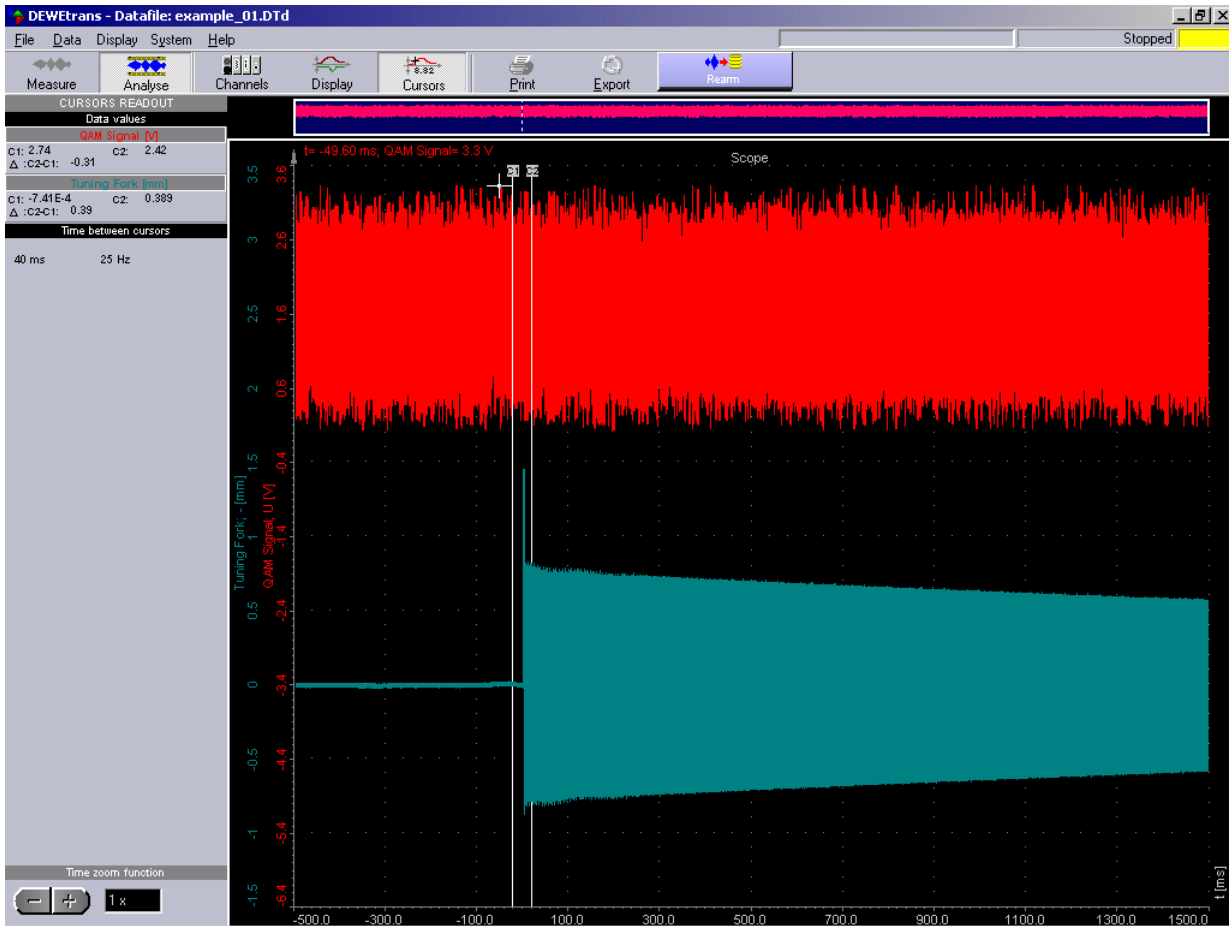


ACQUIRING POST TRIGGER DATA



RECORDING DATA FROM THE TRANSIENT RECORDER BOARD

If the **Auto rearm** is not selected, the system will automatically change into the **Analyze** mode after the recording and display the recorded data.

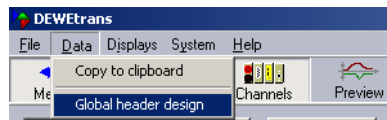


ANALYZE SCREEN AFTER DATA RECORDING

Learn more about the data analysis and the data export possibilities in section 5.

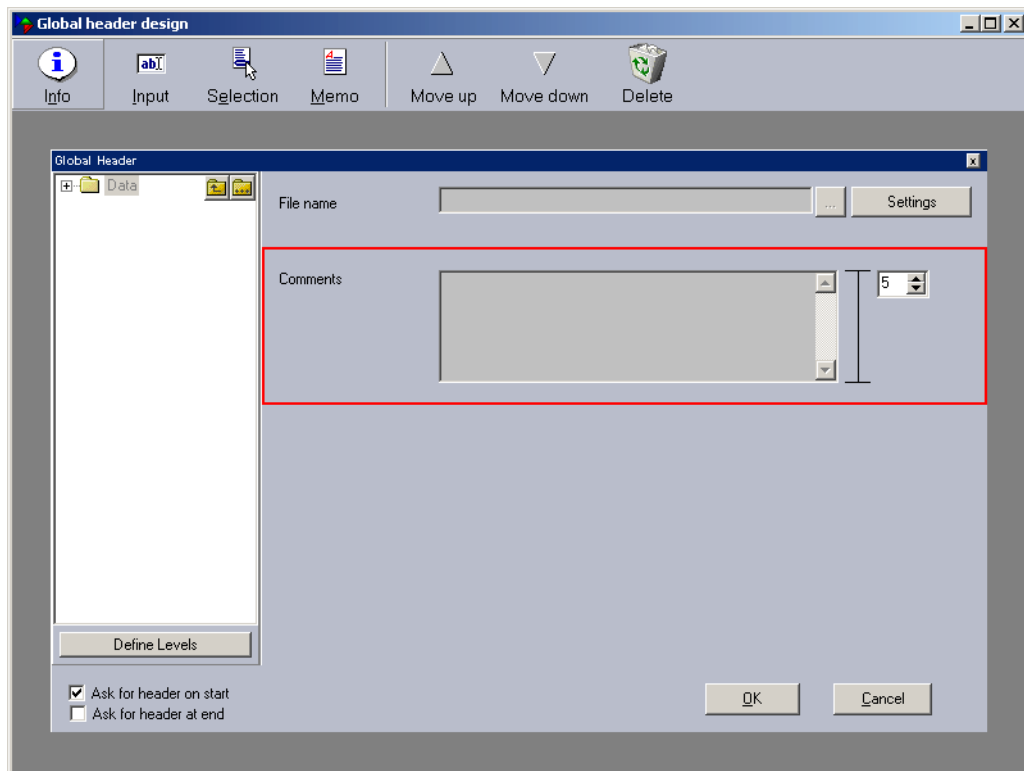
4.4 Designing the data header (global header)

The data header (also called global header) can be adapted according to your requirements. To enter the edit mode, select **Global header design** from the **Data** menu.



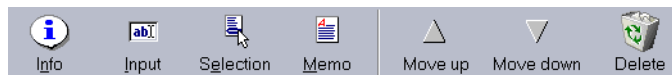
OPEN THE GLOBAL HEADER DESIGN WINDOW

The data header design window has several tools, which will be described below.



GLOBAL HEADER DESIGN WINDOW

The icon bar at the top of the window allows you to change the right section of the window. We will now check icon by icon the functions. They can be used to create, delete or move fields. The currently selected field will have a red box around.



EDIT ICONS AT THE TOP OF THE WINDOW

4.4.1 Info field



The Info button adds a new line in the right section of the window.



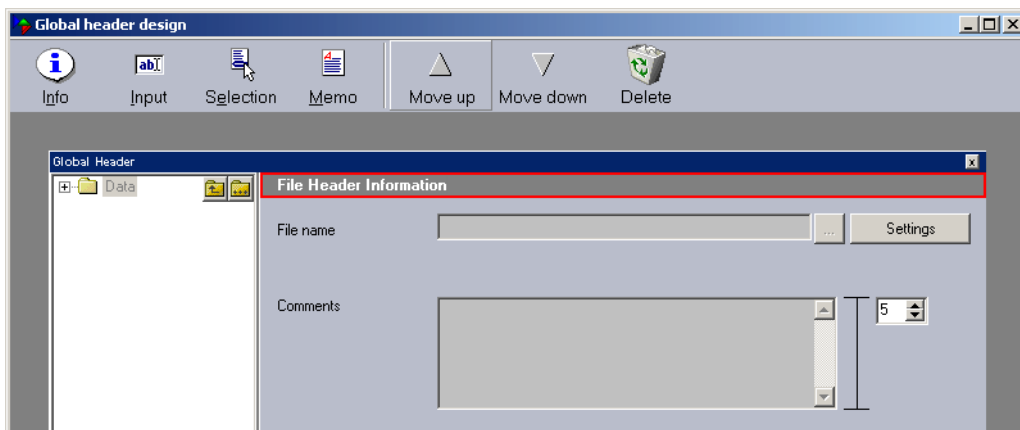
Just click in the new line and enter the desired text, for example 'File header information'.



4.4.2 Position up/down



With the both buttons **up** and **down**, you can now change the position of the info field created above. For example, we want to move it to the top of the window, press the up button twice.



NEW INFO FIELD 'FILE HEADER INFORMATION' MOVED TO THE TOP OF THE WINDOW

You can change the position of fields at any time. Just select it (the red box will appear) and move it up or down.

4.4.3 Delete field



To remove unused or unrequired fields, select the field and press the **Delete** icon. The only field you can't delete is the file name entry field.

4.4.4 Input field



The input field can be used for any single line values or comments. You can use it for example for user or location information, ...

Let us create a new field and rename it to 'Location'. To rename the field, just click on the name and overwrite it.



SINGLE LINE INPUT FIELD LABELED 'LOCATION'

4.4.5 Selection field




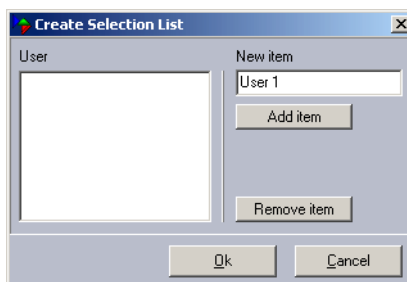
The selection field is very useful when you have to use the same 'value' very often. This can be for example a list of user names or also a list of departments within your company.

Let's create a selection field and label it 'User' (click on 'Section' and overwrite it).



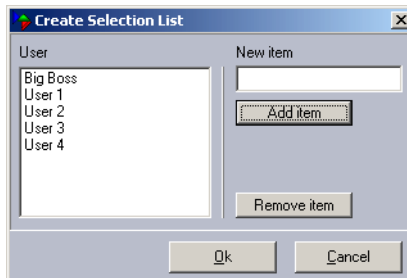
'USER' SELECTION FIELD

Now you have to define the content of your list. To do that, press the  button on the right side.

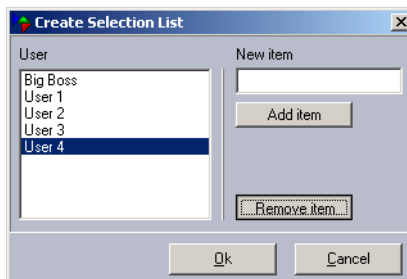


VALUE ENTRIE WINDOW

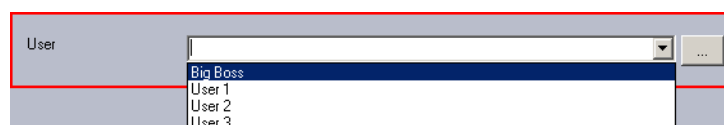
Enter the desired names in the **New Item** field and press the **Add Item** button. The name will appear in the list on the left side, in our example labeled **User**. Enter as many names as required.



To remove a name, just select it from the list on the left side and press the **Remove Item** button.



When all names are entered, press the **OK** button or press **Cancel** to reject all entries. The result of upper entries is the following drop down list in the global header window.



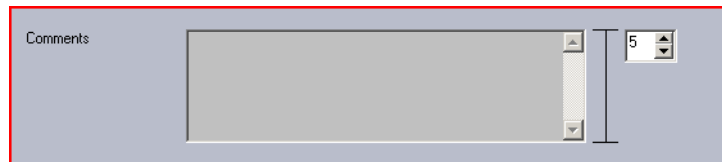
DROP DOWN SELECTION FIELD FOR USER NAMES

4.4.6 Memo field



The memo field can be used to enter any comment in more than one line. This field is very helpful for any measurement remarks, for example connected sensors (serial numbers) or measurement conditions ('dry weather', 'all machines powered down', ...).

To create a comment field, just press the **memo field** button.



COMMENT FIELD WITH 5 VISIBLE LINES

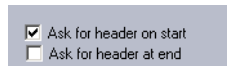
On the right side of the memo field, you can select the **number of visible lines** in the field. This is no limitation in the number or characters, just a limitation of place on the display. As a standard, 5 lines are selected.

This is all you have to know about the right section of the global header design. Now we want to have a deeper look on the left side.

4.4.7 Ask for header

The header window can appear in two different times:

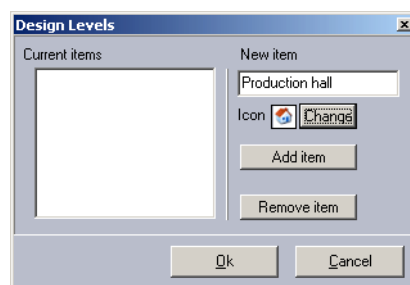
- on start of the measurement
- at the end of the measurement



Just select your preferred setting at the left bottom of the window.

4.4.8 Define directory levels

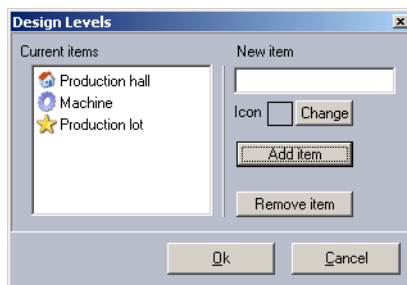
As we have already seen in section 4.2.1 data management, the global header can be used to create folders easily. To adapt the structure to your requirements, you can use the Define directory levels button. When you press it, the following window appears:



Enter the desired names and press the **Add Item** button.

It is also possible to add icons to find your data easier - but not necessary. The icons have to be bitmap files (.BMP) with 16 x 16 pixel size. Just press the Change button in the icon section and search for a matching file.

In our example, we enter the three levels production hall, machine and production lot with matching icons.

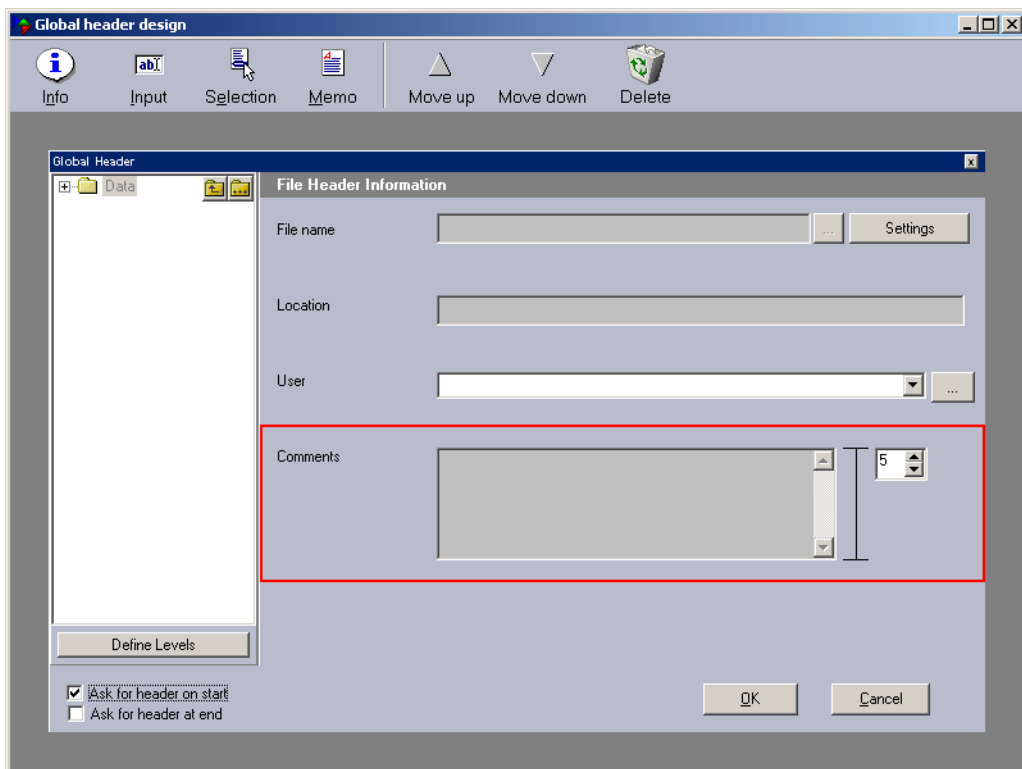


If you select one of the values, the **Add Item** button will change to **Edit Item**. To remove a value select it and press the **Remove Item** button.

To accept the entries press the **OK** button or **Cancel** to leave without changes.

4.4.9 End global header design

We have done a lot of changes in the global header design. The window should look similar to the following image:



To accept all changes, just press the **OK** button.

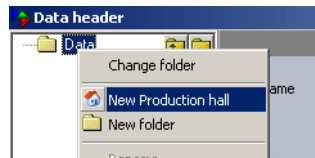
4.5 How to work with the folder levels

Now back in the **Setup** menu, press the **File details** button to go back to our new header window.

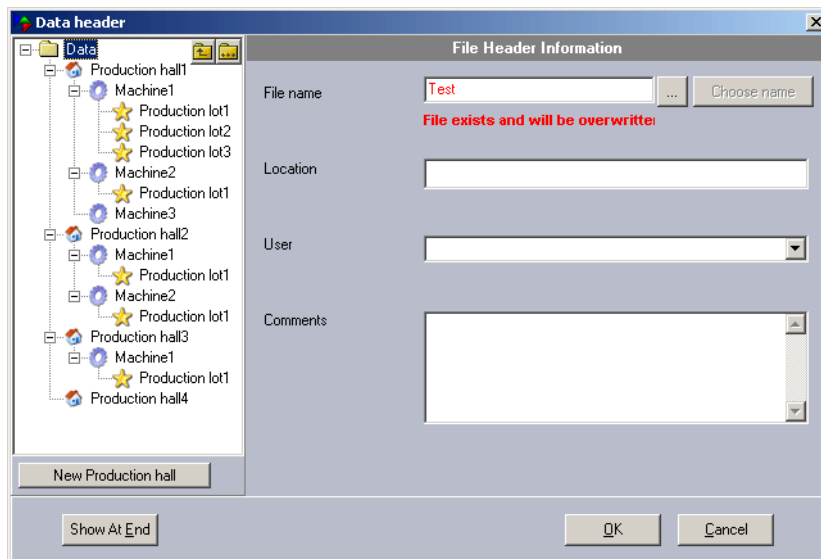
You will see now that the button at the bottom of the folders list has now changed from

to . This will now automatically create a new folder called 'Production hall1'. If you have done that, the name will change to 'New Maschine' and in the Production hall1 folder, a 'Machine1' folder will appear.

The currently available folder can be also selected when you press the right mouse button.



This is a very simple way to create complex folder structures in no time. In our example, the structure can look like that:



As you can see, our selected icons have been used. This helps to keep the overview.

5 Using the Analyze mode to review recorded data

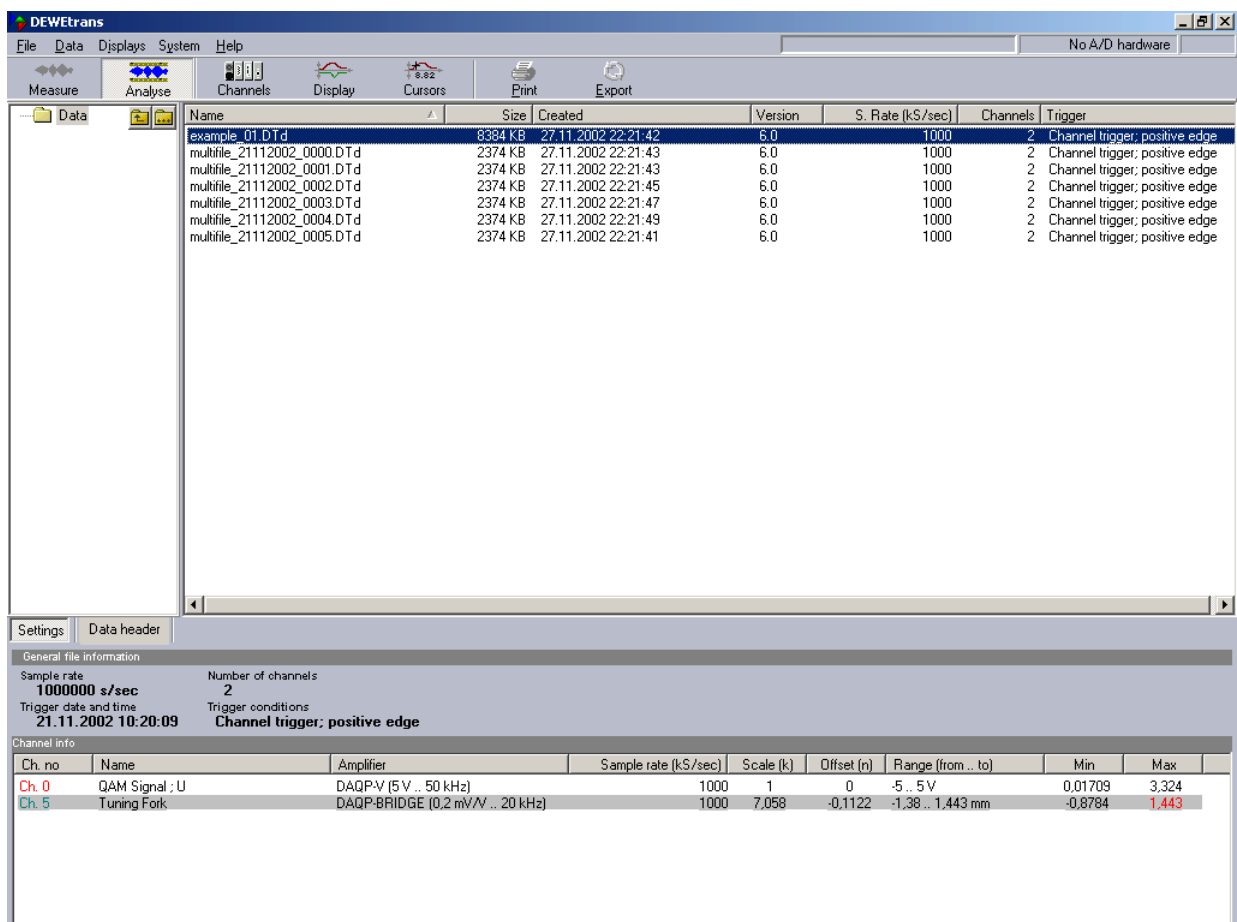
Once data has been recorded, there are a number of things that you can do with it. But you must leave the **MEASURE** mode of DEWETrans and enter the **ANALYZE** mode. This is done using the buttons near the top-left corner of the screen.



ANALYSE MODE CHECKED

5.1 Loading a data file

If you have just captured some data, and you press **ANALYZE**, DEWETrans will automatically load the recent data file. Otherwise, it will present you a selection window where you can choose any data file to load:



LOADING A DATA FILE

The window shown above offers a lot of information about the existing files and the currently selected file.

The upper left section shows the folders structure. In this area, you can select where the data file should be loaded from.

In the upper right section, you can select the file which should be loaded for analysis. It provides you also with plenty of information about all files available in the selected folder.

Name	Size	Created	Version	S. Rate [kS/sec]	Channels	Trigger
example_01.DTd	8384 KB	27.11.2002 22:21:42	6.0	1000	2	Channel trigger; positive edge
multifile_21112002_0000.DTd	2374 KB	27.11.2002 22:21:43	6.0	1000	2	Channel trigger; positive edge
multifile_21112002_0001.DTd	2374 KB	27.11.2002 22:21:43	6.0	1000	2	Channel trigger; positive edge
multifile_21112002_0002.DTd	2374 KB	27.11.2002 22:21:45	6.0	1000	2	Channel trigger; positive edge
multifile_21112002_0003.DTd	2374 KB	27.11.2002 22:21:47	6.0	1000	2	Channel trigger; positive edge
multifile_21112002_0004.DTd	2374 KB	27.11.2002 22:21:49	6.0	1000	2	Channel trigger; positive edge
multifile_21112002_0005.DTd	2374 KB	27.11.2002 22:21:41	6.0	1000	2	Channel trigger; positive edge

FILE SELECTION TABLE

- File name Name of the file
- File size Size of the file in kB (= 1024 Bytes)
- Created Date and time when the file has been created
- Version The version of DEWETrans used to acquire the data file
- S. Rate The used sampling rate in kS/s
- Channels Number of active channels
- Trigger Trigger condition or free run if no trigger has been selected

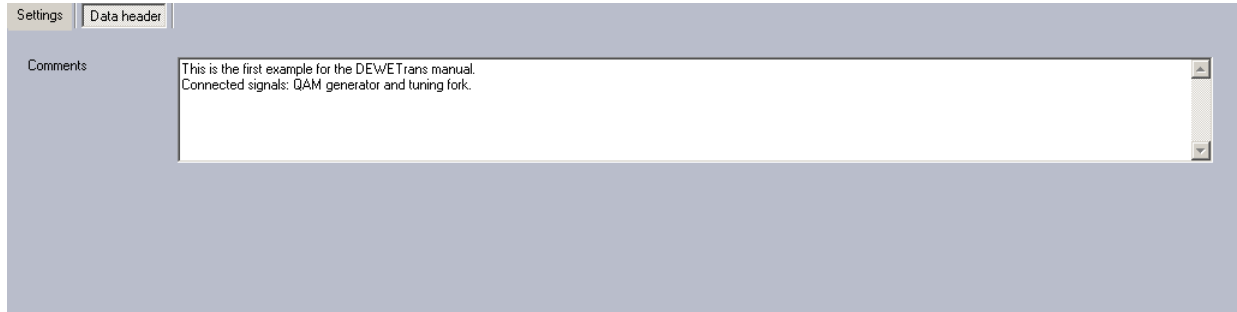
The bottom of the window displays the **Settings**, **Events** and **Data header** of the selected file. As a standard, **Settings** is selected. This part shows now more detailed information about the selected file.

Settings		Data header						
General file information								
Sample rate	1000000 s/sec	Number of channels	2					
Trigger date and time	21.11.2002 10:20:09	Trigger conditions	Channel trigger; positive edge					
Channel info								
Ch. no	Name	Amplifier	Sample rate [kS/sec]	Scale (k)	Offset (n)	Range (from .. to)	Min	Max
Ch 0	QAM Signal ; U	DAQP-V (5 V .. 50 kHz)	1000	1	0	-5 .. 5 V	0,01709	3,324
Ch 5	Tuning Fork	DAQP-BRIDGE (0,2 mV/V .. 20 kHz)	1000	7,058	-0,1122	-1,38 .. 1,443 mm	-0,8784	1,443

FILE SETTINGS INFORMATION TABLE

- Ch No. Channel number and color of the channel
- Name Channel name
- Amplifier Type, input range and filter range of the amplifier
- Sample rate The used sampling rate in kS/s
- Scale Scaling factor k ($y = kx + n$)
- Offset Scaling offset n ($y = kx + n$)
- Range Scaled input range (min. to max. value)
- Min The minimum value within the channel
- Max The maximum value within the channel

When you change to Data header, it finally displays all the information you have entered in the data header window at the beginning (or the end) of a measurement. The exact content depends also on the fields you may have changed in the global header design.



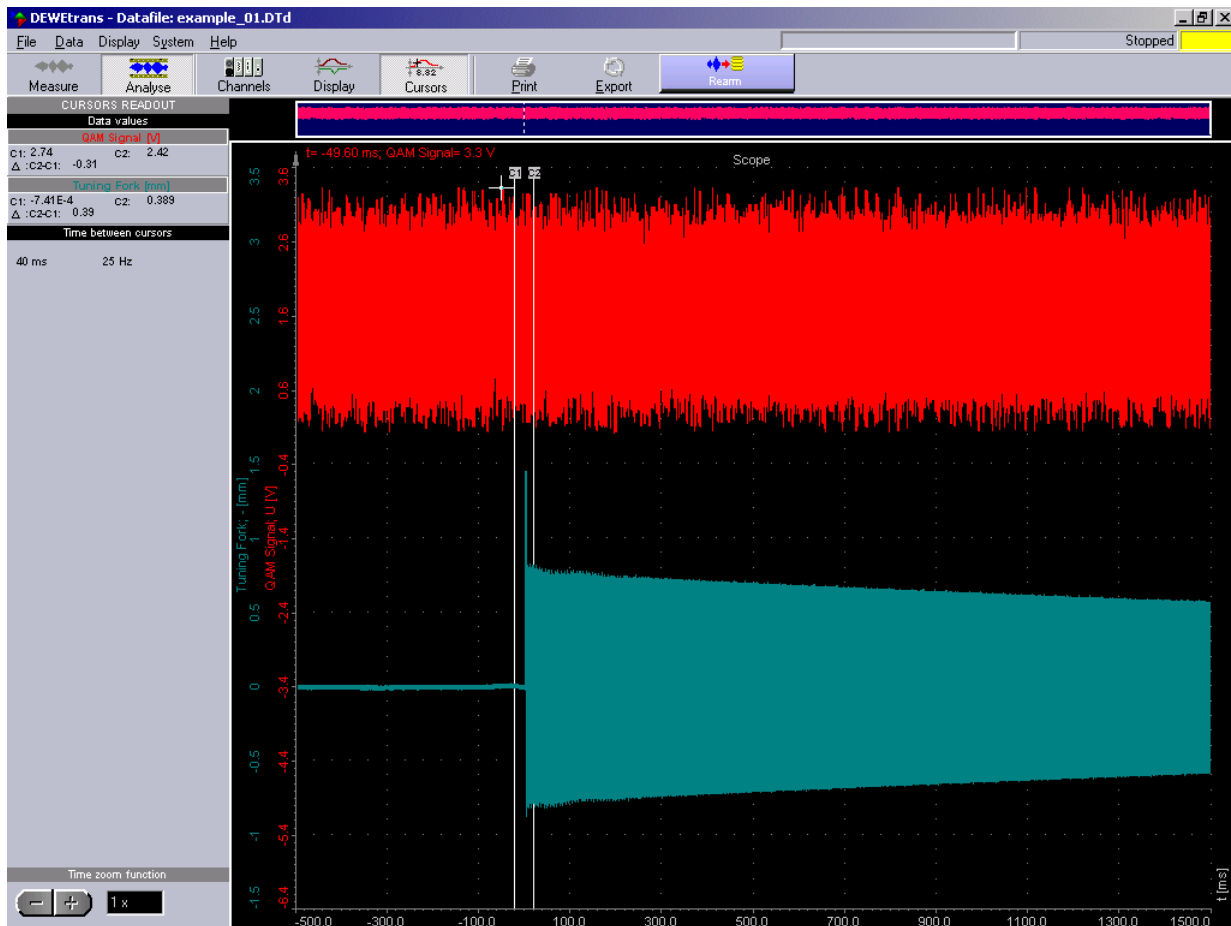
FILE HEADER INFORMATION (FROM ANOTHER FILE)

Select any data file in the file list and double click on the entry or select **Scope** from the **Display** menu.

All of the channel scaling, name, and units info that were in effect at the time of recording are restored so that your data can be properly interpreted, and the Scope display screen will be shown. You can use all of the features available in the **MEASURE** mode to change the graph and inputs from each graph, change the X-axis and Y-axis scales, and more. We will not repeat all of the possibilities here, please refer to section 4.

5.2 Reviewing data on scope screen

As mentioned, you can change the appearance of the data now. It can be done by using the Display button and changing the position and scale (see also section 3).



TYPICAL SCOPE DISPLAY IN ANALYZE MODE

5.3 Signal analysis

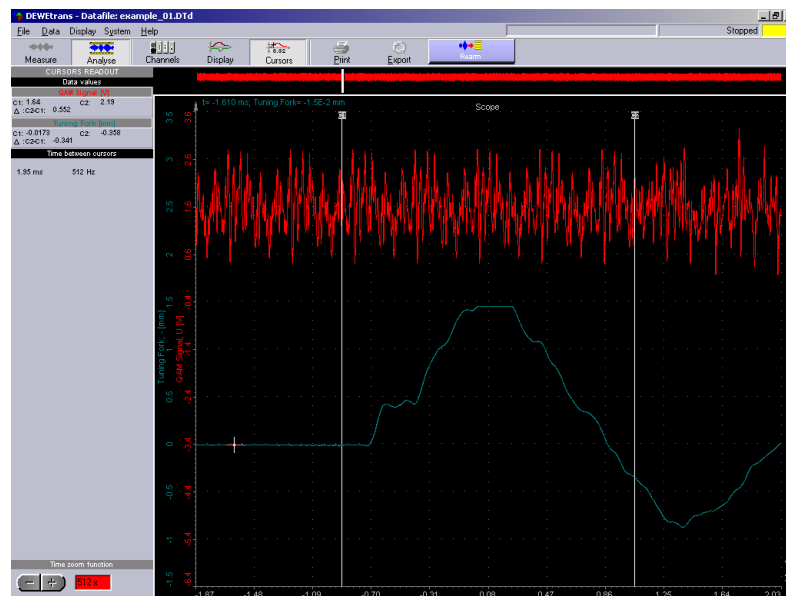
The analyze mode offers several functions to have a more detailed look on the recorded data.

5.3.1 Measurement cursors

The recorder displays offers two measurement cursors for the active graph, which can be positioned in two ways:

- Move mouse cursor to the first position of interest. Click and hold left mouse button and move to the second position of interest.
- Drag the first cursor from left side of the graph to the position of interest and the second cursor from the right side of the graph.

On the left part of the display, the readout values of the currently selected graph will be displayed. As there is only one timebase available, the cursor position is the same for all displayed graphs.



CURSOR READOUT OF THE GRAPH

5.3.2 Zoom

After loading the data, you will always see the signal over the complete storage time. But you can also see details. Just use the both measurement cursors as described above to select an area of interest. Now press the \pm buttons of the time zoom function (bottom-left corner of the screen) and the appearance will change immediately:



ZOOM INTO SELECTED AREA USING \pm BUTTONS

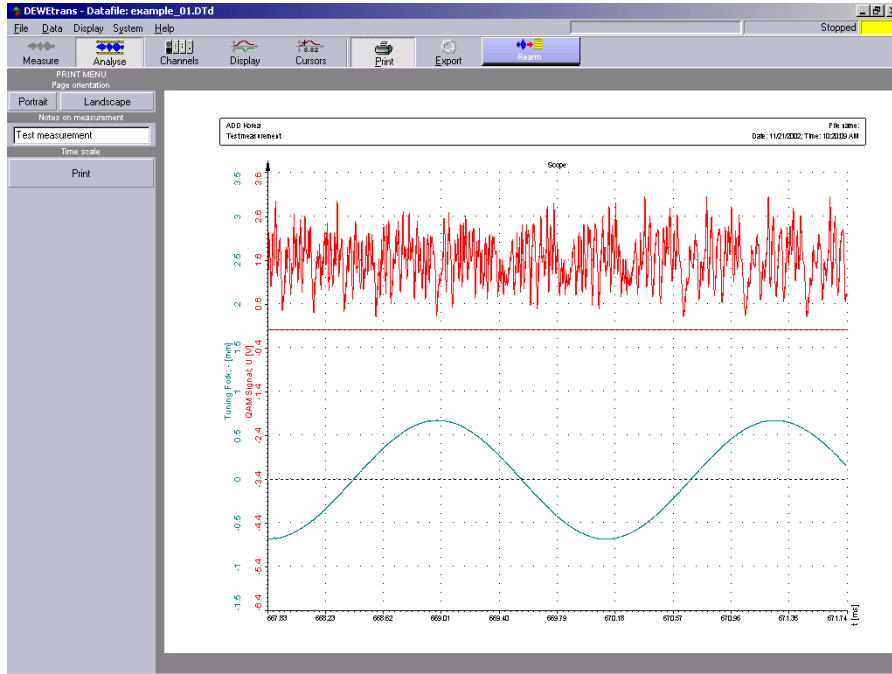


KEEP THE WHOLE SIGNAL IN YOUR EYES WITH THE SIGNAL OVERVIEW BAR

The signal overview bar at the top of the recorder display shows always the current position within the signal. You can also click on the marked area and move the marker - this will also move the displayed signal.

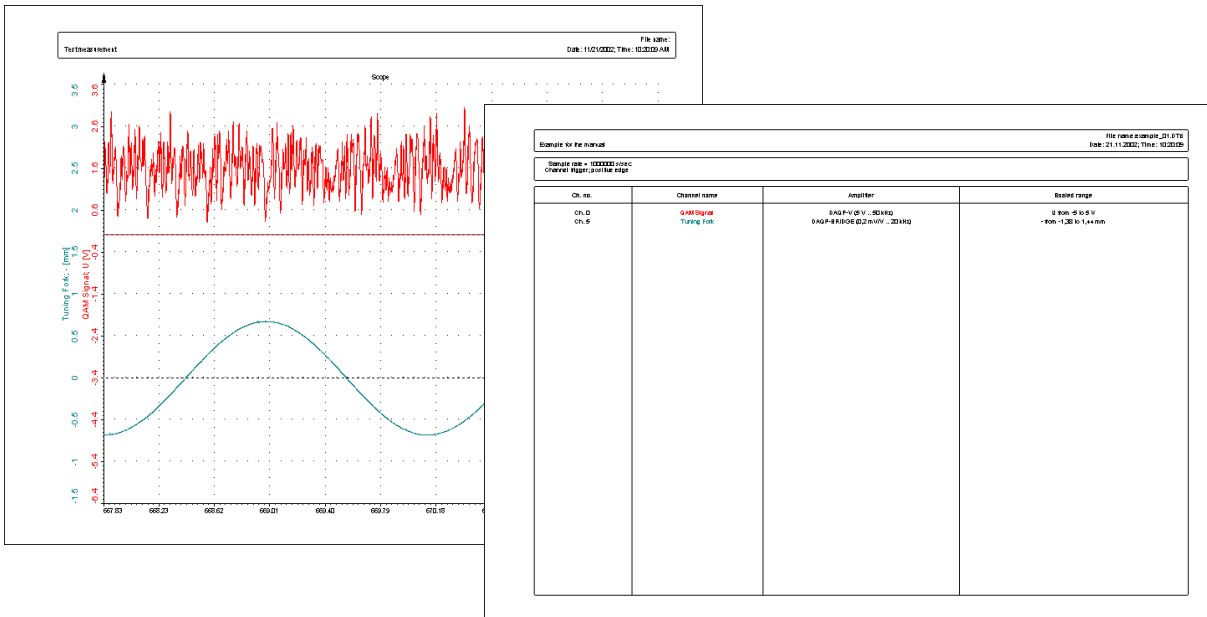
5.4 Printout

In the **ANALYZE** mode, the DEWTrans offers a printing function. It is working with **Display**, **Cursor** and also with the **Channels**. To do a printout, just select one screen, change the appearance as desired and press the **PRINT** button. The following screen will appear:



PRINTOUT DISPLAY

Select between **Portrait** and **Landscape** format and enter a **comment**, then press the **Print** button below. This will open the printer configuration window, where you may define your printer settings and start the job.



TYPICAL RECORDER AND SETUP PRINTOUTS

DEWTrans uses the complete WINDOWS® printer support. You can select between all available printers - even network printer - and use also the printer spooler. After starting the printout, you can start immediately continue working with DEWTrans, even if the printer is still running.

5.5 Exporting your data

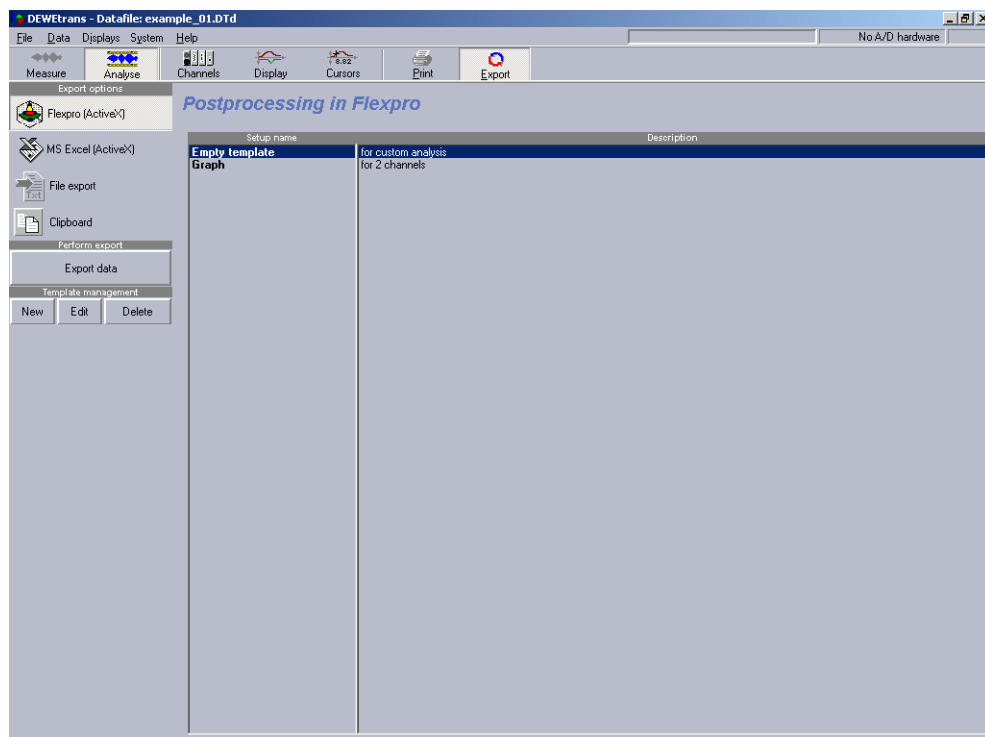
Here is the fundamental purpose for the **ANALYZE** mode - to export data for off-line analysis using other software. We strongly recommend FlexPro, a third-party application that is easy to learn and use, and yet extremely powerful. Because we sell and support FlexPro, we offer easy export to this format, and advanced automation when data is exported to this program, including the ability to run custom macro "scripts" inside FlexPro. More about FlexPro in the next section.

To export your data, press the **Export** screen button, which is visible only when you are in the ANALYZE mode, along the top of the screen or select **Export** from the **Data** menu:



ANALYZE MODE SELECTED

Once you press **Export**, the following screen will appear, ready to export data directly into FlexPro:



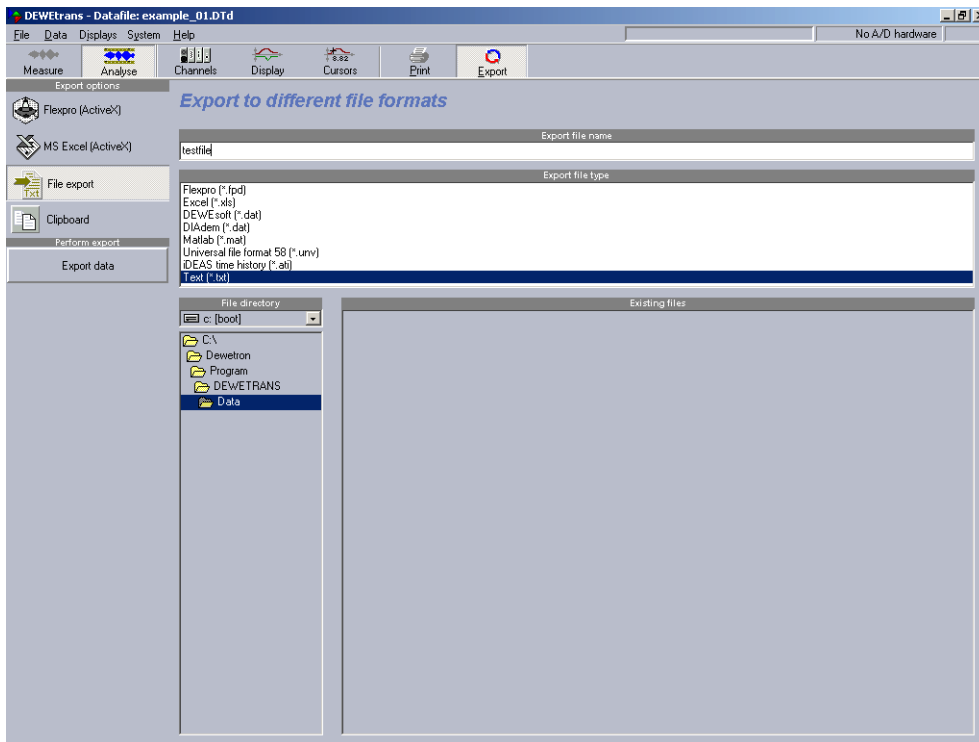
EXPORT DISPLAY WITH STANDARD FLEXPPO ANALYSIS TEMPLATES

5.5.1 Export formats

DEWtrans currently support the following data export:

- FlexPro direct data transfer via ActiveX
- Microsoft Excel direct data transfer via ActiveX
- File Export several file formats, see below
- Clipboard copy data to Windows Clipboard, allows pasting into another running application

If you press the **File Export** button, following display appears:

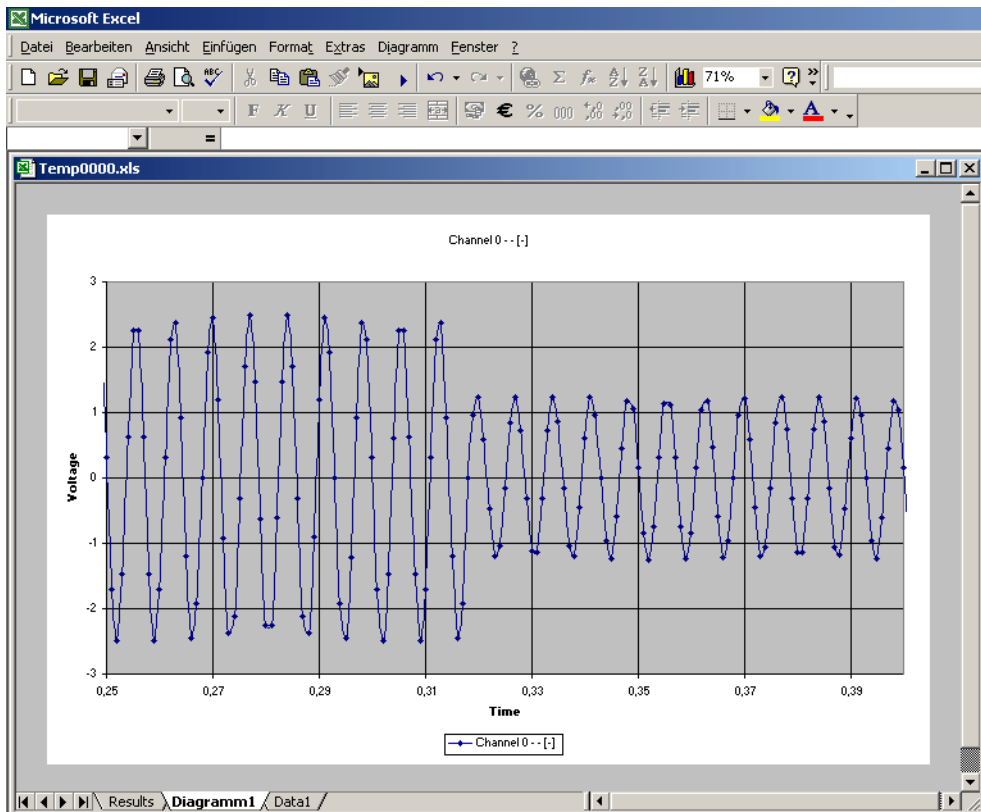


EXPORT SCREEN - FILE EXPORT

The supported data file formats are:

- | | |
|----------------------------|---|
| ■ FlexPro | Powerful, easy-to-use data analysis software |
| ■ Microsoft Excel | Standard spreadsheet software in most companies |
| ■ DIAdem | Powerful data analysis software package |
| ■ Matlab | Common analysis and mathematics software |
| ■ Universal File Format 58 | 3-D modeling and modal analysis software |
| ■ Ideas time history | Superset of the Ideas format |
| ■ Text File | Delimited ASCII text file |

If you click on either **FlexPro** or **MS Excel**, you will see that a list of preformatted scripts appears in the center of the screen. You can select any one of them and then click the **Export Data** button below the format icons to perform the exporting.



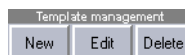
TYPICAL EXCEL SCREEN

Note: our Excel export function knows about Excel's built-in limitation of 64,000 rows per worksheet. If your data is longer than that, it simply creates multiple-worksheets within the workbook that it creates! It also make a simple chart with the first several thousand data points for each input channel shown. You can use all of Excel's built-in tools to change the chart format and make additional calculations and graphical outputs.

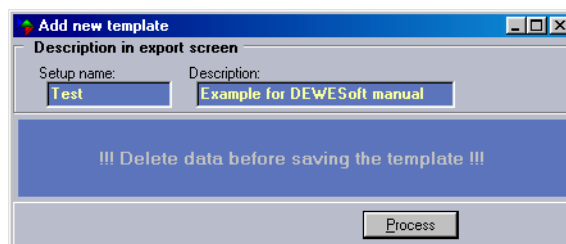
The other file formats just prompt you for a filename, which you supply using a standard Windows file dialog box. Click OK and the software will do the rest. Be sure to supply the proper filename extension, particularly for ATI files.

5.5.3 Creating and changing FlexPro scripts

You can easily create your own scripts in FlexPro or edit the existing ones. Just press the New button to create a new one or Edit to change an existing script.



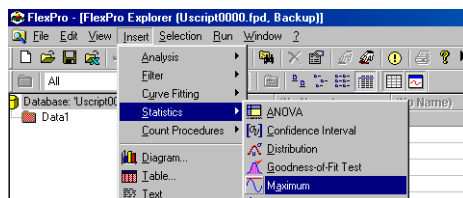
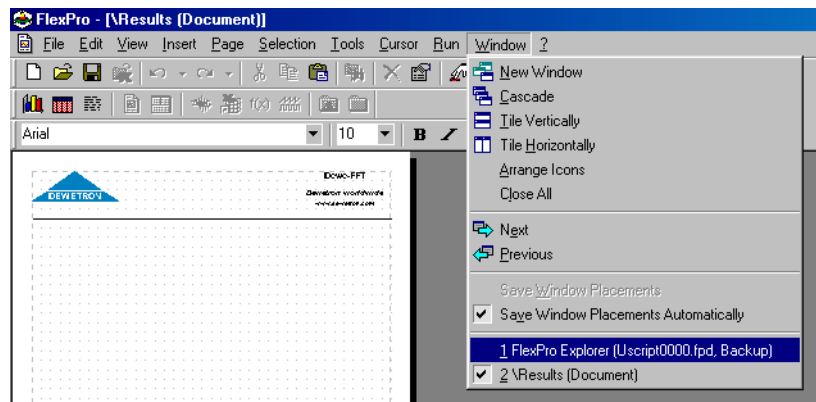
When you press the New button, you have to enter a name and a comment for the new script.



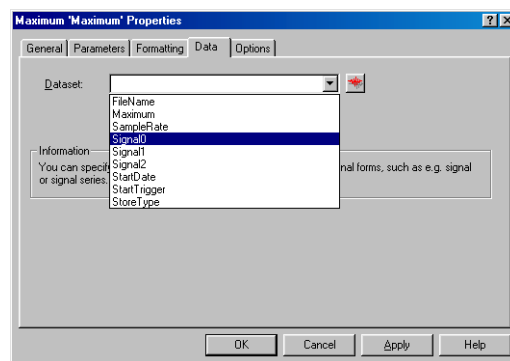
When you confirm your entries, FlexPro will automatically start with a default template. Enter the **Window** menu and select the **FlexPro Explorer** window.

Data Analysis

The FlexPro Explorer window allows you to create your script. Please refer to the original FlexPro documentation for more details. We just want to show you a simple script, which should be a first help.

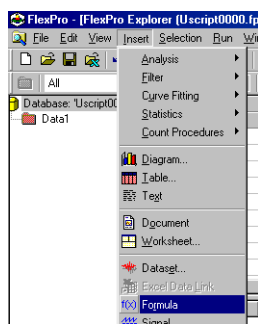


1. Select **Insert - Statistics - Maximum**

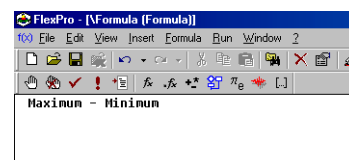


2. Select the desired signal

3. Repeat step 1 and 2 with **Statistics - Minimum** and **Statistics - RMS**

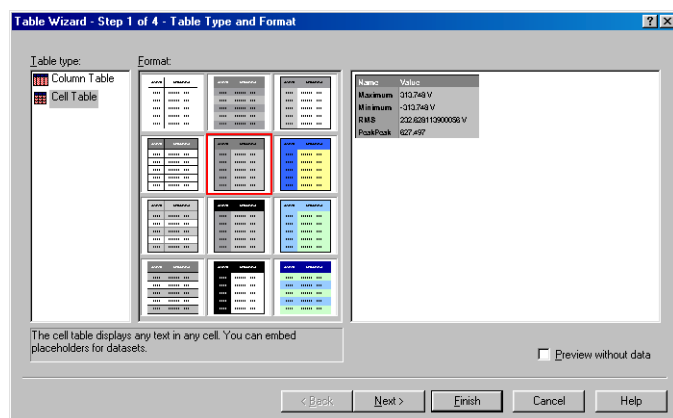


4. Select **Insert - Formula**

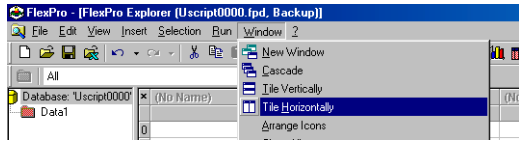


5. Enter the text 'Maximum - Minimum' and close the formula window

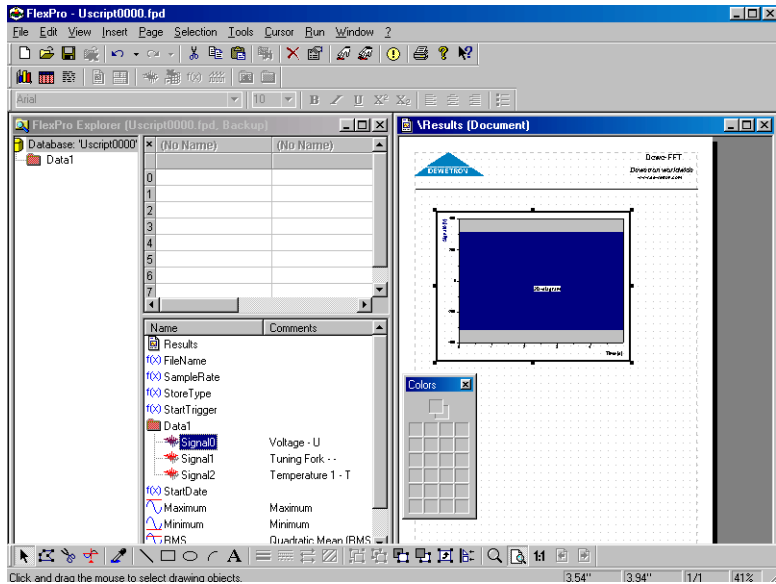
6. Select the formula with the right mouse button and select **Rename** from the list. Rename the formula to **PeakPeak**



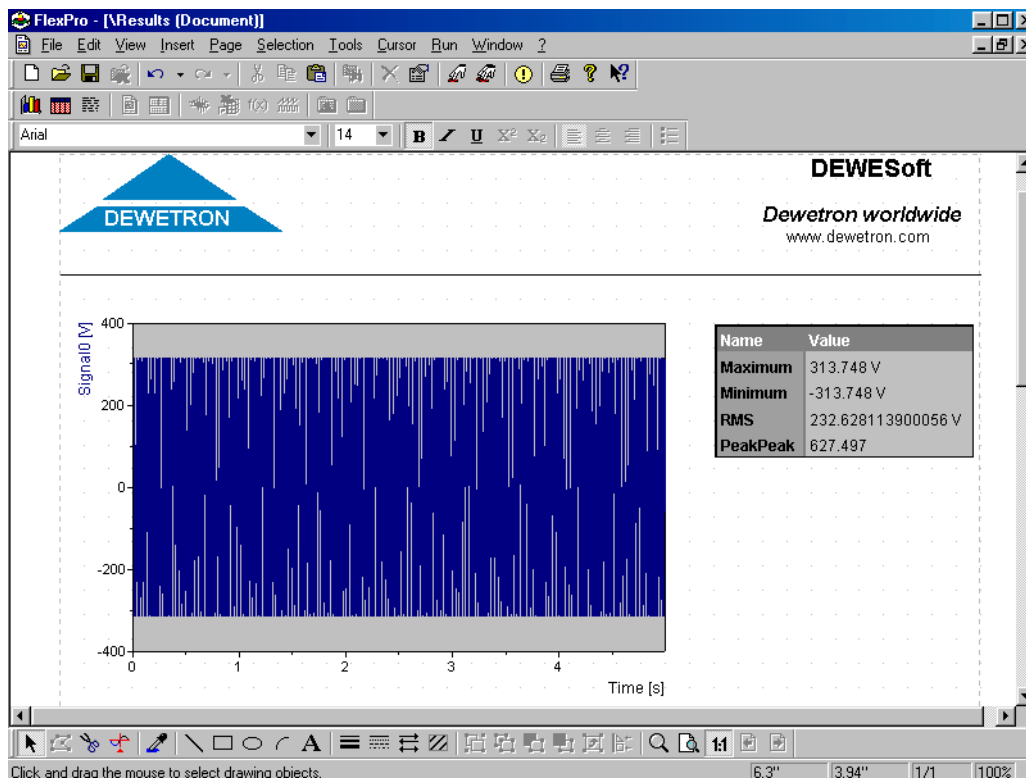
7. Select the signals **Minimum**, **Maximum**, **RMS** and **PeakPeak** from the FlexPro Explorer and select **Insert - Table**



8. Select Window - Tile Horizontally



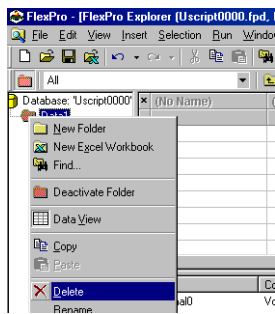
9. Click on a signal and move it on the report - a chart will be automatically created



10. Move also the table on the report - your first script is finished

Data Analysis

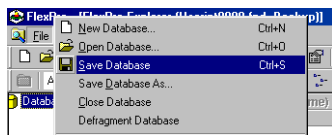
After your script has been defined, the most important procedure follows: Delete all data and the data folders.



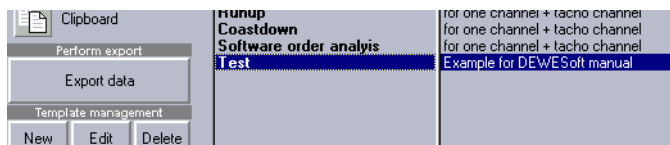
Defragment the FlexPro database and confirm to delete the undo information.



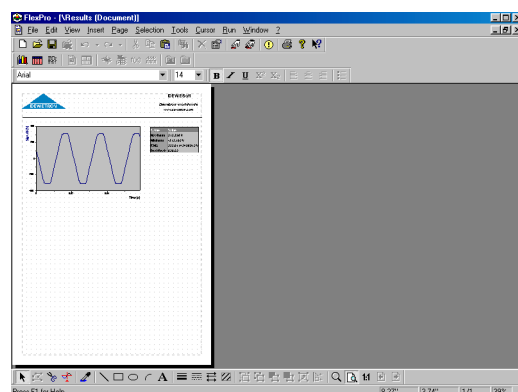
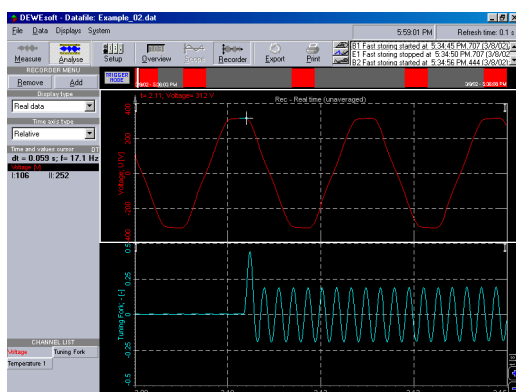
Save the database and exit FlexPro.



DEWETrans will now display the new script in the FlexPro scripts list:



Let's try it out: Change the recorder, select a file and an area you want to display, go back to the export and select our new export script.



5.6 Export summary

Data Export is easy, fast, and dynamic with DEWETrans, supporting a wide variety of popular formats, including the delimited ASCII text formats which makes highly transportable data files that can be imported into virtually any analysis program on the market today.

Remote control functions

6 Remote control functions (DEWETrans Client)

DEWETrans is designed to operate also in distributed networks. To explain the network functions, it is necessary to know about the used programs first.



DEWETrans has been already described in the sections before. It is the main program to acquire the data. This software has to be installed on the transient recorder system(s). On the next pages, these systems will be called **servers**.



RunExe is a utility which has to be installed on all transient recorder systems. The setup procedure creates a link in the startup folder. When you switch on the transient recorder system, the RunExe will be started automatically. Make sure that RunExe is really started (there is a small icon in the WINDOWS task bar), otherwise the Remote Client can't connect to the transient recorder.



The **RemoteClient** is the software interface to communicate and control the transient recorder systems from any client system. It can be installed on any system, for example on your office PC or a Notebook. You just need any TCP/IP connection to the transient recorder system.



The **WinVNC** is a client software which has to be installed on both transient recorder system and client PC. It is responsible for the remote control capabilities. Under WINDOWS 2000 and XP, it is running as a service. Make sure that WinVNC is really running (there is a small icon in the Windows task bar), otherwise the systems can't communicate.



Summary:

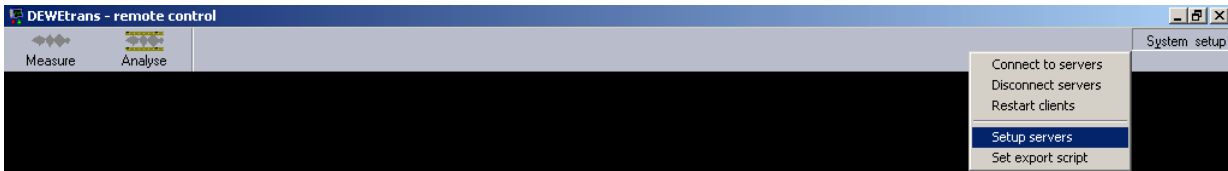
Transient recorder system:	DEWETrans	installed, can run but don't has to
	RunExe	installed and running
	WinVNC	installed and running
Client PC system:	RemoteClient	installed and running
	WinVNC	installed and running

6.1 Remote Client base settings

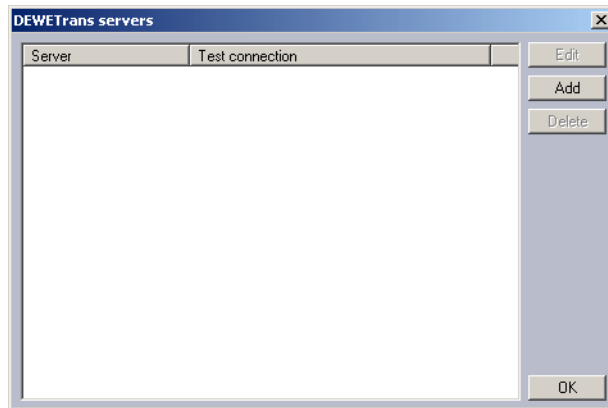
When you run the **Remote Client** for the first time, you have to do some base settings. In the upper right corner, there is the **System setup** menu.

6.1.1 Define servers

Select **Setup servers** from the **System setup** menu.

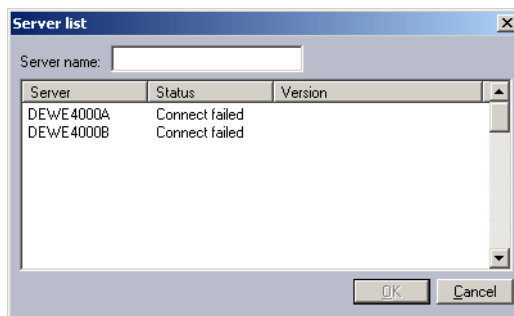


The following screen will appear:



SETUP SERVERS WINDOW CONTAINS NO SYSTEMS AFTER FIRST STARTUP

Press the **Add** button to add new servers (transient recorder systems). You will get a new window with the list of all available systems within the network. Just select the desired system (e.g. DEWE4000A) and press the **OK** button.



SERVER SELECTION LIST

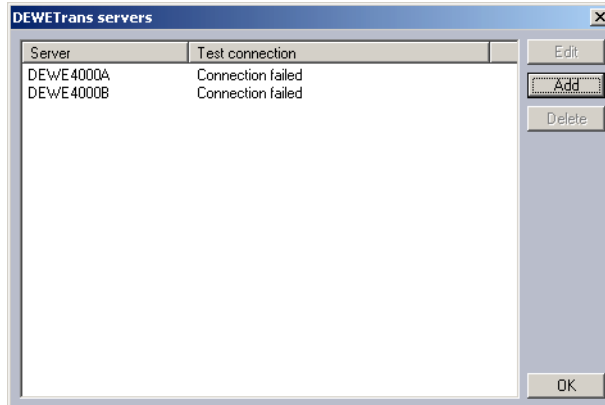
If you are working in a network without DNS service (Domain Name System), you can also enter the IP address of the system in the **Server name** field, for example 192.100.100.100

Right to the system name, you can see 'Connection failed'. Don't worry about it. It is just the information that DEWETrans is currently not running on this system. You can try to start DEWETrans on one system and you will see immediately that the state changes to OK and the version is shown.

Server	Test connection
DEWE4000A	Connection failed
DEWE4000B	OK, DeweScope 6.0

Remote control functions

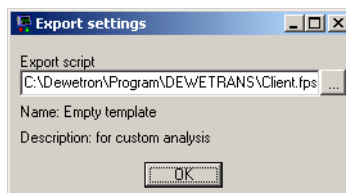
To add further transient recorders to the server list, just press the **Add** button again. If you select one transient recorder and press **Edit** button, you can change the entry to another system. Or you press the **Delete** button to remove a system from the server list.



After you have entered all required systems, press the **OK** button to confirm your settings.

6.1.2 Set export script

If you are using FlexPro for data analysis, you can enter the position for the FlexPro script using the **Set export script** from the **System setup** menu.



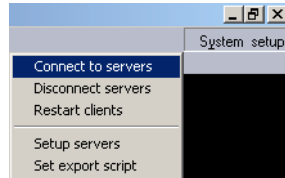
CHOOSE THE EXPORT SCRIPT FOR FLEXPRO

There you can select from all available scripts. Just select a file (e.g. Client.fps) and press the **OK** button. From this time, the Client.fps template will be chosen when you press the **Export** button in the **Analyze** mode.

6.2 Connecting to servers

After the settings have been made, you can connect to the selected servers. There are two ways to start the connection:

- Select **Connect to servers** from **System setup** menu.



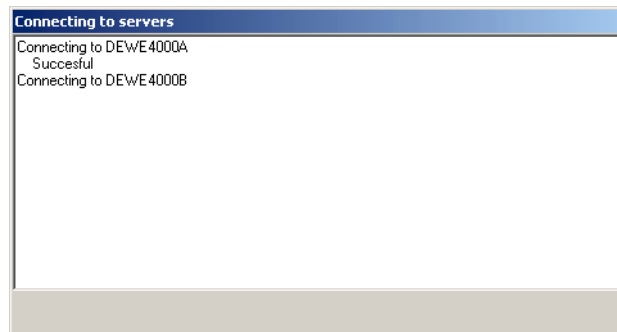
SELECT CONNECT TO SERVERS ...

- Press the **Measure** icon on the top left area of the screen.



... OR PRESS MEASURE BUTTON TO START CONNECTION

The connection progress will start immediately:

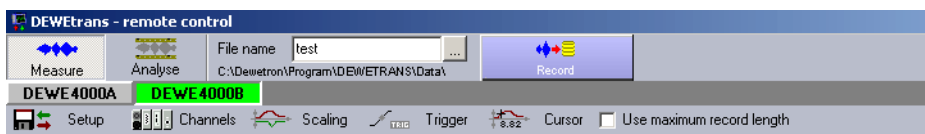


CONNECTION PROGRESS WILL BE DISPLAYED

If there are any faults during connection, e.g. one system is not available in the network, you get the error message 'Failed'. All already established connections will be disconnected and you have to confirm the error message by pressing the OK button.

Make sure that the network is running properly and the RunExe file is running on all servers before you try again to connect.

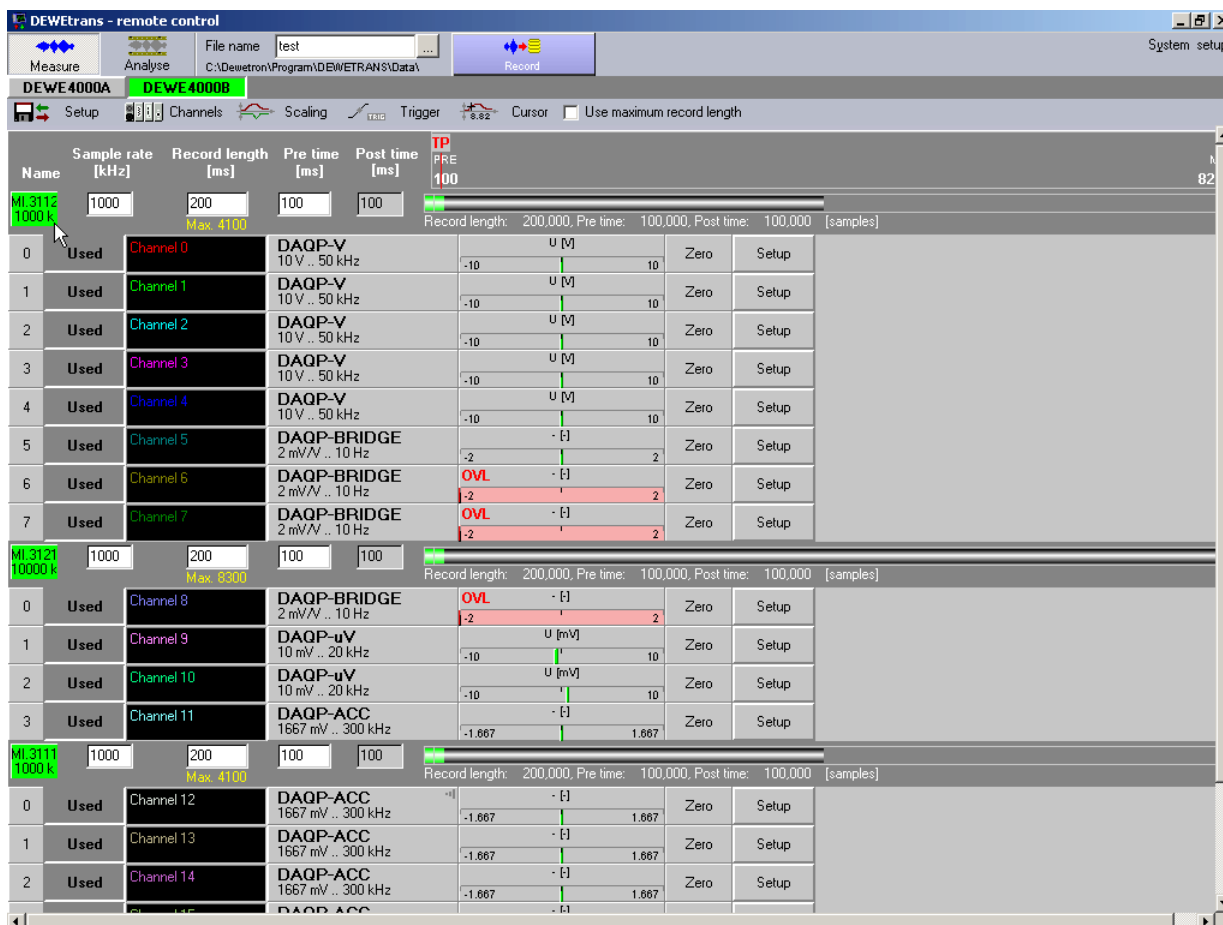
When the RemoteClient has connected all servers, the top of the client software will change:



CONNECTED SERVERS ARE AVAILABLE FOR SELECTION

Remote control functions

Please wait a few seconds to get the whole screen content of the selected server.



REMOTE DISPLAY ON THE CLIENT

6.2.1 Select server

You can change between all connected servers by pressing the icon with the server name:



EXAMPLE: DEWE4000A AND DEWE4000B ARE AVAILABLE FOR SELECTION

It may take a few seconds to get the new screen content. The display on the server will also have a different looking: the menu bar is not accessible during remote controlled sessions! (see next page)

Name	Sample rate [kHz]	Record length [ms]	Pre time [ms]	Post time [ms]	Use
0	1000	200	100	100	Used Channel 1 DAQP-V 10V, 50 kHz -10 U 50 10 Zero Setup
1	1000	200	100	100	Used Channel 2 DAQP-V 10V, 50 kHz -10 U 50 10 Zero Setup
2	1000	200	100	100	Used Channel 3 DAQP-V 10V, 50 kHz -10 U 50 10 Zero Setup
3	1000	200	100	100	Used Channel 4 DAQP-V 10V, 50 kHz -10 U 50 10 Zero Setup
4	1000	200	100	100	Used Channel 5 DAQP-V 10V, 50 kHz -10 U 50 10 Zero Setup
5	1000	200	100	100	Used Channel 6 DAQP-BRIDGE 2 mV, 10 Hz -2 -10 10 Zero Setup
6	1000	200	100	100	Used Channel 7 DAQP-BRIDGE 2 mV, 10 Hz OVL -10 10 Zero Setup
7	1000	200	100	100	Used Channel 8 DAQP-BRIDGE 2 mV, 10 Hz OVL -10 10 Zero Setup
8	1000	200	100	100	Used Channel 9 DAQP-BRIDGE 2 mV, 10 Hz OVL -10 10 Zero Setup
9	1000	200	100	100	Used Channel 10 DAQP-ACC 10 mV, 20 kHz -10 U 10 10 Zero Setup
10	1000	200	100	100	Used Channel 11 DAQP-ACC 10 mV, 20 kHz -10 U 10 10 Zero Setup
11	1000	200	100	100	Used Channel 12 DAQP-ACC 1957 mV, 300 kHz -1.957 -10 1.957 Zero Setup
12	1000	200	100	100	Used Channel 13 DAQP-ACC 1957 mV, 300 kHz -1.957 -10 1.957 Zero Setup
13	1000	200	100	100	Used Channel 14 DAQP-ACC 1957 mV, 300 kHz -1.957 -10 1.957 Zero Setup
14	1000	200	100	100	Used Channel 15 DAQP-ACC 1957 mV, 300 kHz -1.957 -10 1.957 Zero Setup

REMOTE DISPLAY ON THE SERVER

6.2.2 Channel setup

To change the channel setup (see also section 2) click on the **Channels** icon . Now you can change all settings like on the real system.

6.2.3 Load / save setup

Press the **Setup** icon to select between **Load setup**, **Save setup** and **Save setup as**. Select Load setup to load a setup from the selected server. Select Save setup or Save setup as to store the current settings of the server on the server.

Be aware that the settings are not stored on the client PC as a standard. If you want to store it on the client PC, you have to define a network drive on your server linked to your client PC.

6.2.4 Scaling

Scaling is mainly the same then the **Preview** on the server. With this function, you can change the scaling settings and signal position on the screen (see also section 3.2).

6.2.5 Trigger

Use the **Trigger** icon to change the trigger settings on the selected server. The trigger settings are the same than on the transient recorder system (see also section 3.1).

6.2.6 Cursor

To get an idea of the acquired signal, you can use the **Cursor** icon to activate the cursors. The function of the cursors is described in section 3.3.

6.2.7 Use maximum record length

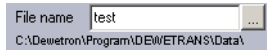
Check the **use maximum record length** box Use maximum record length to activate the whole memory of the transient recorder board. This function is also described in section 4.

Remote control functions

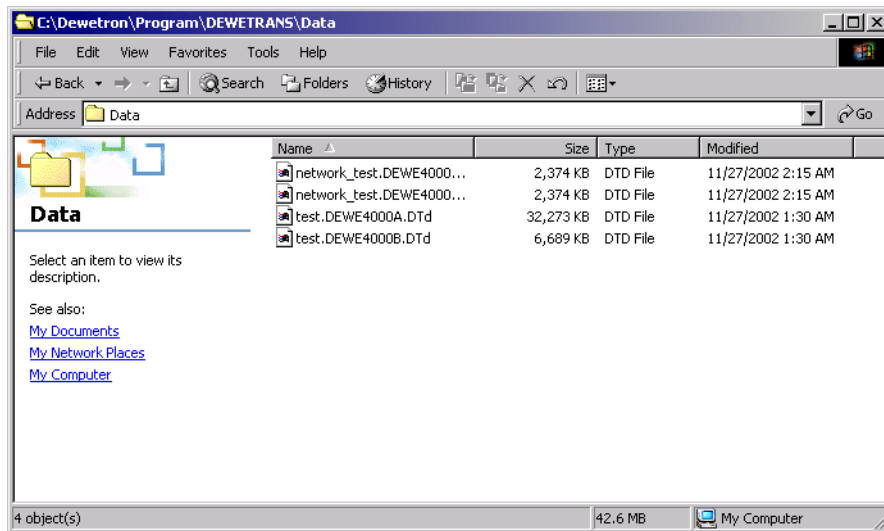
6.3 Recording data with the Remote Client

6.3.1 File name

Before you can start the acquisition, you have to enter a file name in the **File name** field and/or change the location for the data file. This data file will be stored when you press the record button. As a standard, the file will be stored on the client PC.



For each server, an own data file will be created. Example: You have two servers connected to the Remote Client software. After the servers have acquired the data, they will be transferred to the client PC.



WINDOWS EXPLORER: TWO FILES FROM TWO SERVERS ARE AVAILABLE

As you can see in the example above, the file name consists of three parts, separated by dots: the main file name you have entered, the server name and the file extension (.DTd).

The example above shows also that the settings of the servers can be different: The test files have a different file size.

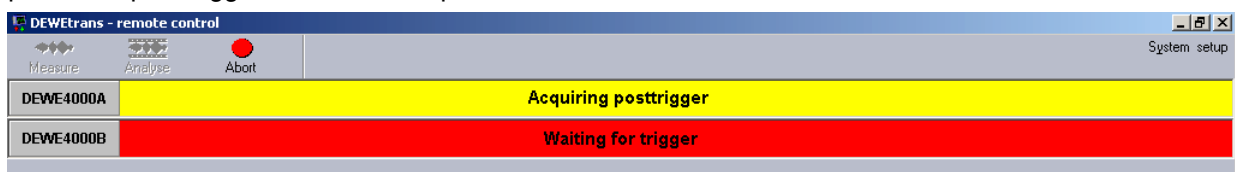
6.3.2 Start recording

To start the recording simply press the record button.



PRESS RECORD TO START THE ACQUISITION ON ALL SERVERS

After you have pressed the record button, the servers are waiting for the trigger event. When the trigger event appears, the post trigger data will be acquired.



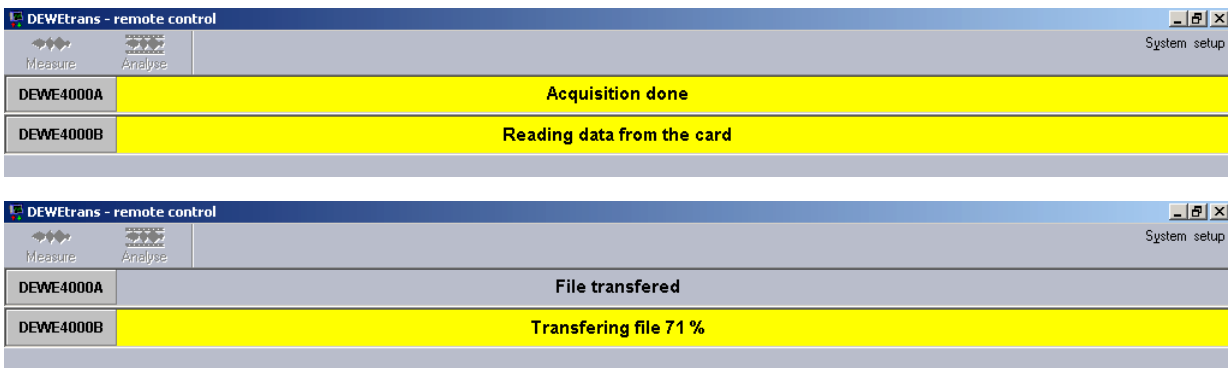
TWO BOARDS: ONE IS WAITING FOR A TRIGGER, THE SECOND IS ALREADY ACQUIRING POST TRIGGER DATA

As long as the servers are waiting for the trigger event, it is possible to abort the recording. Just press the **Abort** button at the left top of the screen.



After the data has been acquired, the server transfers the data to the client PC and stores the data. The sequence is the same for each transient recorder:

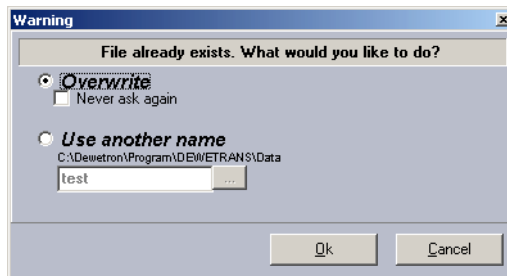
- Reading data from card
- Acquisition done
- Transferring file xx %
- File transferred



After the files have been transferred, you can analyze them. Or press the **Rearm** button to do the acquisition again.



In this case, the RemoteClient will pop up a new window. You can now select whether to overwrite the previous file, enter a new file name or cancel the new acquisition.



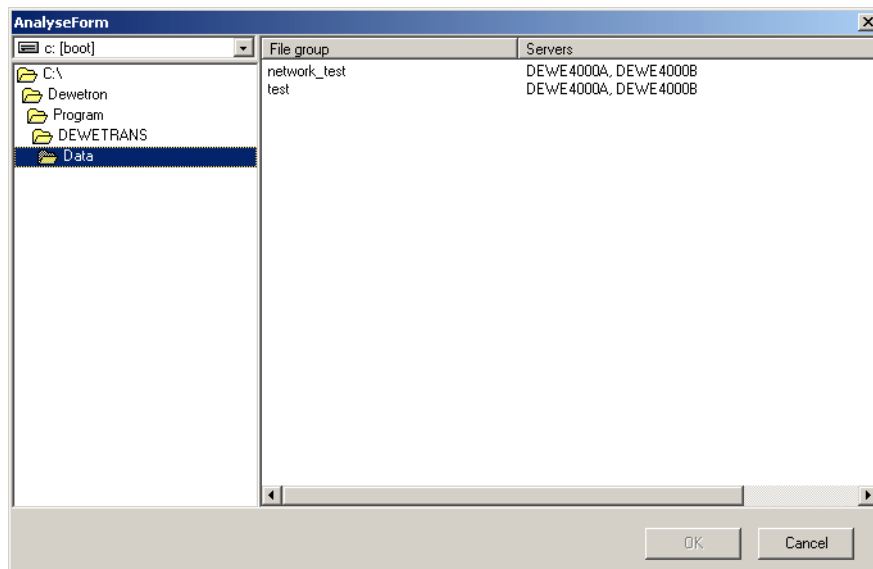
Remote control functions

6.4 Analyze recorded data

To analyze recorded data, it is not necessary to have the servers connected. Just press the **Analyze** button.

If you have just done an acquisition, the RemoteClient will immediately show the settings of the file for the selected server.

If you press the **Analyze** button for the second time, or you don't have acquired data before, the file selection window will appear:



SELECT THE FILE TO ANALYZE

Select the file and press the OK button.

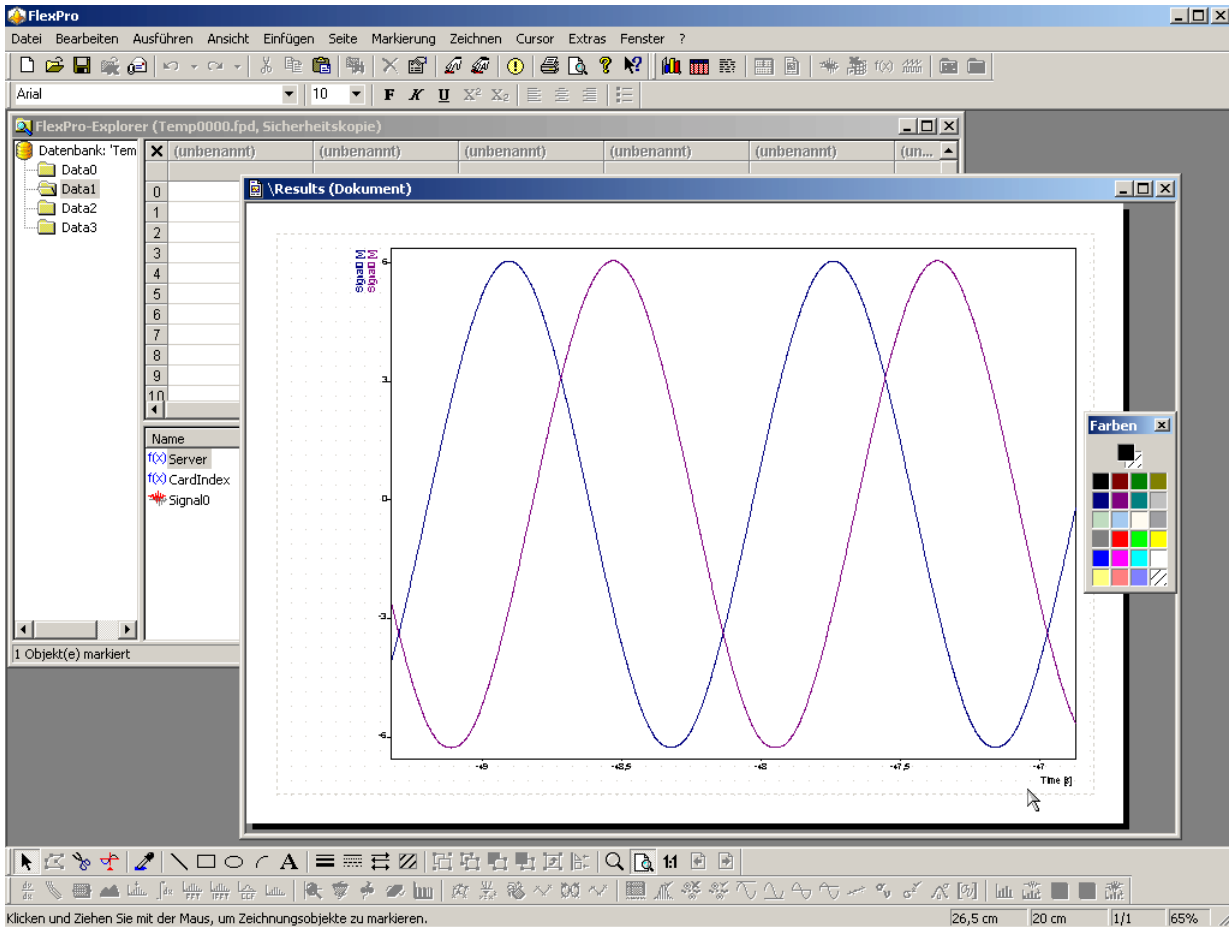
Ch. no	Name	Amplifier	Sample rate (kS/sec)	Scale (k)	Offset (n)	Range (from .. to)	Min	Max
Channel 0	Channel 0 ; U	DAQP-V (10 V .. 10 kHz)	1000	1	0	-10 .. 10 V	-6,315	6,051
Channel 1	Channel 1 ; U	DAQP-V (10 V .. 10 Hz)	1000	1	0	-10 .. 10 V	-0,004884	0,009768
Channel 2	Channel 2 ; U	DAQP-V (10 V .. 10 Hz)	1000	1	0	-10 .. 10 V	-0,009768	0
Channel 3	Channel 3 ; U	DAQP-V (10 V .. 50 kHz)	1000	1	0	-10 .. 10 V	-0,004884	0,009768
Channel 4	Channel 4 ; U	DAQP-V (10 V .. 50 kHz)	1000	1	0	-10 .. 10 V	-0,004884	0,004884
Channel 5	Channel 5	DAQP-BRIDGE (2 mV/V .. 10 Hz)	1000	1	0	-2 .. 2	-2	-2
Channel 6	Channel 6	DAQP-BRIDGE (2 mV/V .. 10 Hz)	1000	1	0	-2 .. 2	-0,6808	-0,6134
Channel 7	Channel 7	DAQP-BRIDGE (2 mV/V .. 10 Hz)	1000	1	0	-2 .. 2	-2	-2
Channel 8	Channel 8	DAQP-BRIDGE (2 mV/V .. 10 Hz)	1000	1	0	-2 .. 2	-2	-2
Channel 9 ; U	Channel 9 ; U	DAQP-uV (10 mV .. 20 kHz)	1000	1	0	-10 .. 10 mV	0,2344	0,3223
Channel 10 ; U	Channel 10 ; U	DAQP-uV (10 mV .. 20 kHz)	1000	1	0	-10 .. 10 mV	-0,2882	-0,2002
Channel 11	Channel 11	DAQP-ACC (1667 mV .. 300 kHz)	1000	1	0	-1,667 .. 1,667	-0,005698	0,00407
Channel 12	Channel 12	DAQP-ACC (1667 mV .. 300 kHz)	1000	1	0	-1,667 .. 1,667	-0,004884	0,004884
Channel 13	Channel 13	DAQP-ACC (1667 mV .. 300 kHz)	1000	1	0	-1,667 .. 1,667	-0,004884	0,004884
Channel 14	Channel 14	DAQP-ACC (1667 mV .. 300 kHz)	1000	1	0	-1,667 .. 1,667	-0,006512	0,00407
Channel 15	Channel 15	DAQP-ACC (1667 mV .. 300 kHz)	1000	1	0	-1,667 .. 1,667	-0,005698	0,004884

SETTINGS FOR THE SELECTED DEWE4000A DATA FILE

Now press the **Export** button to transfer the acquired data to the FlexPro script we have selected in section 6.1.2.



All data will now be transferred into FlexPro and the script will be processed. The result is a report ready for printout:



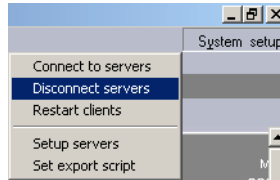
FLEXPRO DATA ANALYSIS

Basic information about the creation of FlexPro scripts is available in section 5.5.

Remote control functions

6.5 Disconnecting servers

After the acquisition has been done, you can disconnect the servers. Just select **Disconnect servers** from the System setup menu.



When you want to switch off the systems, you should always disconnect the servers before.

To reconnect the servers, just select **Connect servers** or press the **Measure** button.

Another feature belongs to the disconnection: **Restart servers**. This function shut down the servers and reboot them completely.

As the system is based on WINDOWS 2000 or XP, please keep in mind that you have to deactivate the password entry at the startup of WINDOWS. Otherwise the servers keep staying at the password entry and the RemoteClient is not able to connect the servers again!

Notes

7 Support information

We hope that you gained useful insight into DEWETrans, both from the software itself and from this manual. But we are here to help you, should you require some assistance.

If you have purchased DEWETrans, we thank you for your business. If you are evaluating it, we thank you for your attention, and would love to hear from you and learn about your experience with it. Is there some way we can make it better for your application?

It is our intention to continue developing it and making it more useful and powerful, without sacrificing speed or ease of use. Our development efforts are driven almost entirely by requests from customers like you, so your comments, suggestions, and ideas are always welcome, and will be heard! Please contact us:

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Notes

Appendix A: DEWETrans Shortcuts

Display functions

- <CTRL> + <F> Toogle between full screen display and standard display

Setup functions

- <F4> Channel setup

Appendix A: Shortcuts

Appendix B: A/D conversion

Appendix B: Basics of A/D conversion

1 A/D conversion: discrete measurement

In the measurement world of analog recorders and analog oscilloscopes, we had the chance to see at any time any amplitude value. The digital has limitations, the measured signal from an A/D converter is always discrete in both time and amplitude. This is caused by the used conversion technology, the system speed and also the limited storage capabilities.

But the digital world is coming more and more common, so we have to know some backgrounds about the functionality of A/D converters. Understanding the technology helps to achieve best measurement results and saving time and money at the same time.

There are three important elements in the digital measurement world:

- time resolution (= sampling rate)
- amplitude resolution (= number of bits of the converter)
- accuracy

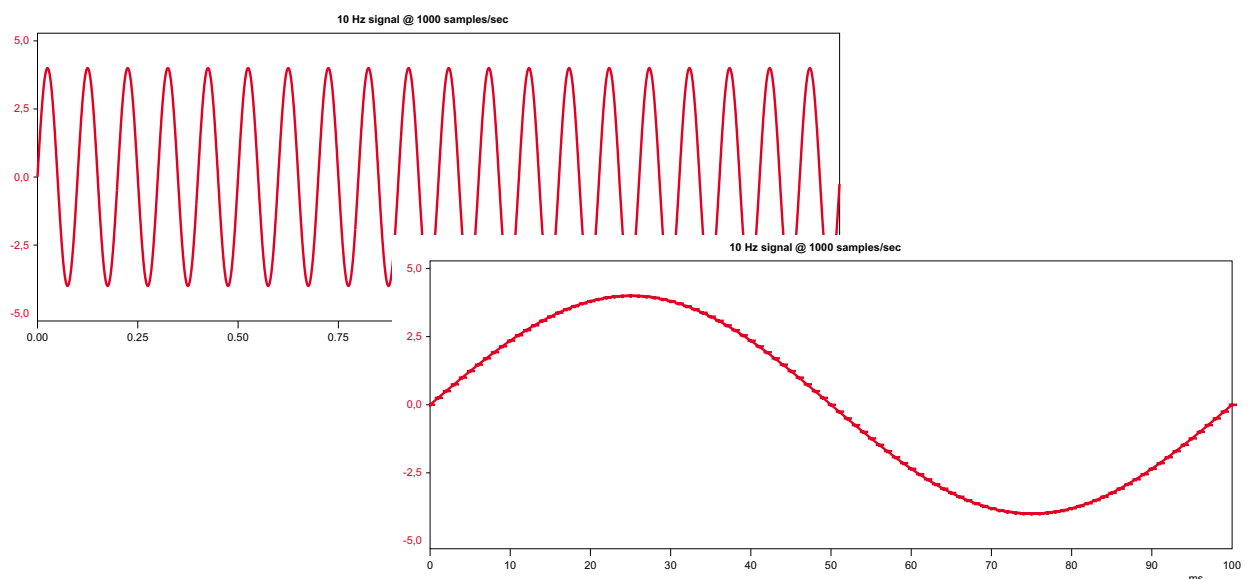
2 Sampling rate

Selecting the correct sampling rate is very important to obtain good measurement results. When the sampling rate is too high, you will see a perfect signal, but you will also receive plenty of unnecessary data - waste of harddisk memory.

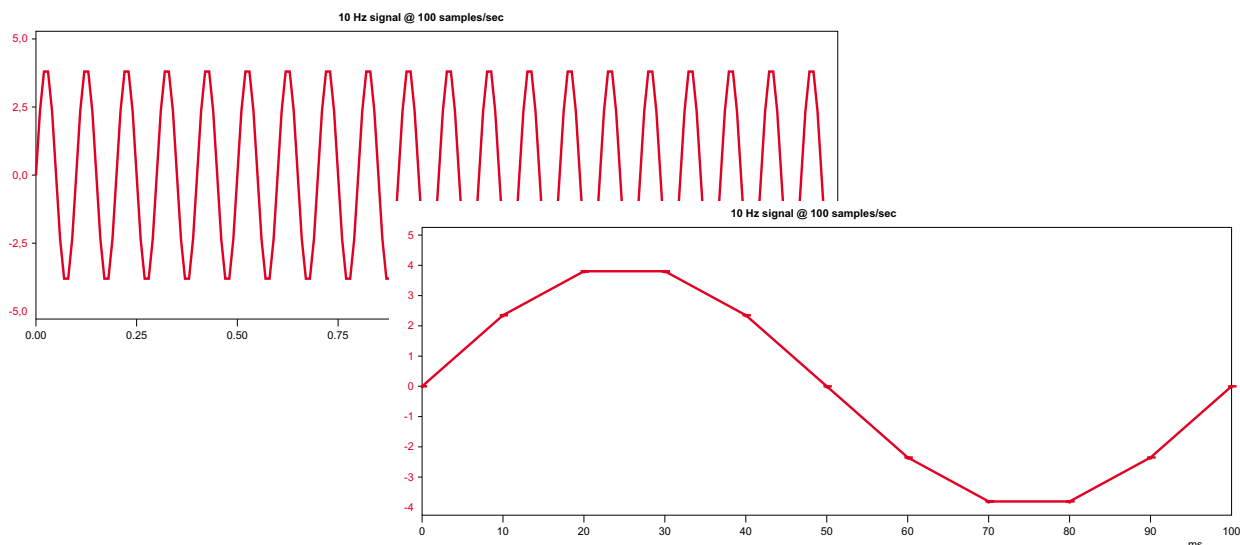
A sampling rate below the signal frequency will save harddisk memory - but delivers an unuseful result: The displayed signal looks interesting, but is completely wrong (= aliasing effect).

The following example should show you the relation between signal frequency and sampling rate. The example shows always a 10 Hz sinewave with ± 4 V amplitude. We will decrease the sampling rate from too high until too low.

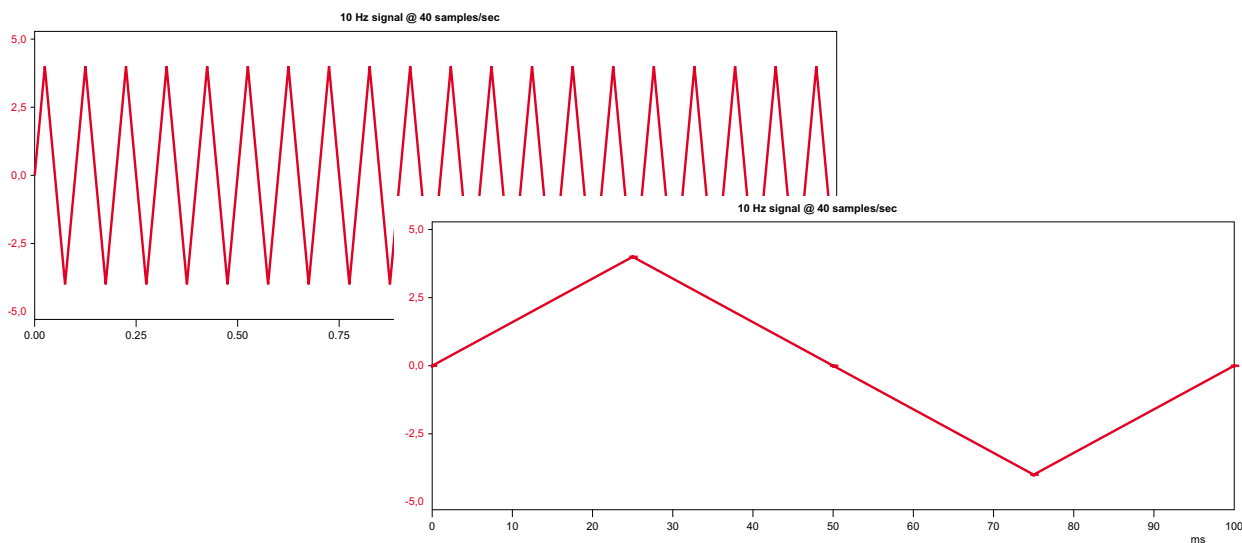
- 10 Hz sinewave, 1000 samples/sec => 100 sampling points per periode show a wonderful precise sinewave signal - but requires plenty of harddisk memory



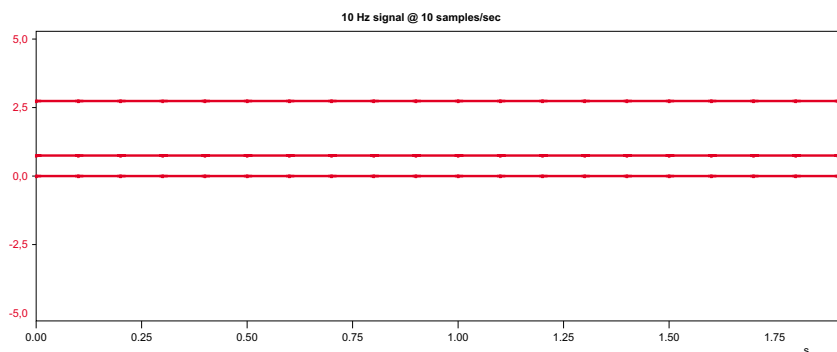
- 10 Hz sinewave, 100 samples/sec => 10 sampling points per periode deliver a quite useful sinewave with moderate memory requirements



- 10 Hz sinewave, 40 samples/sec => 4 sampling points per periode deliver no sinewave signal any more. The amplitude information will get completely lost, because you may sample at any time, but not at the maximum. Even the time and frequency analysis can be a problem, depending on the sampling time.

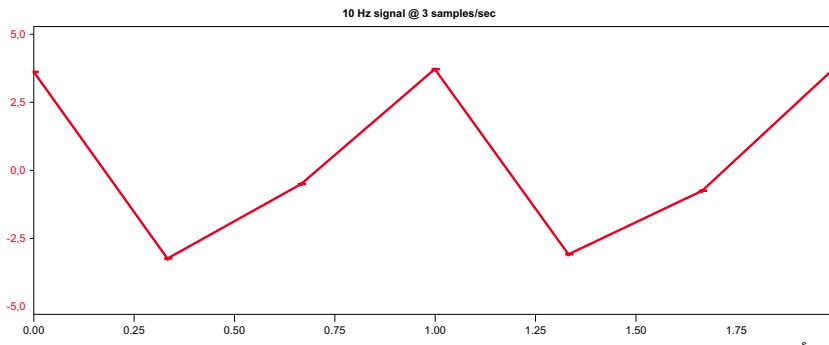


- 10 Hz sinewave, 10 samples/sec => 1 sampling point per periode show a flat line, independent from the sampling time.



Appendix B: A/D conversion

- 10 Hz sinewave, 3 samples/sec => 0.33 sampling points per periode delivers an interesting result: there seems to be a signal, but the frequency is much below the 10 Hz. This is a typical aliasing effect.



All the examples are idealized and won't appear that extrem in the reality. But they can give you an idea how signal frequency and sampling rate corresponds. For the reality, we would recommend a sampling rate which is about 5 to 20 times higher than the highest expected signal frequency - this varies from application to application.

3 Amplitude resolution

Up to now, we just worried about the time resolution of our signal. But the amplitude resolution is also important. It is given by the number of bits of the A/D converter and gives the smallest difference between two values of an input signal. The most common values are 8, 12, 16 or even 24 bits. The following table shows the relation between bit resolution and input range resolution:

Number of bits	Discrete steps	Minimum resolution for					
		±1 V input range		±5 V input range		±10 V input range	
8	256	0,007812500 V	7,8 mV	0,039062500 V	39,1 mV	0,078125000 V	78,1 mV
12	4096	0,000488281 V	0,488 mV	0,002441406 V	2,441 mV	0,004882813 V	4,883 mV
14	16384	0,000122070 V	0,122 mV	0,000610352 V	0,610 mV	0,001220703 V	1,221 mV
16	65536	0,000030518 V	0,031 mV	0,000152588 V	0,153 mV	0,000305176 V	0,305 mV
24	16777216	0,000000119 V	0,119 µV	0,000000596 V	0,596 µV	0,000001192 V	1,192 µV

You can easily calculate the resolution by yourself. First calculate the number of discrete steps:

$$\text{Discrete steps} = 2^{\text{Number of bits}}$$

Then divide your input range by the number of discrete steps:

$$\text{Input resolution} = \frac{\text{Input range}}{\text{Discrete steps}}$$

Or calculate directly:

$$\text{Input resolution} = \frac{\text{Input range}}{2^{\text{Number of bits}}}$$

The more bits, the higher the resolution. A high amplitude resolution is very important for enhanced mathematics, like FFT analysis. The higher the resolution, the better is the dynamic range - and the higher the costs!

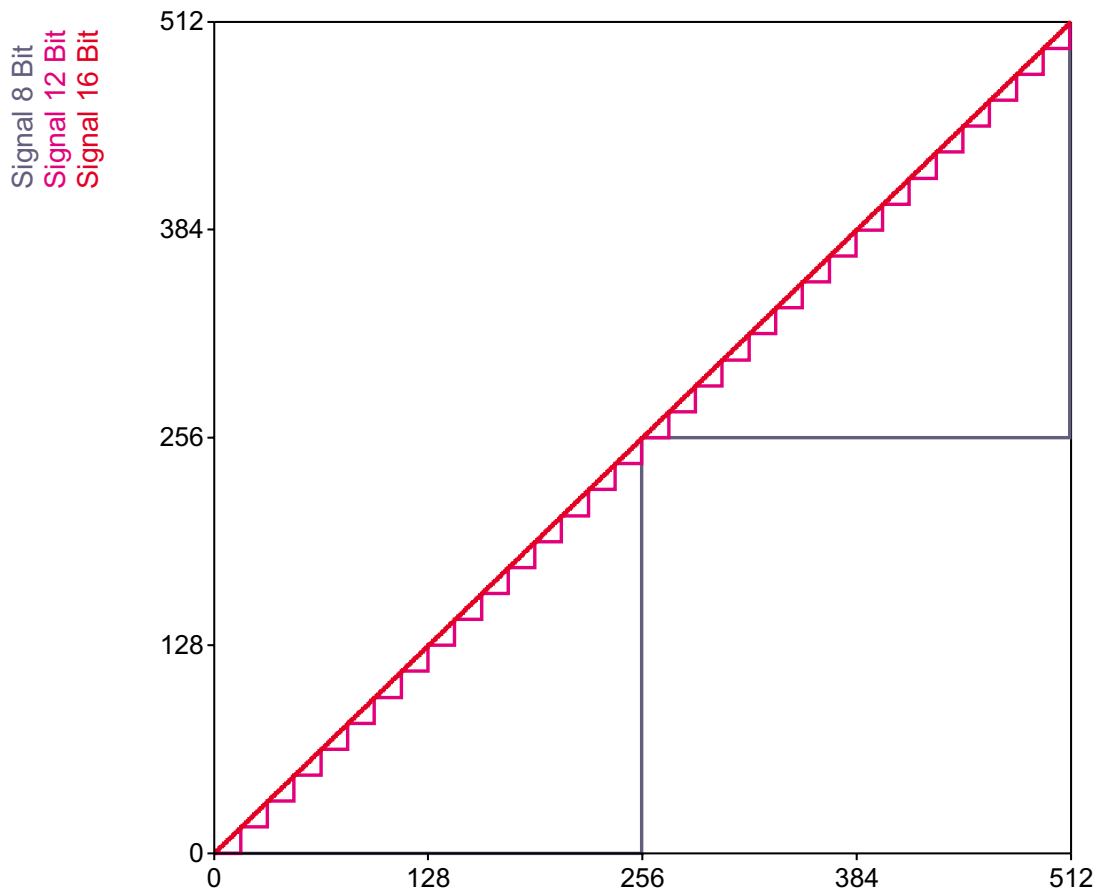
But high resolution has also other disadvantages: To get a stable signal, the A/D converter requires more time. The higher the resolution, the more time is required for the conversion:

Number of bits	Discrete steps	Minimum sampling time per channel			
		using standard A/D boards		with special A/D boards	
8	256	-	-	2 ns	500 MS/s
12	4096	0.8 us	1.25 MS/s	10 ns	100 MS/s
14	16384	1,25 us	800 kS/s	-	-
16	65536	3 us	333 kS/s	1 us	1 MS/s
24	16777216	0.17 s	6 Hz	-	-

The table above shows the conversion time for typical A/D boards in single channel mode. Using standard A/D boards you can do continuous measurements, streaming your data to harddisk, like you have done that before with analog recorders.

The special A/D boards are normally transient recorder boards with their own fast acquisition memory on-board. They are working 'block oriented', which means you can't do a continuous measurement. The technology is the same which is used in modern digital storage oscilloscopes.

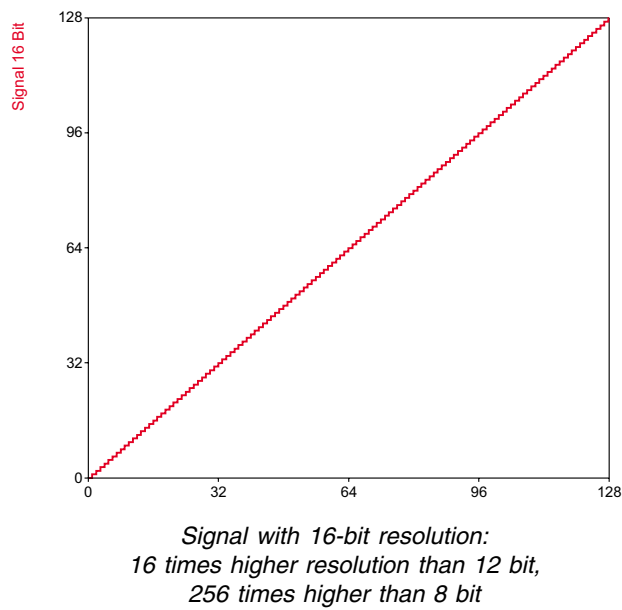
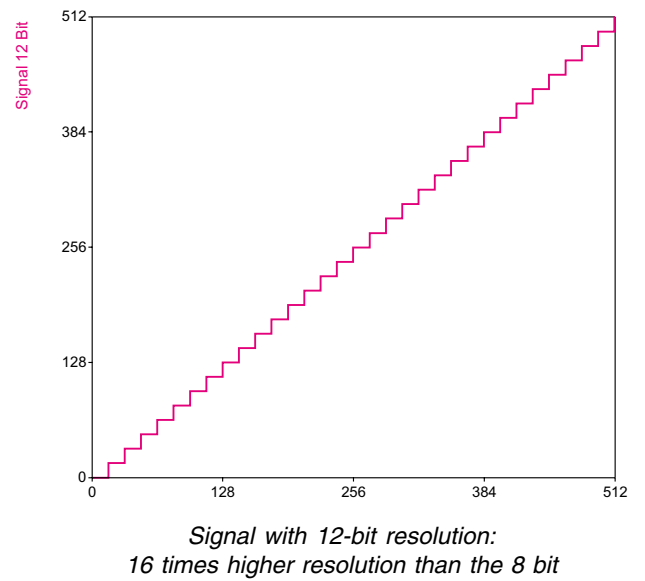
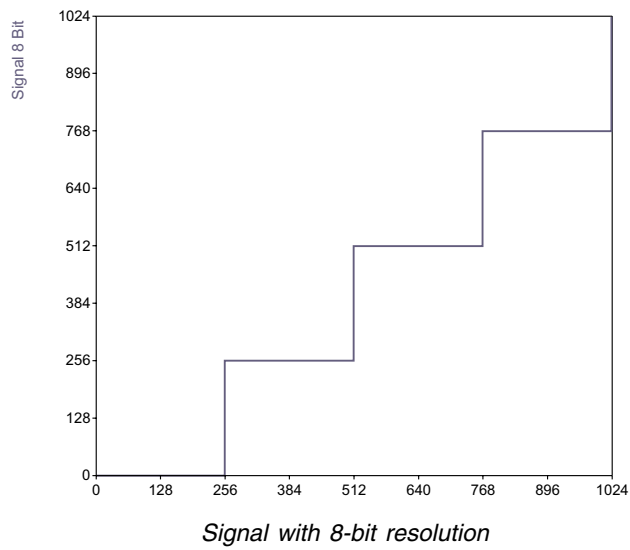
When we compare now the same input signal sampled with 8, 12 and 16 bits, the signal will look like that:



With three A/D boards (8, 12 and 16 bit resolution) set to 1 kS/s, we have acquired 512 ms of a signal, which is continuously growing with 1000 per second (ideal signal without units). While the 16 bit board has an own discrete amplitude value for each sampling point, the 12 bit board always shows discrete amplitude steps of 16. And the 8 bit shows the steps each 256.

Appendix B: A/D conversion

The following three graphs show the amplitude resolution more detailed:



4 Accuracy

Most users mix up amplitude resolution and accuracy, but there is a big difference.

- The amplitude resolution is given by the number of bits of the A/D converter and is the smallest difference between two values the system can display (as mentioned above).
- The accuracy declares the difference in percent between the nominal and the real value of the measurement system.

Each part of a measurement system has its own accuracy: the A/D board, the amplifiers, the sensors. Even the cables may have an influence to the system accuracy.

All these accuracies are not really interesting for the instrument user. It's just important to know the system accuracy - the sum of all parts. So it is very easy to calculate the accuracy: connect a well known and high precise signal to the measurement system and have a look on the result. The difference is the error, which can be removed by doing a system calibration directly in DEWETrans.

There are two different ways to mention the accuracy.

- Accuracy, related to the input range
- Accuracy, related to the input signal

4.1 Input range related accuracy

The most common way is to mention the accuracy related to the input range. This way is also used for DEWETRON amplifiers and systems. The formula is simple:

$$\text{Accuracy \%} = \frac{\text{Input signal} - \text{Expected input signal}}{\text{Full scale input range}} \times 100$$

Three examples for a 10 V input range:

$$\text{Accuracy} = \frac{9,505 \text{ V} - 9,5 \text{ V}}{10 \text{ V}} \times 100 = \frac{0,005 \text{ V}}{10 \text{ V}} \times 100 = 0,05 \%$$

$$\text{Accuracy} = \frac{4,505 \text{ V} - 4,5 \text{ V}}{10 \text{ V}} \times 100 = \frac{0,005 \text{ V}}{10 \text{ V}} \times 100 = 0,05 \%$$

$$\text{Accuracy} = \frac{0,505 \text{ V} - 0,5 \text{ V}}{10 \text{ V}} \times 100 = \frac{0,005 \text{ V}}{10 \text{ V}} \times 100 = 0,05 \%$$

In all three cases, the error is the same, because the absolute fault of 0.005 V in relation to the 10 V input range is always the same.

4.2 Input signal related accuracy

Sometimes the accuracy is related to the input signal. The formula is similar to the range related formula:

$$\text{Accuracy \%} = \frac{\text{Input signal} - \text{Expected input signal}}{\text{Expected input signal}} \times 100$$

Appendix B: A/D conversion

The same three examples, again with 10 V input range, but related to the input signal:

$$\text{Accuracy} = \frac{9,505 \text{ V} - 9,5 \text{ V}}{9,5 \text{ V}} \times 100 = \frac{0,005 \text{ V}}{9,5 \text{ V}} \times 100 = 0,053 \%$$

$$\text{Accuracy} = \frac{4,505 \text{ V} - 4,5 \text{ V}}{4,5 \text{ V}} \times 100 = \frac{0,005 \text{ V}}{4,5 \text{ V}} \times 100 = 0,11 \%$$

$$\text{Accuracy} = \frac{0,505 \text{ V} - 0,5 \text{ V}}{0,5 \text{ V}} \times 100 = \frac{0,005 \text{ V}}{0,5 \text{ V}} \times 100 = 1 \%$$

As the input range is not used in the formula, the input range itself has no influence to the accuracy. The absolute fault is still 0.005 V, but the lower input signal, the worse the accuracy in percent!

4.3 Resolution and accuracy

The amplitude resolution has to be higher than the accuracy of the system. As a standard, it should be 5 to 10 times higher to compensate the bit noise of the A/D converter and other faults - this is very important to get reproduceable results. The following table shows the required accuracy for the different A/D converter resolutions:

Number of bits	Total number of discrete steps (= 100 % input range)	1 discrete step (related to 100 % input range)
8	256	0,39063%
12	4096	0,02441%
14	16384	0,00610%
16	65536	0,00153%
24	16777216	0,00001%

As the system accuracy is normally in ranges between 0.05 % and 3 % (depending on the system and sensors), the A/D resolution of each bit is much below the system accuracy. Only with 8-bit A/D converters you can come into troubles.

Notes

Appendix C: reserved

Appendix C: reserved

The appendix C is reserved for future developments of DEWETrans.

Appendix C: Analysis backgrounds

Notes

Appendix D: Hardware

1 Transient recorder board specifications

Up to date and complete technical specifications can be found for each transient recorder board, on the web sites and printed technical documentation of the manufacturer. Links to these manufacturers, and to specific pages containing detailed specs wherever possible, are shown below. What we have done is to summarize the most salient specifications of each major transient recorder board that is supported by DEWETrans, and include this information below. Please use this information only as a casual reference, and rely on the manufacturers' detailed specifications.

1.1 Websites of supported manufacturers

Detailed information about A/D boards and current drivers can be downloaded directly from the manufacturers homepages.

- DEWETRON <http://www.dewetron.com>
 <ftp://ftp.dewetron.com/public>
- Spectrum <http://www.spec.de>

1.2 Spectrum transient recorder boards

1.2.1 PCI.208 board

PCI.208 Transient recorder board					
Software programmable parameters					
Sampling rate	781 kHz to 200 MHz, external clock	Trigger output	enable / disable		
Input range	±200 mV, ±500 mV, ±1 V	Trigger mode	channel 0, channel 1, external, software		
Input impedance	50 Ohm / 1 MOhm (relais)	Trigger level	1/16 ... 15/16 of the input range		
Input coupling	AC/DC (jumper)	Trigger edge	rising or falling edge		
Clock output	enable / disable	Posttrigger	32 samples up to 256 MSamples		
Memory depth	32 samples up to installed memory in increments of 32 samples		in increments of 32 samples		
Technical data					
Resolution	8 bit	Input range	±200 mV	±500 mV	±1 V
Samplerate	781 kS/s up to 200 MS/s	Offset error (100 MHz)	< 3 LSB	< 2 LSB	< 2 LSB
Bandwidth DC -3 dB	0 Hz to 90 MHz	Offset error (200 MHz)	< 4 LSB	< 3 LSB	< 3 LSB
Bandwidth AC -3 dB	40 Hz to 90 MHz	Gain error (100 MHz)	< 4 %	< 3 %	< 2 %
Differential linearity error	< ±0.5 LSB	Gain error (200 MHz)	< 4 %	< 3 %	< 2 %
Integral linearity error	< ±0.5 LSB	Noise (100 MHz)	< 1 LSB	< 1 LSB	< 1 LSB
ENOB fs = 1 MHz, fck = 100 MHz	7.5 bit typ. (ADC)	Noise (200 MHz)	< 2 LSB	< 2 LSB	< 2 LSB
ENOB fs = 31 MHz, fck = 100 MHz	6.5 bit typ. (ADC)	Crosstalk	< -48 dB	< -48 dB	< -48 dB
Aperture jitter	10 ps typ. (ADC)				
Input impedance	50 Ohm or 1 MOhm 25 pF	Dimension	312 mm x 109 mm		
TTL Input impedance	110 Ohm 15 pF	Connector	9 mm BNC		
Multi/Gate: Trig to 1 st sample delay	8 to 42 samples (fix)	Overvoltage protection	±20 V		
Multi/Gate: recovery (< 100 MHz)	< 20 samples	Warm up time	10 minutes		
Trigger output delay	6 samples	Operating temperature	0°C - 50°C		
Trigger accuracy (< 100 MHz)	1 sample	Storage temperature	-10°C - 70°C		
Trigger accuracy (200 MHz)	2 samples	Humidity	10% to 90% non condensing		
Digital input to analogue input delay	2 samples				
Ext. clock: output delay	ca. - 6 ns	Power supply (V)	+3.3 V	+5 V	+12 V
Ext. clock: delay to internal clock	ca. 10 ns	Power consumption (A)	0 mA	3800 mA	0 mA
Sync: board to board trigger jitter	0 samples	Power consumption (W)	0.0 W	19.0 W	0.0 W
Sync: board to board clock delay	< 1 ns				

1.2.2 PCI.258 board

PCI.258 Transient recorder board						
Software programmable parameters						
Sampling rate	2.5 MS/s to 500 MS/s, external clock	Trigger input	50 Ohm / 1 MOhm (relais)			
Input range	±100, ±200, ±500 mV, ±1, ±2, ±5 V	Trigger mode	channel 0, channel 1, external, software			
Input impedance	50 Ohm / 1 MOhm (relais)	Trigger level	1/16 ... 15/16 of the input range			
Input coupling	AC / DC (jumper)	Trigger edge	rising or falling edge			
Clock output	50 Ohm or > 24 kOhm	Pulsewidth	0 to 254 samples in increments of 2			
Memory depth	64 samples up to installed memory in increments of 64 samples	Posttrigger	32 Samples up to 256 MSamples in increments of 32 samples			
Technical data						
Resolution	8 bit	Input range	±100 mV ... ±500	±1 V ...		
Samplerate	2.5 MS/s up to 500 MS/s	Offset error	adjustable by user			
Bandwidth DC -3 dB	0 Hz to ³ 190 MHz	Gain error (< 250 MS/s)	< ±2 %	< ±3 %		
Bandwidth AC -3 dB	40 Hz to ³ 190 MHz	Gain error (500 MS/s)	< ±2 %	< ±3 %		
Differential linearity error	< ±1.5 LSB (ADC)	Noise (< 250 MS/s)	< ±1 LSB	< ±1 LSB		
Integral linearity error	< ±1.5 LSB (ADC)	Noise (500 MS/s)	< ±2 LSB	< ±2 LSB		
SNR fs = 70 MHz, fck = 250 MS/s	44 dB typ. (ADC)	Crosstalk (1 MHz square)	< -48 dB	< -48 dB		
ENOB fs = 20 MHz, fck = 250 MS/s	6.7 bit typ. (ADC)					
ENOB fs = 70 MHz, fck = 250 MS/s	6.7 bit typ. (ADC)	Dimension	312 mm x 109 mm			
Aperture jitter	2.3 ps rms (ADC)	Connector	3 mm SMB			
Input impedance	50 Ohm / 1 MOhm 25 pF	Warm up time	10 minutes			
Overvoltage protection	±20 V	Operating temperature	0°C - 50°C			
Multi: trigger to 1 st sample delay	19 to 44 (fix)	Storage temperature	-10°C - 70°C			
Multi: Recovery time	< 20 samples	Humidity	10% to 90% non condensing			
Ext. trigger accuracy (< 250 MS/s)	2 samples					
Ext. trigger accuracy (500 MS/s)	4 samples	Power supply (V)	+3.3 V	+5 V	-12 V	+12 V
Int. trigger accuracy	1 sample	Power consumption (A)	0 mA	2700 mA	100 mA	10 mA
Ext. clock: delay to internal clock	< 3 ns	Power consumption (W)	0.0 W	13.5 W	1.2 W	0.12 W

Appendix D: Hardware

1.2.3 MI.30xx series boards

MI.30xx Transient recorder board series			
Software programmable parameters			
Samplerate	1 kS/s to max. samplerate, ext. clock	Trigger input	50 Ohm / 1 MOhm (relais)
Input range	± 200 mV, ± 500 mV, ± 1 V, ± 2 , ± 5 and ± 10 V	Triggermode	channel X, external, software, window
Input impedance	50 Ohm / 1 MOhm (relais)	Triggerlevel	1/256 ... 255/256 of the input range
Clock input	50 Ohm or 1 MOhm (relais)	Triggeredge	rising edge, falling edge or both edges
Memory depth	32 samples up to installed memory in increments of 32 samples	Trigger pulsewidth	1 to 255 samples in increments of 1
		Posttrigger	32 samples up to 256 MSamples in increments of 32 samples
Technical data			
Resolution	12 bit	Dimension	312 mm x 105 mm
Differential linearity error	< 1 LSB (ADC)	Width (Standard)	1 full size slot
Integral linearity error	< 1 LSB (ADC)	Width (with digital inputs)	1 full size slot and 1 half size slot
Multi: trigger to 1 st sample delay	-10 to +20 samples (fix)	Connector	3 mm SMB
Multi: recovery time	< 20 samples	Input impedance	50 Ohm / 1 MOhm 25 pF
Ext. trigger accuracy (< 125 MS/s)	1 sample	Overvoltage protection	± 20 V
Ext. trigger accuracy (> 160 MS/s)	2 samples	Warm up time	10 minutes
Int. trigger accuracy	1 sample	Operating temperature	0°C - 50°C
Ext. clock: delay to internal clock	42 ns \pm 2 ns	Storage temperature	-10°C - 70°C
Input signal with 50 Ohm termination	max 5 V rms	Humidity	10% to 90%
Trigger output delay		Digital Inputs input impedance	110 Ohm @ 2.5 V
Offset error	adjustable by user		
Gain error	< 1 %	Power consumption for	MI.3021 MI.3024 MI.3026
Noise (< 125 MS/s)	< 2 LSB	All channels active, max samplerate	
Noise (> 125 MS/s)	< 3 LSB	+5 V	2.5 A (12.5 W) 3.4 A (17.0 W) 3.0 A (15.0 W)
Crosstalk @ 500 kHz	< -70 dB	+3.3 V, +12 V, -12 V	0 A 0 A 0 A
		Power down mode	
		+5 V	1.7 A (8.5 W) 2.3 A (11.5 W) 2.3 A (11.5 W)
		+3.3 V, +12 V, -12 V	0 A 0 A 0 A
	MI.3021	MI.3024	MI.3026
Standard board memory*	8 MSamples	8 MSamples	8 MSamples
1 channel mode			
memory / channel	8 MSamples	8 MSamples	8 MSamples
max speed / channel	50 MS/s	100 MS/s	200 MS/s
2 channel mode			
memory / channel	4 MSamples	4 MSamples	4 MSamples
max speed / channel	50 MS/s	100 MS/s	100 MS/s
4 channel mode			
memory / channel	-	2 MSamples	2 MSamples
max speed / channel	-	50 MS/s	50 MS/s
Min. internal clock	1 kS/s	1 kS/s	1 kS/s
Max. internal clock	50 MS/s	100 MS/s	200 MS/s
Min. external clock	1 kS/s	1 kS/s	1 kS/s
Max. external clock	50 MS/s	100 MS/s	100 MS/s
-3 dB bandwidth	25 MHz	40 MHz	40 MHz
SNR fin = 500 kHz	66 dB (typ.)	66 dB (typ.)	65 dB (typ.)
ENOB fck = Max	10.6	10.6	10.5
	* The table shows the standard memory. The board memory may be upgraded to 256 MSamples.		
Trigger modes			
Standard	Comparing the highest 8 bit of input signal for programmed level and edge		
External	External TTL input with positive edge, negative edge or both edges		
Window	Definition of an upper and lower border. Trigger is recognized if window is entered or left		
OR trigger	Each channel has independent trigger recognition. All sources may be connected by a logical OR		
Pulse width	Could be combined with Standard, External and Window. Trigger is enabled if a pulse is recognized shorter or longer than the programmed pulsewidth. Therefore it is possible to detect the correct edge even in noisy signals		
Steepness	Trigger detection of over- or underrange of the defined slope between two levels is recognized		
Multiple recording	Recording several trigger events in segments of the same size without restarting the hardware. May be used together with any internal or external trigger mode		
Gated sampling	This option allows recording of a signal controlled by an internal or external gate signal		
Timestamp	The time of a trigger event relatively to the start time of the board is written into an extra buffer. Resolution of the timestamp is one sample		

