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INSTRUCTION

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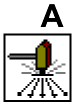
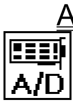
To obtain information on a Help topic quickly, click the **Search** button at the top of the **Help** window or press the `S` key on your keyboard.

A

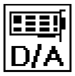


Action

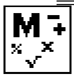


Analog Input

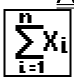
Analog Meter



Analog Output

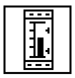


Arithmetic

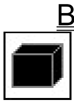


Average

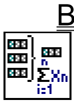
B



Bar Graph



Black Box



Block Average

C

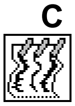
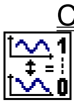


Chart Recorder



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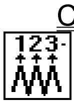
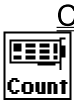
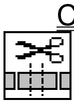


Counter

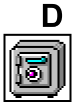


Counter Input

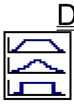


Cut Block

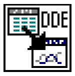
D



Data Archiving

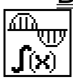


Data Window

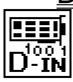


DDE Input

DDE Output

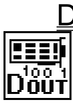


Differentiation / Integration



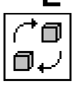
Digital Input

Digital Meter



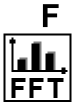
Digital Output

E



Export/Import Black Box

F



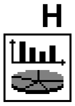
FFT

Filter

G

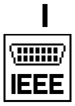
Generator

H



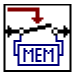
Histogram

I



IEEE488 Interface

L



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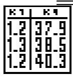
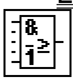
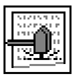


List Display



Logical Operations

M



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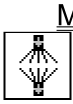
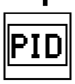
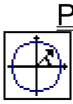


Multiplexer/Demultiplexer

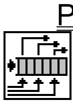
P



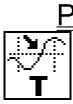
PID Control



Polar / Cartesian

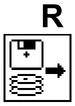


Position in the Signal

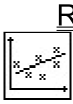


Pre / Post Trigger

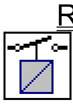
R



Read Data



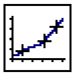
Regression



Relay

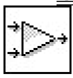
RS232 Interface

S

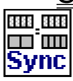


Scaling

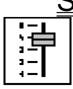
Separate



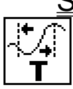
Setpoint



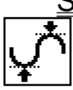
Signal Adaptation



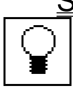
Slider



Start / Stop Trigger

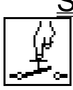


Statistical Values



Status Lamp

Stop



Switch

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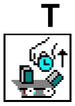
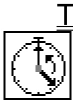
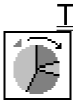


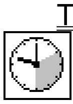
Time Base



Time Delay



Time Slice



Timer

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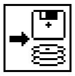

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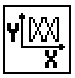

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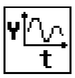


Module Installation, Configuration and Manipulation
Module Selection Menu
Help Index

New in DASY*Lab* Version 2

Below, you will find an overview of the most important additions and changes of the current **DASY*Lab*** version. Please select the **Back** button of the help symbol bar or press the Z key to **return** to this overview.

Arithmetic Module	additional function type
Copyright Information	at program start
Country Settings	formatting of the text output
DDE	expanded options, client/server capability
Default Directories	define file locations for default settings by file type
Disk Streaming	optimized data storage procedure
Display Modules	expanded design options, increased capabilities
Display Window Arrangement	store and select window arrangements
Event Driven Actions	**Action** module for event driven triggering
Filter	now also filter of odd order
Function Bar Info	Quick Info assistance
Generator	expanded with frequency and amplitude modulation
IEEE488 Interface	three types are supported
Module Bar	procedures for loading a worksheet
Module Groups	some modules assigned to other module groups
Module Name	numbered through by default
Module Option **Copy Inputs ...**	simplifies worksheet creation
New Modules	
Output Settings	expanded options, new arrangement
Read/Write Data	expanded options, new file formats
Separate Module	expanded setup capabilities
Slider	increased capabilities
Special Module Group	groups **Black Box** and other new modules
Switches	can be operated now as momentary switches

Arithmetic Module

The Arithmetic module has been expanded by a fourth function type: Operations with two or more operands. In this mode, incoming signals of **all** channels are combined in one arithmetic operation, a statistic operation, or a logic operation, with a single module output.

Copyright Information

At every program start a **Copyright Information** box is displayed. You can disable this display.

Country Settings

For text output, **DASY*Lab*** uses the format definitions of the Windows control panel.

DDE

The **Start/Stop via DDE** menu item of the Experiment menu has been discarded. DDE operations are possible at any time.

Default Directories

Using the Default Directory menu item (in the Options menu) you can set and modify the **preset**

locations of drives and directories which **DASY*Lab*** uses by default for opening or saving files. **Different directories** can be specified for various **file types**.

Disk Streaming

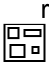
This function, which is part of the Experiment Setup, enables fast saving of measurement values of all channels in a compressed data format. It can also be read in by **DASY*Lab*** without any problems. Disk Streaming reduces the amount of required mass storage space, speeds up the saving process and therefore allows the storage of measurement data gathered at a high acquisition rate.

Display Modules: Enhanced Options

- Now the Analog Meter and the Digital Meter can process **up to 16** data channels.
- These two modules, as well as the Bar Graph module, feature a variety of new setting possibilities regarding **value ranges,** colored indications of **limit overflows/underflows** and the **change of the values** (increase or decrease compared to previous values).
- **Colors** and **fonts** can be specified individually.
- The new Copy Inputs to Outputs function is particularly useful.
- The Status Display module also offers this option.
- Now you can store the arrangement of the Display Windows and recall the information when required.

Display Window Arrangement

You can **store arrangements** of the display windows (their **size** and **position** on the screen) and recall the stored information if desired.



Save Window Arrangement

Select Window Arrangement

Delete current Window Arrangement

Event Driven Actions

The concept of event driven actions expands the automation capabilities. If (settable) conditions apply, one action module can trigger various actions at the receiver module.

Function Bar Info

If the mouse pointer points onto a button in the function bar, a **Quick Info** window will be displayed showing the name of the function. (**Quick Info** is available in all the windows with a function bar, such as the display windows of the Y/t Chart and the List module.)

Generator Module

A signal generated by the Generator module can be controlled in its frequency and/or amplitude by another data channel. During measurement, the frequency and amplitude of the generator signal can be changed using a slider, for example.

IEEE488 Interface

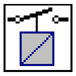
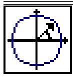
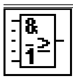
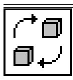
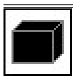
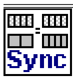
In addition to the INES interface **DASY*Lab*** now supports also the interface cards of the companies IOtech and National Instruments. You can select the drivers of the cards installed in your system during installation of **DASY*Lab***.

Module Bar

Using the Load module bar with worksheet option (in the Options menu) you can decide whether, when opening a new worksheet, the current module bar should remain active or should be replaced by the one stored with the worksheet.

Module Group Assignment

The following modules have been assigned to different module groups from previous **DASY*Lab*** versions:

Icon	Module	new module group	previous module group
	Relay	Trigger Functions	Control
	Polar/Cartesian	Signal Analysis	Mathematics
	Logical Operations	Mathematics	Control
	Export/Import	Special	**Black Box**
	New Black Box	Special	**Black Box**
	Signal Adaptation	Special	Signal Analysis

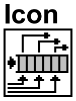
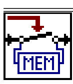
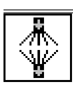
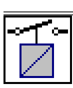
Module Name

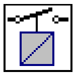
When you create a new module **DASY*Lab*** suggests a default Module Name. Beside the functional description the name contains a sequential **number** of the module **type** (e.g. Generator**02** for the third **Generator m**odule). This default can be changed at will.

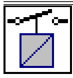
Module Option Copy Inputs to Outputs

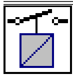
The modules of the Display module group as well as the Save Data and the DDE output modules feature the new option Copy Inputs to Outputs. For the module in the worksheet, this option creates an output for each activated input. The data is passed **unchanged.** The worksheet layout remains clearly readable since the creation of data channel branching is no longer required.

New Modules

Icon	Module	Module group
	Position in the Signal	Statistics
	Latch Function	Control
	Multiplexer/Demultiplexer	Data Reduction
	Data Archiving	Files
	Cut Block	Data Reduction

 Action — Special

 Message — Special

 Time Base — Special

Output Setup

The output parameters can be determined using the dialog box of the Experiment Setup item (instead of the previously separate menu item) of the **Experiment** menu. The number of setting possibilities has been expanded and includes several scan modes (the **Acquisition Mode** of previous versions), global settings for analog and digital output, selection of the **time base** for all data generating modules etc. The Disk Streaming option is new.

Read/Write Data

The Write Data module now also supports the Remus and DADiSP formats.

The Read Data module can also read in files stored in the ASCII and IEEE 32 Bit format.

Separate Module

Using the Separate module a certain number of data values or blocks can be suppressed for one time at the start of the measurement.

Slider Module

The Slider module generates up to 16 signals. The setup and operating capabilities have been expanded.

Module Group Special

In this new group replacing the previous **Black Box** module group, you find the new Action, Message and Time Base modules. It also contains the Black Box modules (**Empty Black Box, Export/Import**) and the Signal Adaptation module.

Switch Module

The Switch module can now also be used as a **One Shot** switch.

Help Index

Main Menu Options

Choose any of the main menu options on which you want help:

- File
- Edit
- Modules
- Experiment
- View
- Options
- Help

Help Index

Help Menu Commands

Here, the commands of the **Help** menu can be selected.

Index

This option activates the Help system and shows the index of topics on which help can be obtained on screen. Then you can select all the Help functions available, except those referring to data acquisition hardware.

Hardware

If you have installed a data acquisition board in your system, choose this menu function to obtain specific help about the installed board. The information is specific to the board type you selected when you installed the **DASY*Lab*** software.

Glossary

This function provides a list of terms for which the definition can be displayed.

Using Help

This option provides help for how to use the online help system.

System Information

Information on your hardware, operating system, Windows version, system resources etc. is presented on screen.

About DASY*Lab*

Information on the current **DASY*Lab*** version is presented on screen.

Main Menu Options
Help Index

How to use the DASY*Lab* Help System

How to Scroll this Help Window

- Use the scroll bars at the sides of this Help window,
- **or** press the , ↓, `PgUp` and `PgDn` keys on your keyboard.

How to Start Help

- To **activate** the online Help system, click Help from the Main Menu and choose the Help Index or one of the other options available there.
- You can usually obtain information on the function you are currently using by pressing the `F1` function key or by clicking the **Help** button included in many dialog boxes. Then, either specific information on the current function, command or dialog box, or the **Help Index** will be displayed.
  - **>** You can obtain further information on how to use the Windows Help system itself by pressing the `F1` function key while using a Help window or by choosing **Using Help** from the Help menu.

How to use the Help Index

The Help Index displays the index of topics on which help can be obtained on screen. There you can select all the Help functions available, except those referring to data acquisition hardware.

- Click on the underlined topic on which you want help,
- **or** press the `TAB` key on your keyboard until the topic on which you want help is selected; then press the `ENTER` key.
- You can return to the **Help Index** page any time by clicking the **Contents** button at the top of each Help window or by pressing the `C` key on your keyboard.

How to Find Help on a Topic

Use the **Search** function or the **Alphabetical Indexes** to obtain help on a specific topic quickly.

- How to use the **Search** function:
  - Click on the **Search** button at the top of the Help window,
  - **or** press the `S` key on your keyboard.

The **Alphabetical Indexes** contain all the topics on which online help is available. **Scroll** through the lists; then **choose** the topic on which you want to obtain information.

- How to **Scroll** the Help Window:
  - Use the scroll bars at the sides of the Help window,
  - **or** press the , ↓, `PgUp` and `PgDn` keys on your keyboard.
- How to **Choose** a Help Topic:
  - Click on the topic on which you want to obtain information,
  - **or** select a topic by repeatedly pressing the `TAB` key until the topic is highlighted, then press `ENTER`.

How to Return to Previous Help Topics

After reading the information on a topic, you can return to the help pages previously displayed

- by (repeatedly) clicking the **Back** button at the top of the Help window,
- **or** by (repeatedly) pressing the `B` key on your keyboard.

How to Close the Help Window

- Double-click the Control-menu box in the upper left corner of the Help window,
- or press `ALT+F4`,
- or choose **Exit** from the **File** menu of the **Help** window (`ALT`, `F`, `X`).

Help Index

The Elements of the DASY*Lab* Screen

The following elements of the **DASY*Lab*** screen are often referred to in the online **Help**. Please click the underlined topics to obtain further information.

Title Bar

The **Title Bar** is the upper border of the **DASY*Lab*** window and shows the name of the application (**DASY*Lab***) and the file name of the current worksheet. If the current worksheet has not yet been saved, "(Untitled)" appears as a placeholder.

Menu Bar

Below the title bar, the **Menu Bar** lists the Main Menu Options. Each menu contains a list of commands or actions. You can open each of these lists by clicking the Main Menu Option on the Menu Bar with the left mouse button, or by pressing the `ALT` key and then typing the letter that is underlined in the Main Menu Option.
You can then choose an option from that list by clicking it or by typing the letter that is underlined in the menu item (**without** pressing the `ALT` key again!). The display field in the left half of the Status Bar will often contain information describing the selected menu item.

Function Bar

Below the menu bar, the Function Bar contains **icons** which provide easy access to menu functions often used during experiments. Just click the icon representing that function. The online help text for each menu command refers to their corresponding icons on the function bar.
When the mouse pointer is pointing at a Function Bar icon, a tag with the name of that function will appear. (You will find **QuickInfo** in all of the module windows which provide a Function Bar.)
Click here for a list of the icons currently integrated and the menu commands they represent.

Module Bar

The Module Bar, at the left of the **DASY*Lab*** window, displays a selection of frequently required modules in icon form. Use the **left** mouse button to click on the icon which symbolizes the module you want to add to your worksheet. The name of the module the mouse pointer is pointing at is displayed in a small window above the module icons. Select the Modules menu to choose from the complete list of **all the modules available.**
The Module Bar can be configured freely.

Work Area

The work area is where you create the virtual **DASY*Lab*** experiment setup (the worksheet). The size of the worksheet segment which is actually displayed in that workspace on your screen varies depending on your display adapter. In any case, the area available for a worksheet is much larger than can be displayed on screen at a time. You can use the scroll bars to pan horizontally and vertically around in the worksheet.
You can install modules in the work area either by choosing them from the Modules menu or by clicking the corresponding icons on the Module Bar. Then these modules must be connected by data channels. You can also drag any module symbol to any location in the worksheet by placing the mouse pointer on it and then pressing and holding down the left mouse button while moving the mouse. If you touch the window border while doing this, the work area display will automatically follow your movements across the worksheet until you release the mouse button, thus placing the module symbol to its new position.

Status Bar

The **Status Bar** at the bottom of the **DASY*Lab*** window provides useful information:

- On the left of the display you will find an explanation of the menu function you have selected on the **menu bar.**
- The control bar on the right displays the progress of operations, e.g. of the Autorouter function arranging data channels, or, during experiments, the driver buffer status. This control bar indicates the progress of the filling of the driver buffer. If the bar turns red, this indicates that the acquisition

rate is too fast to be kept continuously. Left to the driver buffer indicator there is a small indicator for lost samples. Many drivers acquire data under interrupt control. Some boards allow to check whether all interrupts have been processed by the program. A yellow flashing light indicates that some interrupts have been missed. For more detailed information see the hardware halp for our boards.

- The current time is displayed on the far right.

Help Index

Creating Data Channels or Branches

... the quick way:

To connect a module, simply **drag** it against the other module to which it is to be connected until their output **(O)** and input symbols **(I)** touch. When you release the mouse button, **DASY*Lab*** will automatically connect the two modules and auto-route the wires.

This prodecure even works when both modules are configured differently, i.e. when **different channel numbers** have been selected, and when some of their inputs/outputs are **already connected** to other (i.e., third) modules.
Thus you might, for example, activate four output channels of a Generator module, then connect two of them to Display modules and the remaining two to modules from the Signal Analysis group.

... with the Autorouter option on:

- Click the **left** mouse button **once** at the point where you wish the data channel to begin - the output symbol **(O)** of a module or - for a branch - any position on the data channel. The mouse pointer then changes into a **plug symbol**.
- Then place the **tip** of that plug symbol on the input symbol **(I)** of another module. (Note that the input of the second module must be **free**.) While you do this, a thin black line is being drawn from the starting point of the connection.
- Click the **left** mouse button **again**, on the **input** symbol at the end of the connection, to **establish** the connection.
- To **cancel** the process, click the **left** mouse button **once** anywhere **outside** the input symbol.

... with the Autorouter option off:

- Click the **left** mouse button **once** at the point where you wish the data channel to begin - the output symbol **(O)** of a module or - for a branch - any position on any data channel. The mouse pointer then changes into a **branch symbol**.
- Draw the new data channel by moving the mouse. While creating each segment, you can only lengthen or shorten each one **either vertically or horizontally**. (You need not move the mouse pointer exactly along the future track of the channel but you may move it sideways, too.)
- Click the **left** mouse button **again** you freeze the length of the data channel segment you have just created and **switch** over to the other **axis** (horizontal or vertical) for the next segment.
- When the data channel hits a module, you must guide it around it.
- When the tip of the new data channel is level with the input symbol of the module where you want it to terminate, just **click** that **input symbol** to complete the data channel connection.
- To **undo** the **last segment**, click the **right** mouse button **once**.
- To **cancel** the process, **double-click** the **left** mouse button **anywhere.**

To create a branch:

- If the output of a module is to provide data for **more than one** input and/or module, simply create a branch. Click the **left** mouse button **once anywhere** on the data channel where you want the additional channel to branch off. Create the additional connection to the other module input as described above.

Related topics:
Deleting data channels
Rearranging data channels
Autorouter

Rearranging Data Channels or Branches

To rearrange a data channel ...

- ... you must first **delete** the data channel (click the channel **twice** with the **right** mouse button) and then **create** it again on a different track.
  Note that the deletion of a data channel segment may affect further segments and/or branches, which would then be deleted as well.

Related topics:
Creating data channels
Deleting data channels

To rearrange a junction point on a data channel ...

- Click the **left** mouse button **once** at the junction point which you want to move. The mouse pointer then changes into a **branch symbol**.
- **Drag** the small box which now represents the junction point to its new position on the data channel.
- Confirm the new position by **clicking** the **left** mouse button **again**. All the data channels concerned will be rearranged automatically.
- Note that you can only drag the junction point **either vertically or horizontally** along a data channel. If you want to move it around a corner you must first position it right at that corner and then move it on in the other direction in a second step.

Autorouter

Deleting Data Channels or Segments

- The quick way: **two** separate clicks (not a double-click!) with the **right** mouse button on the data channel to be deleted:
  - At the **first** click, the section which is to be deleted will **change** its **color**.
  - At the **second** click it will be **deleted**.
  - To **cancel** the process, click anywhere else on the screen but **not on the same section** for the second time. The data channel will then resume its previous color.
- **or:**
  - **Double-click** the **right** mouse button on the **end** of the connection (i.e. the **input symbol** of the second module).
  - **Confirm** the deletion in the dialog box which appears automatically, or choose **Cancel.**
  - If you **accidentally** double-click the **beginning** of the connection (i.e. the **output symbol** of the first module), you will be asked to confirm the deletion of that **module** (instead of the data channel). Click the **Cancel** button in the dialog box.
- To delete **all** the input and/or output channels of a module:
  - **Double-click** the **right** mouse button on the **module symbol.** In the dialog box, click the desired option, or choose **Cancel.**
- **Please note** that any confirmed deletion will always be executed in compliance with the other elements of the worksheet. This means that if, for example, you delete a channel section which divides up into branches in its further course, all those **further branches will be deleted, too**.

Related topics:
Creating data channels
Rearranging data channels
Autorouter

How to Start/Stop an Experiment

These Help pages contain

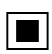
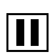
- some basic information on the options provided by **DASY*Lab*** to control an experiment or data acquisition process;
- then, an overview of the **manual control** options;
- at last, a survey of the wide range of possibilities for how to control an experiment **automatically.**

Please click the underlined terms for further information on them.

With **DASY*Lab*,** you can control your data acquisition procedures in various ways.

- Besides **starting** and completely **stopping** an experiment you can also **interrupt** it temporarily and later **resume** it at the same point.
  - As soon as you **pause** an experiment, the acquisition of **new data** is stopped (for example, by **Generator, A/D** or **Digital Input, PID** or **Manual Control** modules). The data which have been acquired up to that moment will, however, be retained and processed completely.
  - The acquisition of **new** data is resumed when the interrupted experiment is **continued.**
- There are four different methods of controlling an experiment. You can choose any of the first three methods according to your individual preferences:
  - Choose the commands from the Experiment **menu** using your mouse or your keyboard: click the menu item, or press the `ALT`, `X` keys, then type the letter that is underlined in the item name.
  - Click the **icons** on the function bar. All these icons symbolize **menu commands,** and clicking one of them has the same effect as choosing the corresponding menu command.
  - Use **keyboard shortcuts.** If available, these shortcut-key combinations are listed to the right of the menu item. Instead of opening the menu and choosing that command, you simply press the key combination.
  - You can also configure the experiment setup (the worksheet) and/or your computer so that the experiment will be started and stopped **automatically.**

  The following table sums up the correspondences between the three **manual** control methods:

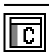
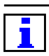
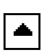
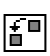
function	**Experiment** menu command	icon	shortcut
start	Start		`F5`
stop	Stop		`CTRL+F5`
pause	Pause		`CTRL+F6`
resume	Pause		`CTRL+F6`

- Please click the underlined term to obtain a survey of the options provided by **DASY*Lab*** to control an experiment or data acquisition process automatically.

Help Index
Main Menu Options

Function Bar Configuration

The following table lists all the **icons** provided on the function bar and the **menu commands** they represent. Click the menu command for further information.

Icon	Command	Menu	Function
	Start	**Experiment**	start experiment
	√ Pause	**Experiment**	pause experiment
	Pause	**Experiment**	resume experiment
	Stop	**Experiment**	stop experiment
	Experiment Setup	**Experiment**	set general experiment parameters (dialog box)
	Hardware Setup	**Experiment**	set hardware-specific parameters (dialog box)
	New	**File**	clear work area to create a new worksheet
	Open...	**File**	open worksheet file
	Save	**File**	save worksheet to file
	File Info...	**File**	open File Info dialog box
	Worksheet to Clipboard	**Edit**	copy worksheet to Windows clipboard
	Hide	**View**	display control panel only, hide worksheet
	Hide Display Windows	**View**	minimize **all** the display windows (reduce to icons)
	Show Display Windows	**View**	activate **all** the display windows
	To Preceding Black Box Level	**Edit**	leave the current **Black Box,** return to preceding worksheet level (or to the Main Chart) (To **enter** a Black Box, double-click the module on the worksheet.)
(list)	Select Window Arrangement	**View**	re-arrange display windows in one of the ways you have saved before
	Save Window Arrangement	**View**	save current **sizes** and **positions** of all the display windows
	Delete current Window Arrangement	**View**	delete current arrangement from list

Help Index

Creating your First Worksheet

By following this tutorial, you will create a simple worksheet and find out about the basic elements and functions of **DASY*Lab*.**

If you prefer to follow these instructions in written form, please refer to chapter 2 of your **DASY*Lab*** Owner's Manual

To follow the steps described in these instructions on screen, we recommend clicking the question mark on the menu bar of this **Help** window to choose **Always on Top.** The instructions in the **Help** window will then remain visible on the screen while you perform the steps in the **DASY*Lab*** window. Do not forget, however, that you must make the **DASY*Lab*** window or the **Help** window **active** (by clicking anywhere in them) before you can perform any activity in them.

To avoid too many elements of the **DASY*Lab*** window being hidden by the **Help** window, please maximize the **DASY*Lab*** window, resize the **Help** window to about a quarter of the screen size, and drag it to the lower right corner of the screen.

> To **scroll** through these instructions, use the scroll bars at the sides of the **Help** window, or press the , ↓, `PgUp` and `PgDn` keys on your keyboard. (If you wish to use your keyboard, do not forget to **select** the **Help** window first.)

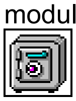
> Click on a term with a **dotted underline** to obtain further information on that term. To remove the information box and return to the tutorial, click anywhere, or press any button on your keyboard.

> Click on an **underlined** term to obtain further information on that item (usually a menu command). To return to the tutorial, click the **Back** button at the top of the **Help** window, or press the `B` key on your keyboard.

1. On the left-hand side of the **DASY*Lab*** screen you can see the Module Bar. It displays a selection of icons which represent modules frequently used in worksheets.

Place the mouse pointer on the **module bar icon** shown here. It represents a Generator module.
Click this icon with the **left** mouse button.

(The name of the module the mouse pointer is pointing at is displayed in a small window above the module icons.)

2. 

In the same way, choose the Y/t Chart module by clicking its icon on the module bar with the **left** mouse button.

You have now integrated these two modules into your worksheet; their symbols appear on the worksheet.

The modules can be **installed** either by clicking the corresponding icons on the module bar, or by choosing them from the Modules menu. While the module bar can only offer a **limited selection of icons**, the **Module** menu provides the **complete list of available modules.**

When you install a module from the **Display** group (for example, a **Y/t Chart** module), an additional **icon** may appear at the bottom of the screen (see below, step **5**).

3. The modules on the worksheet must now be connected by data channels so that data can be transferred between them.
To connect them most conveniently, move the mouse pointer to the **Y/t Chart** module symbol, press the left mouse button, and **drag** the module symbol against the **Generator** module symbol (mouse button still pressed down) until their output **(O)** and input symbols **(I)** touch. When you release the mouse button, **DASY*Lab*** will automatically connect the two modules and auto-route the wires.
(Of course, you can also connect two modules without moving the module symbols - you'll do that in a few minutes.)
The **data channel** is completed now, the output of the first module is connected to the input of the second. The experiment can begin!

4. At the top of the **DASY*Lab*** screen, below the main menu bar, you can see the function bar. It contains

icons which provide fast access to several functions which you will frequently use in your experiments. (When the mouse pointer is pointing at a Function Bar icon, a **QuickInfo** tag with the name of that function will appear.) Just click the icon representing that function.

With the **left** mouse button, click this icon on the function bar - the first one on the left.

This will start the experiment, and soon the **Generator** module will generate a **signal.** (Pressing `F5` has the same effect.)

5. The signals and results of measuring processes can be displayed graphically by means of the modules from the **Display** group. They consist of **two elements** each: the **worksheet symbol,** which is integrated into the worksheet and connected to the other modules by data channels, and the actual Display Window, which appears minimized as an **icon** at the bottom of the computer screen, and which you must separately **restore** (or "open") whenever you wish to make use of that function during an experiment.

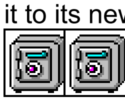
   Open the **Y/t Chart Display Window** using the **left** mouse button:

   - either by clicking this **function bar icon** (it represents the Show Display Windows command from the **View** menu),
   - or by double-clicking the **display window icon** at the bottom of the desktop.

   The Y/t Chart Display Window appears, and you can now observe the signal generated by the **Generator** module as it is shown on that display.

   Before you perform the next steps, please drag the **Y/t Chart Display Window** to a position above this **Help** window, so that it does not hide any elements of your worksheet. It may be necessary to adjust its height first. (You can drag a window by clicking its title bar with the **left** mouse button and moving it to its new location with the mouse button pressed down.)

6.  By alternately clicking these two function bar icons with the **left** mouse button you pause the running experiment and resume it at the same stage at which you interrupted it. (Pressing `CTRL+F6` on your keyboard has the same effects.)

7. If you click the **right** mouse button on the **Y/t Chart Display Window screen,** the **Color dialog box** appears. Select a new color for the display background by clicking any of the colors on the palette; then click **OK.**

8.  Now stop the experiment. You can either click this icon on the function bar or press `CTRL+F5` on your keyboard.

9. Perhaps you cannot see the **Y/t Chart module symbol** (on the worksheet) any more because it is hidden behind the **display window.** In that case, drag that window aside a little (see step **5**), or **reduce** it to an icon by clicking the **Minimize** button (the down arrow in the upper right-hand corner of the display window).

10. Using the **right** mouse button, **double-click** on the **Y/t Chart module symbol** (on the worksheet). In the dialog box which opens then, select **Delete Module** and press **OK:** The **Y/t Chart** module will be **deleted** from your worksheet.

11.  Now add the Bar Graph module to your worksheet by clicking its icon on the module bar with the **left** mouse button. The **module symbol** appears on the worksheet, and the **icon** representing the corresponding **display window** appears on the lower edge of the desktop.

12. Connect the input of the **Bar Graph module symbol** with the output of the **Generator** module symbol as described above (see step **3**).

Open the **Bar Graph Display Window** either by clicking this **function bar icon** or by double-clicking the display window **icon** at the bottom of the desktop.

Start the experiment again now, and observe the **Generator** signal as it is displayed in the **Bar Graph Display Window.**

13. Stop the experiment then, and

click the module bar **icon** representing the Digital Meter module. The **module symbol** appears on the worksheet next to the **Bar Graph** module symbol,

and the corresponding **display window icon** appears at the bottom of the desktop.

14. **Move** the **Digital Meter module symbol** about on the worksheet by clicking it with the **left** mouse button and dragging it, with the mouse button pressed down, to various locations, for example below the **Bar Graph module symbol.** **DASY*Lab*** will automatically arrange the blocks evenly according to the **grid** settings defined in the Window Setup dialog box from the Options menu.

15. The quickest way to connect the **Digital Meter** module to the **Generator** module is to "tap" the already existing data channel between the **Generator** module and the **Bar Graph** module. To create that branch, move the mouse pointer and click anywhere on the data channel between these two module symbols with the **left** mouse button. The mouse pointer now changes shape to a hand holding a plug. Place the tip of the plug precisely onto the input symbol **(I)** of the **Digital Meter module symbol,** and click the **left** mouse button again. This establishes the connection, and **DASY*Lab***'s integrated Autorouter function automatically finds the correct path for the new data channel segment.

You can now start, pause, and resume the experiment, open the **Digital Meter Display Window** by double-clicking its **icon** at the bottom of the screen, and you can change the color of that display as described above (see step **7**).

16. The default wave form generated by channel 0 of the **Generator** module is a square wave signal. **Double-click** on the **Generator module symbol** with the **left** mouse button now. A **dialog box** appears, allowing you to define the signal to be generated. **Chapter 5** of your **DASY*Lab*** Owner's Manual will provide you with further information on these parameters.
For a start, try clicking on the **Sine** button in the Wave Form box, then choose the **OK** button. The **Display** modules will show the new signal type you have selected.

17. The **Y/t Chart** module would come in handy now. It gives a much better visualization of a sine wave than the digital meter. Unfortunately, we deleted it from the worksheet! To re-install it, just click the **module bar icon** again (see step **2**). Does **DASY*Lab*** refuse to react to your mouse clicks? Well, maybe your **experiment** is still running. You must always **stop** an experiment before making any changes in the experiment setup, such as adding modules or changing sample rates.

Create another data channel **branch** (see step **15**) to connect the **Y/t Chart** module symbol,

then start the experiment again.

18. You should **save** your first worksheet now, so that you can use it to try out some more of **DASY*Lab's*** options later on.

First, stop the current experiment,

then click this function bar icon with the **left** mouse button. It represents the Save command from the **File** menu.

A dialog box appears. In it, the **File Name** box displays a list of **demo worksheet** files that were copied to the **DASY*Lab*** directory during the setup procedure. These ready-to-run worksheets may give you an idea of the wide range of measuring and data acquisition tasks that can be solved by **DASY*Lab*.** You can open, run, modify and re-run them all later. Their File Info box contains a description.

Now type a file name of your choice (using no more than eight characters) in the **File Name** box above the mentioned list box; for example, type TUTOR1. Choose the **OK** button, and your first worksheet will be saved as TUTOR1.DSB in the **DASY*Lab*** default directory. (**DASY*Lab*** automatically adds its standard extension **∗.DSB**.) The **DASY*Lab*** window **title bar** now shows the new file name.

19.  If you want to **open** this (or any other) worksheet file later, click this **icon** on the **function bar** with the **left** mouse button. This icon is a shortcut to the Open command from the **File** menu.

Congratulations! You have successfully finished the **DASY*Lab*** Basics lesson and are now ready to begin working with **DASY*Lab!***

The next time you have a question or need help, you can

- repeat this tutorial;
- read these instructions, or part of them, in chapter 2 of the Owner's Manual;
- find the answers in other relevant chapters of the **DASY*Lab*** documentation;
- use online Help. You will usually obtain online help by pressing the `F1` function key whenever you need help; or use the **Search** function in the **Help** window.

20. Unless you prefer to keep on experimenting with **DASY*Lab*** right away, exit the program now by **double-clicking** the **Control-menu box** in the upper-left corner of the **DASY*Lab*** window, or by pressing `ALT+F4` on your keyboard.

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Customizing the DASY*Lab* Screen

While you are working on your **DASY*Lab*** worksheet, it is displayed in its **normal size** on the screen. The modules with their input and output symbols, the instruments and the data channels are easy to distinguish and can be arranged easily.

There is much more space at your disposal than is displayed on the screen:

- You can **drag** any module to any position on the **entire** worksheet. Click it **once** with the **left** mouse button, then move it with the mouse button pressed down. If you touch the window frame, the window will automatically move on across the worksheet in that direction.
- You can move the window all over the actual worksheet by using the scroll bars.

How to display more of your worksheet:

> Remove the **function bar** and/or the **module bar** from the **DASY*Lab*** window. Choose these options from the **View** menu, or press `ALT`, `V`, `F` or `ALT`, `V`, `M`.

> To view the **complete worksheet** in a separate window, choose the Overview option from the **View** menu, or click the corresponding icon in the function bar. However, you **cannot edit or change** it there. The scale of the additional display is automatically adapted to the size of the worksheet to be presented.

> Enlarge the window to its maximum size:
Click the **Maximize** button in the upper right-hand corner of the **DASY*Lab*** window, or choose **Maximize** from the Windows **Control** menu. The worksheet will be displayed so that it covers the full computer screen. Other Windows applications like the Program Manager will then run in the background.
After you enlarge the window, the **Maximize** button is replaced by the **Restore** button (which contains both an up arrow and a down arrow). Clicking the **Restore** button returns the window to its previous size.

How to change the appearance of the worksheet:

> To change the **appearance** of the **DASY*Lab*** worksheet (grid, type of grid, spacing), choose the Window Setup option from the **Options** menu.

> To change the **colors** of the **DASY*Lab*** worksheet, choose the Colors option from the **Options** menu.

> To change the colors of the **DASY*Lab*** window frame, menu bar etc., choose the **Color** option from the Windows **Control Panel.**

How to reduce the screen to the elements most essential for an experiment:

> Choose the **Hide** function from the **View** menu, or click the corresponding icon on the function bar, to reduce the **DASY*Lab*** window containing the worksheet to its minimum size (but **not** to an icon!).
In its place, a minimized **control window** appears which contains only the status bar (displaying the current time and the buffer status) and the control icons from the function bar, which allow you to **start, stop, pause** and **continue** the experiment.
In addition to the control window, only those **display windows** (**analog/digital meters**, **Y/t Charts** etc.) are displayed on screen which have been **activated.**
This option allows you to concentrate on those elements which are essential for the control and evaluation of the actual experiment.

> You can **restore the previous window size** by clicking the **Restore Size** arrow in the upper right-hand corner of the control panel.

> Please note that the effect of clicking this arrow may differ from the effect in many other Windows applications: The control window is not necessarily enlarged to full screen size, but only to the size the worksheet window was when the **Hide** function was chosen.

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Customizing the Display Windows

General Remarks

When installed into a worksheet, the modules from the Display group - unlike all other modules - consist of **two** elements each:

- the **worksheet symbol,** which is integrated into the worksheet and connected to the other modules by data channels,
- and the actual **display window,** which appears minimized as an **icon** at the bottom of the screen first, and which you must **restore** (or "open") whenever you wish to make use of that function during an experiment.

Opening the Display Windows

- You can **open each** of the display windows contained in your worksheet **individually** by double-clicking its **icon** at the bottom of the computer screen.
- You can **open all** the display windows contained in your worksheet **simultaneously** by choosing **Show Display Windows** from the **View** menu, or by clicking the corresponding function bar icon.

Minimizing the Display Windows

- You can **minimize each** of the display windows **individually** by clicking its **Minimize** button (in the upper right-hand corner of the display window).
- You can **minimize all** the display windows contained in your worksheet **simultaneously** by choosing **Hide Display Windows** from the **View** menu, or by clicking the corresponding function bar icon.

Hide Display Windows

Arrangement of the Display Windows

While observing an experiment, with data being displayed on several instruments, you may find it useful to save certain arrangements of these display windows (i.e. their sizes and positions on the screen). You can then easily restore any of these arrangements when it seems most suitable, and you can even switch between various window setups to compare different display modes.
For these purposes, **DASY*Lab*** provides the following menu commands and function bar icons:

Save Window Arrangement

Select Window Arrangement

Delete current Window Arrangement

Help Index

DASY*Lab* by Keyboard

Although most Windows applications are designed with mouse operation in mind, using the keyboard may be more convenient under certain circumstances. Several operations in **DASY*Lab*** can be carried out both ways, so that users can decide for themselves which way to choose. The following lines contain a survey of possible keyboard operations in **DASY*Lab***.

- As usual, **menu commands** can of course be chosen by pressing `ALT` (to move to the menu bar), then typing the underlined letter in the menu name (to open the menu), and then typing the underlined letter in the menu command.
- For some menu commands which you will frequently use, **keyboard shortcuts** are provided. Instead of opening the menu and choosing the command, simply press the key combination. These keys are listed to the right of the corresponding menu item. The online help pages will refer to them as well.

  For a list of these commands and their shortcut-key combinations, please press the `TAB` or the `SHIFT+TAB` keys now to highlight the underlined topics, and press the `ENTER` key to display a list.

  Experiment menu commands:

  How to Start/Stop an Experiment

  View menu commands:

  Save Window Arrangement

  Select Window Arrangement

  Delete current Window Arrangement

- **Module Manipulation** by Keyboard

  The modules on the worksheet can be manipulated in various ways. The module symbols on the worksheet can be dragged about, connected by data channels, configured, or deleted. The last two of these manipulations can also be performed by means of the keyboard.

  Before you can manipulate a module, you must **select** it.

  Only **one** module on the worksheet is selected at a time and can be manipulated as described. It can be identified among the module symbols on the worksheet by the inverse coloring of its title bar, on which the module name is displayed.

  - To **select** a module, either click it once with the left mouse button, or press the `TAB` key on your keyboard until that module is selected.
  - When you press the `ALT+ENTER` keys, the **module configuration** dialog box appears.
    Press the `TAB` or the `SHIFT+TAB` keys to move from one field or button to another; select items by pressing the arrow keys, the `SPACE` and the `ENTER` key.
    (Note: Channel Selection is only possible by mouse operation.)
  - To copy settings entered for the selected channel to the other activated channels, use the F7/F8 Function Keys. This procedure can **only** be performed by means of keyboard operation.
  - To **delete** the selected **module** from the worksheet, or to delete **all** the input and/or output **channels** of that module, press the `DEL` key. In the dialog box appearing then, select the desired option, or choose **Cancel**, and press `ENTER`.

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File Menu Commands

The commands of the **File** menu enable you to save, open, and print worksheets, to manage your worksheet files, and to exit the program.

Some of these functions can also be chosen by clicking the corresponding **icons in the** function bar.

New

Open...

Save

Save As...

File Info...

Print...

Printer Setup...

Page Format...

Exit

Main Menu Options

New

File menu command: **New**

Choose this command to create a **new** worksheet. The **DASY*Lab*** work area will be cleared completely.

If there is already a worksheet on the screen which you have changed since you last saved it, you will be asked to

- save that worksheet before beginning work on the new one,
- **or** to reject those changes,
- **or** to recall the **New** command.

After creating the **new worksheet** you can save it to a file by selecting the Save or the Save As... commands from the **File** menu.
Click on the **Save** icon in the function bar to save the current file.

> To open a worksheet that has been previously saved to a file, select the Open... command from the **File** menu, or click the **Open** icon in the function bar.

File Menu Commands

Open...

File menu command: **Open...**

Choose the **Open** command, or click the function bar icon, to **open** a worksheet that has been previously saved. The **DASY*Lab*** work area will be cleared completely.

If there is already a worksheet on the screen which you have changed since you last saved it, you will be asked to

- save that worksheet before beginning work on the new one,
- **or** to reject those changes,
- **or** to recall the **Open Worksheet** command.

After choosing the **Open** command you can select the file on which you want to resume work from a list of files.

You can ...

- open one of the files from the list **directly** by **double-clicking** the file name),
- select a different directory by double-clicking the directory name,
- select a different file format for the file display, or
- select a different drive.

(To use your keyboard, press the `TAB` or the `SHIFT+TAB` keys to move from one field to another; select items from the lists by pressing , ↓, `SPACE` and the `ENTER` key.)

In the **File Name** box you can define the filter for the file list. The default setting for the filter (**∗.DSB**) will create a list of **DASY*Lab*** worksheet files, which usually have the extension **∗.DSB**.
Type a different extension, or use wildcards (like ∗.∗), to get lists of different groups of files. For example, if you have saved **DASY*Lab*** worksheets with **extensions** other than **∗.DSB** (using the Save As... command from the **File** menu).
However, **DASY*Lab*** can only open files in its own **DSB format**, no matter what extension the files have.

Note: If password protection is active, you will first be asked to enter the password before the file is actually opened (unless you have already entered it before). Without the correct password, the file cannot be opened.

When you save a worksheet, the current module bar configuration is saved with it. This implies that when you open a worksheet file, its module bar configuration will replace the current one on your screen. If you prefer to retain the current configuration, disable the Replace Module Bar option (**Options** menu).

> You can specify a default directory for **DASY*Lab*** worksheet files (**Options** menu command).

> To create a **new** worksheet, select the New command from the **File** menu, or click the **New** icon in the function bar.

File Menu Commands

Save...

File menu command: **Save...**

Choose the **Save** command, or click the function bar icon, to save a worksheet.

> Click here for a list of the settings and parameters that will be saved together with the worksheet.

1. If you have created a **new worksheet** (command New from the **File** menu) **without saving it** to a file (**untitled** is displayed in the **DASY*Lab*** window title bar), you can select the file name, the directory and the disk drive where the file is to be stored:
   - Type the **file name** in the **File Name** box. (Note that the file name must be chosen in accordance with MS DOS conventions.)
   - If you do not type an extension, **DASY*Lab*** will **automatically** add the **standard extension** (**∗.DSB**). **DASY*Lab*** always saves worksheet files in its own format, even if you select an extension other than **∗.DSB**.
   - You can ...
     - select one of the file names in the list by **double-clicking** the file name. The file which was originally saved under that name will then be **replaced** with the new worksheet. A warning message will first appear, asking you to either confirm the procedure or to cancel it.
     - select a different directory by double-clicking the directory name, or
     - select a different drive for the new file.
     - In the **List Files of Type** box you can select the type of files (defined by their extension) to be listed.

   (To use your keyboard, press the `TAB` or the `SHIFT+TAB` keys to move from one field to another; select items from the lists by pressing , ↓, `SPACE` and the `ENTER` key.)

2. If you have **previously saved** the new worksheet to a file (using the Save As... or Save commands from the **File** menu), or if you have **opened an existing file** (command Open... from the **File** menu), its name is displayed in the **DASY*Lab*** window title bar.
   Selecting the **Save** command, or click the function bar icon, to save the current worksheet. The existing file will be replaced **without further messages**.

> You can specify a default directory for **DASY*Lab*** worksheet files (**Options** menu command).

> To save the worksheet with a **new** file name, select the Save As... command from the **File** menu.

> If password protection is active (from the **Options** menu), the worksheet will be protected by a specified password. If the password has not yet been defined , the user is prompted for its definition when the worksheet is saved.

File Menu Commands

Save As...

File menu command: **Save As...**

Choose the **Save As** command to save a worksheet with a **new file name**, in a different directory, or on a different drive.

> Click here for a list of the settings and parameters that will be saved together with the worksheet.

After you have chosen the **Save As...** command from the **File** menu you can select the file name, the directory and the disk drive where the file is to be stored.

- Type the **file name** in the **File Name** box. (Note that the file name must be chosen in accordance with MS DOS conventions.)
- If you do not type an extension, **DASY*Lab*** will **automatically** add the **standard extension** (**∗.DSB**). (**DASY*Lab*** always saves worksheet files in its own format, even if you select an extension other than **∗.DSB**.)
- You can ...
  - select one of the file names in the list by **double-clicking** the file name. The file which was originally saved under that name will then be **replaced** with the new worksheet. A warning message will first appear, asking you to either confirm the procedure or to cancel it.
  - select a different directory by double-clicking the directory name, or
  - select a different drive for the new file.
  - In the **List Files of Type** box you can select the type of files (defined by their extension) to be listed.

  (To use your keyboard, press the `TAB` or the `SHIFT+TAB` keys to move from one field to another; select items from the lists by pressing , ↓, `SPACE` and the `ENTER` key.)

> You can specify a default directory for **DASY*Lab*** worksheet files (**Options** menu command).

> To save the worksheet under its **current** file name, use the Save command from the **File** menu.
> To quickly save the current file, click the **Save** icon on the function bar .

> If password protection is active (from the **Options** menu), the worksheet will be protected by a specified password. If the password has not yet been defined, the user is prompted for its definition when the worksheet is saved.

File Menu Commands

Settings Saved in Worksheet Files

The following settings will be **saved together with the** worksheet when you choose the Save or the Save As... commands from the File menu:

- the current Module Bar configuration;
- all of the entries in the File Info... dialog box;
- all of the entries in the Page Format... dialog box;
- the settings concerning the Display Save Window Arrangement.

The following settings will **not** be **saved together with the worksheet:**

- the settings regarding the Start/Stop at Time functions;
- the settings regarding the Auto Start function;
- the View menu settings concerning the display of the Module Bar and the Function Bar and the Animation function;
- the Options menu settings (**Window Setup, Colors,** the **Autorouter** function).

File Menu Commands

File Info...

File menu command: **File Info...**

Choose the File Info command, or click the function bar icon, to display, enter, or modify information about the current worksheet .

- **DASY*Lab*** provides the following information automatically. (These fields cannot be modified by the user.)

field	information
Worksheet	the file name of the current worksheet (extension ∗**.DSB**)
Created	the date and time when the worksheet was created
Modified	the date and time when the worksheet was last saved to file

- You can add the following information:

field	information (and maximum number of characters)
Author, Company, Department	your name, company, and department (up to 50 characters each)
Title	a descriptive title of the worksheet (80)
Worksheet Info Text	additional informative text (4000)

  To begin a new line in the **Worksheet Info Text** field, press `CTRL+ENTER`.

  To move from one field to the other, use the mouse, or press the `TAB` or `SHIFT+TAB` keys.

- Click on the **Clipboard** button to copy all of the information displayed to the Windows Clipboard.

All the **File Info** entries are saved with the worksheet when you choose Save or Save as... from the **File** menu.

The **Author**, **Company**, and **Department** information will also be stored in the DASYLAB.INI file. When you create a new worksheet **DASY*Lab*** will provide this information as the default.

When you print a worksheet or the display of a module from the Display module group, you can include the information about **Author**, **Company**, **Department**, **Title**, and the **Worksheet** file name. Choose Page Format from the **File** menu to select the information you wish to include.

File Menu Commands

Print...

File menu command: **Print...**

Choose the **Print** command, or click the icon in the function bar, to print a worksheet.

> Choose Page Format from the **File** menu to select additional information about the worksheet that can be included in the printing, and to specify the page layout and page frames.

> Choose Printer Setup from the **File** menu to select paper size and paper source, orientation, printer resolution, and other specific settings for your active printer model.

> To activate a different printer model connected to your system, or to install and configure a new printer, choose the **Printers** option in the Windows Control Panel. Please refer to your Windows documentation for further information.

File Menu Commands

Printer Setup...

File menu command: **Printer Setup...**

Choose the **Printer Setup** command to select paper size and paper source, orientation, printer resolution, and other specific settings for your **active** printer model.

The options vary, depending on the printer you are using.

- Change the specifications as needed.
- To set options specific to your printer driver, choose the **Options** button, set the options as needed, and then choose the **OK** button.
- For information about the printer-driver options, choose the **Help** button or press `F1` while using the dialog box.
- Choose the **OK** button.

> Choose Page Format from the **File** menu to select additional information about the worksheet that can be included in the printing, and to specify the page layout and page frames.

> To activate a different printer model connected to your system, or to install and configure a new printer, choose the Printers option in the Windows Control Panel. Please refer to your Windows documentation for further information.

File Menu Commands

Page Format...

File menu command: **Page Format...**

Choose the Page Format command to **format your printing** from **DASY*Lab*.**

The settings selected affect the following print commands:

what is to be printed?	**source** module	**Print command** from module menu ...
worksheet	(work area)	**File (Main Menu Option)**
Y/t chart	Y/t Chart	**Display**
X/Y chart	X/Y Chart	**Display**
diagram	Chart Recorder	**Display**
list of values	List Display	**Edit**

You can select **additional information** to include in the printout, and you can specify the **page layout** and **page frames.**

The upper part of this dialog box mirrors the basic layout of the printed page.

- **Viewport**
  The actual information or display which is to be printed is indicated in the center of this area. Depending on the source module from which the printing will be activated, the worksheet, the graphic display, or the list of values will be positioned here.

  The final **size** of this area on the printed page is defined by the **paper size minus** the paper **frames** selected **minus** the space required for the **additional information** selected.
  The actual display will occupy the **complete page** if you select **no additional information;** the more information you select, the smaller the space remaining for the actual display.
- **Additional Information**
  - In the text box and the check boxes **above** the **Viewport** area you can select the information which will be printed above the actual display **at the top of the page.**
  - In the text box and the check boxes **below** the **Viewport** area you can select the information which will be printed below the actual display **at the bottom of the page.**

  You can enter **one text line** of up to **80** characters in each of the two text boxes.

  Select information already entered and saved elsewhere:
  - The **Experiment Title**, **Author**, **Company**, and **Department** will be printed as entered in the corresponding text boxes of the File Info dialog box from the **File** menu. (In the printout, the information about **Author**, **Company**, and **Department** will be separated by commas.)
  - The date and the time **of the printing** will be printed at the position indicated by the **Date/Time** check box.
  - The **Worksheet Name** to be printed is the file name of the current worksheet.
  - When you select **Description**, ...
    - the worksheet file name will be printed again when you print the **worksheet** itself. The **Worksheet Info Text** from the File Info dialog box will not be included in the printout.
    - When you wish to print a **graphic display** or a **list of values,** the module description printed will be the Description text box of the source module's configuration dialog box. This dialog box appears when you double-click that module symbol on the worksheet.
- **Page Frame**
  Set the margins for the printed page. These are the distances between the paper edge and the printed area of the paper. The measurement system is always centimeters. The default settings are 2.54 cm (one inch) or the values last saved with a worksheet.
- **Printer...**
  Click this button to select paper size and paper source, orientation, printer resolution, and other specific settings for your **active** printer model. (This function is the same as the Printer Setup command from the **File** menu.)

To move from one field to the other, either use your mouse, or press the `TAB` or `SHIFT+TAB` keys.

Choose **OK** to confirm all your selections and to close the dialog box.

- All the **Page Format** entries will be saved with the worksheet when you choose Save or Save as... from the **File** menu.
- To start printing, choose one of the commands listed in the table at the beginning of this **Help** window.
- Choose Printer Setup from the **File** menu to select paper size and paper source, orientation, printer resolution, and similar specific settings for your active printer model.
- To activate a different printer model connected to your system, or to install and configure a new printer, choose the Printers option in the Windows Control Panel. Please refer to your Windows documentation for further information.

File Menu Commands

Exit

File menu command: **Exit**

The **Exit** command closes **DASY*Lab*.**

The following session settings are saved when your **DASY*Lab*** session ends.

- Size and position of the **DASY*Lab*** window on your screen;
- the Module Bar configuration;
- the **Author**, **Company**, and **Department** information from the File Info dialog box (**File** menu);
- the Autostart option (**Experiment** menu);
- the Animation option (**View** menu);
- the display settings of the Module Bar and the Function Bar (**View** menu);
- the Window Setup (**Options** menu);
- the Color settings (**Options** menu);
- the Autorouter option (**Options** menu);
- the Password Protection option (**Options** menu).

If there is a worksheet on the screen which you have changed since you last saved it, you will be asked:

- to either save that worksheet now before exiting **DASY*Lab*,**
- **or** to reject those changes,
- **or** to recall the **Exit** command.

You can also exit **DASY*Lab*** by double-clicking the system control button in the upper left hand corner of the **DASY*Lab*** window, or by pressing `ALT+F4`.

File Menu Commands

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Edit Menu Commands

The commands of the **Edit** menu allow you to copy the **DASY*Lab*** worksheet displayed on the screen to the Windows Clipboard and to configure the Module Bar according to your specific requirements. It also provides the functions necessary to organize **Black Box** files.

Worksheet to Clipboard

Black Box Module

Module Bar

Main Menu Options

Worksheet to Clipboard

Edit Menu Command: **Worksheet to Clipboard**

Select this command, or click the icon in the Function Bar, to **create** a Windows Metafile image (WMF/CLP) of the **DASY*Lab*** worksheet on the Windows Clipboard.

The worksheet is always copied to the Clipboard as displayed on screen, including all the changes made since last saving it.
The worksheet **background** is **not copied,** however, even if you have selected a color and a grid. For further information on these options, see Customizing the **DASY*Lab*** Screen.
The worksheet itself remains unchanged if you copy it to the Clipboard.

The image on the Clipboard is automatically **scaled** to the size of the worksheet on the **DASY*Lab*** worksheet. If the worksheet consists of only a few modules these will appear larger on the Clipboard than if you have arranged a large number of modules all over the virtual worksheet.

Use the **Paste** function provided in any Windows application (usually in the **Edit** menu), to transfer the metafile from the Clipboard to applications such as PaintBrush or Word for Windows for further use.

Edit Menu Commands

Module Bar

Edit Menu Command: **Module Bar**

The Module Bar, on the left hand side of the **DASY*Lab*** window, displays a selection of frequently used modules. The menu commands provide the functions to modify the module bar for your requirements:

New:	provides a blank module bar to be configured.
Open...:	opens a saved module bar.
Save As...:	saves the current module bar configuration to a file with the name of your choice.
Default:	opens the default module bar.

Edit Menu Commands
Main Menu Options

New Module Bar

Edit Menu Command: **Module Bar, New**

Choose this command to create a completely **new** Module Bar. The current module bar will be cleared completely. Then you can assign the module of your choice to each button.

Click on a button in the module bar with the **right** mouse button to assign any module to that button. A dialog box presents a list of all the modules available in **DASY*Lab*.** Scroll through the list using the scroll bar, choose a module by clicking it with the **left** mouse button, and choose **OK** to confirm your choice. The module bar button now displays the icon of the module assigned to it.
When you have customized your module bar, all you have to do to add one of those modules to your worksheet is to click the icon which symbolizes that module with the **left** mouse button.

The modified module bar settings will be automatically saved when you exit the program. The next time you start **DASY*Lab***, you will find the same module bar.
To save a configuration permanently, or to configure several module bars specially adapted for individual experiment tasks, you must save them to files and open them again later.

Choose these commands from the **Edit / Module Bar** menu:

> Open... to open a saved module bar configuration.

> Default to open the default module bar configuration.

Edit / Module Bar Menu Commands
Edit Menu Commands

Open Module Bar...

Edit Menu Command: **Module Bar, Open**

Choose this command to **open** a Module Bar that has been saved to a file.

You can select the module bar file from a list of files presented in a dialog box.

You can ...

- open one of the files from the list **directly** (**double-click** the file name),
- select a different directory (double-click the directory name),
- select a different file format for the file display, or
- select a different drive.

(If you wish to use your keyboard, press the `TAB` or the `SHIFT+TAB` keys to move from one field to another, select items from the lists by pressing , ↓, `SPACE` and the `ENTER` key.)

In the **File Name** box you can define the filter for the file list to be presented in the box below. The default setting for this filter (**∗.DML**) will create a list of **DASY*Lab*** module bar files, which usually have the extension **∗.DML**.
By typing a different extension here, or by using wildcards (like **∗.∗**), confirmed by pressing the `ENTER` key, you can get lists of different groups of files - for example, if you have saved **DASY*Lab*** module bars with **different extensions** than **∗.DML** (Save As... command from the **Edit / Module Bar** menu).
However, **DASY*Lab*** can only open module bar files in its own **DML** format, no matter what extension the files have.

When you open a module bar file, any modifications of the current module bar on the screen are lost, unless you have saved them (Save As... command from the **Edit / Module Bar** menu).

Whenever you exit the program, the **current** module bar configuration is **automatically** saved to the **DASY*Lab*.DML** file.

> You can specify a default directory for **Module Bar** files (**Options** menu command).

Choose these commands from the **Edit / Module Bar** menu:

> New to provide a blank module bar to be configured individually.

> Save As... to save the current module bar configuration to a file under a name of your choice.

> Default to open the default module bar configuration onto the **DASY*Lab*** screen.

Edit / Module Bar Menu Commands
Edit Menu Commands

Save Module Bar As...

Edit Menu Command: **Module Bar, Save As...**

Choose this command to **save** the current Module Bar configuration on the **DASY*Lab*** screen to a separate **file name.**

You can select the file name, the directory and the disk drive where the file is to be stored.

- Type the **file name** in the **File Name** box. (Note that the file name must be chosen in accordance with MS DOS conventions.)
- If you do not type an extension, **DASY*Lab*** **automatically** adds its **standard extension** for module bar file names (**∗.DML**). (**DASY*Lab*** always saves module bar files in a specific format, even if you select an extension other than **∗.DML**.)
- You can ...
  - select one of the file names presented in the list **directly** (**double-click** the file name). The file will then be **replaced** with the new module bar setup;
  - select a different directory (double-click the directory name), or
  - select a different drive for the new file.
  - In the **List Files of Type** box you can select the type of files (defined by their extension) to be listed in the box above.

  (If you wish to use your keyboard, press the `TAB` or the `SHIFT+TAB` keys to move from one field to another; select items from the lists by pressing , ↓, `SPACE` and the `ENTER` key.)

Whenever you exit the program, the **current** module bar configuration is **automatically** saved to the **DASY*Lab*.DML** file.

> You can specify a default directory for **Module Bar** files (**Options** menu command).

Choose these commands from the **Edit / Module Bar** menu:

> New to provide a blank module bar to be configured.
> Open... to open a saved module bar configuration.
> Default to open the default module bar configuration.

Edit / Module Bar Menu Commands
Edit Menu Commands

Default Module Bar

Edit Menu Command: **Module Bar, Default**

Choose this command to open the **default** Module Bar configuration.

The module bar will be opened immediately. Any modifications of the current module bar on the screen will be lost, unless you have saved them (Save As... command from the **Edit / Module Bar** menu).

The **default module bar** is **not** saved in the **DASY*Lab*.DML** file but is stored internally. Therefore you **cannot change** its setup.

The **DASY*Lab*.DML** file always contains the module bar configuration which was active when you last exited the program.

Choose these commands from the **Edit / Module Bar** menu:

- New to provide a blank module bar to be configured.
- Open... to open a saved module bar configuration.
- Save As... to save the current module bar configuration to a file.

Edit / Module Bar Menu Commands
Edit Menu Commands

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Module Menu

Use this menu to select a **module group.** A module group is made up of a number of different modules providing similar functions. Select a module group to open a submenu with a list of the modules which belong to that group. You can select any of the listed modules by clicking on it. It is immediately placed on the worksheet as a module symbol.

Some of these modules may be installed on the module bar. They may be placed on the worksheet by a single mouse click on the corresponding icon.

The **Module** menu provides the following module groups:

- Input/Output
- Trigger Functions
- Mathematics
- Statistics
- Signal Analysis
- Control
- Display
- Files
- Data Reduction
- Special

Module Installation and Configuration
Special Module Functions and Options

Main Menu Options

Module Group

A **module group** consists of a number of related modules. The Module menu provides all the module groups. Choose a module group from the **Module** menu to open a submenu with a list of the modules which belong to that group. You can select any of the modules listed by clicking on it. It is then immediately placed on the worksheet as a module symbol.

Module

A module represents a **functional element** in the virtual **DASY*Lab*** experiment setup (worksheet). A worksheet can contain **up to 256 modules.** (Additionally, the Black Box concept allows you to exceed that number by as many modules as you want.)

The **functions** symbolized by the modules comprise all the operations required for an experiment,

- from data acquisition (by a data acquisition board) or signal generation (simulated by a virtual generator)
- to data analysis, evaluation and processing (mathematics, statistics, control, trigger and other functions)
- up to their presentation on screen (display instruments) or export for documentation purposes (printer, metafile, etc.).

The modules can be **installed** on the worksheet either by choosing them from the Module menu or by clicking the corresponding icons on the Module Bar.

Modules can appear in various forms.

Click here for further information on how to install and configure modules.

Module Installation and Configuration

Installing Modules

A module can be **installed** on the worksheet by choosing it from the **Module** menu or by clicking the corresponding icon on the Module Bar. Either way, it will immediately be placed on the worksheet as a module symbol.

For modules which provide more than one basic operation you must also select the function type.

- Choose a Module Group from the Modules menu to display a submenu with the **individual modules** which belong to that group. The submenus provide **all** the modules currently available. You can select any of the modules by clicking on its name.
  Click here to display an alphabetical list of **all** the available modules.
- Any module can also be installed on the **Module Bar.** It may then be placed in the worksheet by a single mouse click on the corresponding **Module Bar icon**.

Configuring Modules

Use the **left** mouse button to **double-click** on a module's worksheet **symbol** to open the **dialog box** to configure the module. The following parameters can generally be specified in the dialog box:

- the module name,
- the module description,
- and the number of input/output channels (**up to 16** for most modules).

Once you have **activated** more than one channel, you can **select** each of them to display and define **channel-specific** parameters.

Configuring **several** channels for **one** module is easy when you use the F7 / F8 function keys.

For **module-specific settings** please refer to the module descriptions.

Connecting Modules

Data channels represent the **connections** between the output of a module and the input of another module. By creating branches, each module output can be connected to **up to 16** inputs of other modules.

Click here for further details about creating, deleting and rearranging data channels.

Moving Modules

The modules can be **moved** to any position on the worksheet by **dragging and dropping** the worksheet **symbol.** Click on the worksheet symbol with the **left** mouse button and, while holding the mouse button down, drag it to any position. It will automatically be aligned depending on the spacing value entered in the Window Setup box of the **Options** menu.

Deleting Modules

The modules can be **deleted** by **double-clicking** on the worksheet **symbol** with the **right** mouse button. A **dialog box** appears where you can specify whether the module itself is to be deleted from the worksheet or only its input/output data channels.

\> Some of the operations described here can also be performed using the keyboard. Click here for further information on keyboard operations.

Help Index

Module Name

Each module can be tagged with an identifying name of your choice. It is displayed in the **Module Name** box of the module configuration dialog box and can be modified there. It may consist of up to **12** alphanumeric characters.

The module name helps to identify the individual module in the worksheet:

- With **all** modules, this name appears in the **title bar** of the module symbol in the worksheet.
- With modules which provide an additional display or control window, like the Display modules, the module name is also displayed:
  - **below** the **icon** which represents the **minimized** additional window, and
  - in the **title bar** of that window when it is **activated**.

Modules which influence the functions of other modules (such as the Action module) identify their target module through its **module name** (not through data channels as it might appear). For that reason, module names must always be **unique.**

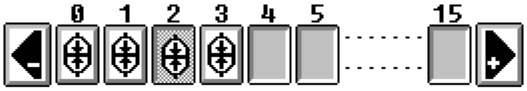
Whenever you install a new module, **DASY*Lab*** suggests a default name in this box. This name is always unique. It indicates the module **function** followed by the consecutive **number** of this module **type** (for example, Generator**00** for the first **Generator** module, Generator**01** for the second **Generator** module, Generator**02** for the third, and so forth). (The description of the module function may be abbreviated because of the limited number of characters.)
The default name can be changed by the user.

Description Module

You can describe the function of the module in the worksheet.
The description may consist of up to **40** alphanumeric characters. It will be stored with the worksheet.
By default this field is empty.

Module Selection Menu

Selecting the Number of Input/Output Channels



Selection Bar Example

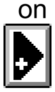
Use this bar to specify the **number** of signal inputs and outputs for a module in your worksheet.

This is an essential part of the module configuration. The corresponding module symbol in the work area will display the required number of input **(I)** and output **(O)** symbols; these serve as the starting points and termination points for the data channels through which data will be transferred between the modules.

Once you have **activated** more than one channel, you can **select** each of them to display and define **channel-specific** parameters.

The **buttons** described below allow you to configure a module easily and conveniently:

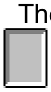
You can **only** increase or reduce the total number of input/output channels of a module using the buttons on the left and the right:



Add One Channel
Click this button to **activate one more** channel and thus **add** another input or output to the module.
If the maximum number of channels has been activated, the **Add Channel** button remains grey.
If the newly activated channel had been used before in the same worksheet, its settings will still be valid as **last** selected, as long as the experiment setup has not been saved to a file in the meantime.
Otherwise the **default values** of that module will be used.

Remove One Channel
Click on this symbol (when more than one channel has been activated) to **reduce** the number of channels **by one.**
If only one channel has been activated, the **Remove Channel** button remains grey.
If the channel that is to be removed is presently selected, the next channel on the left will be automatically selected.
The settings of the removed channel are retained until the worksheet is saved to a file.

The **state of each channel** is indicated by one of the following **symbols:**



channel **inactive**
This symbol indicates an **inactive** channel.
It cannot be selected; it must be **activated** by clicking the **Add Channel** button as described above.

channel **active**
This symbol indicates an **active** channel.
Click the icon with the **left** mouse button to **select** the channel to define specific parameters.
Active channels can only be **removed** by clicking the **Remove Channel** button as described above.

channel **active and selected**
This symbol indicates the **currently selected active** channel.
The **settings** displayed in the text boxes, list boxes and check boxes all refer to that channel, and it is

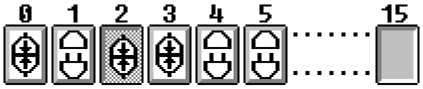
the only one that can have parameters defined.
You can **only** deselect this channel by selecting (clicking) another activated channel, or by removing it as described above.

Note: Other channels which are activated though not selected and displayed may be configured differently. To display the settings of any channel, you must **select** it first.

Hint: Configuring several channels for **one** module is easy when you use the F7 / F8 function keys.

Module Selection Menu
Main Menu Options

Input Channel Selection Bar Analog / Digital / Counter Input



Selection Bar Example

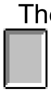
Use this bar to **activate** or **deactivate** the individual input channels of your Analog Input, Digital Input, or Counter Input module.
The numbered connector symbols displayed in the horizontal bar **represent** the **physical input channels** on your data acquisition hardware.

Once you have **activated** more than one channel, you can **select** each of them to display and define **channel-specific** parameters.

The channel name and the other settings displayed in the text boxes, list boxes and check boxes all describe the **currently selected** channel.

Other channels which are activated though not selected and displayed may be configured differently. To display the settings of any channel, you must **select** it first.

The **state of each channel** is indicated by one of the following **symbols:**



channel **not available**
These channels are not available on the data acquisition board installed in your system. Therefore, they cannot be activated or selected.

channel **not activated**
This channel is available on the data acquisition board, but it is **inactive** and it will not acquire data.
Double-click the icon with the **left** mouse button to **activate and select** the channel.

channel **activated**
This channel is **active.** Data will be acquired by the hardware when measurement begins.
The corresponding module symbol on the worksheet supplies an output symbol for this channel.
Click the icon with the **left** mouse button to **select** the channel to define specific parameters.
Double-click the icon with the **right** mouse button to **deactivate** the channel.

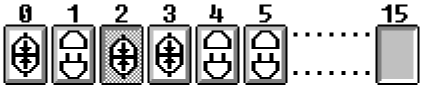
channel **selected**
This symbol indicates the **active** channel which is **currently selected**.
The **settings** displayed in the boxes (for example, the channel name, etc.) all refer to that channel, and it is the only one that can have parameters defined.
You can **only** deselect this channel by selecting (clicking) another activated channel, or by removing it as described above.

Note: Other channels which are activated though not selected and displayed may be configured differently. To display the settings of any channel, you must **select** it first.

Hint: Configuring **several** channels for **one** module is easy when you use the F7 / F8 function keys.

Input / Output Modules
Module Selection Menu

Output Channel Selection Bar Analog / Digital Output



Selection Bar Example

Use this bar to **activate** or **deactivate** the individual output channels of your Analog Output or Digital Output module.
The numbered connector symbols displayed on the horizontal bar **represent** the **physical output channels** on your data acquisition hardware.

Once you have **activated** more than one channel, you can **select** each of them to display and define **channel-specific** parameters.

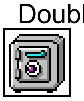
The channel name and the other settings displayed in the text boxes, list boxes and check boxes all describe the **currently selected** channel.

Other channels which are activated though not selected and displayed may be configured differently. To display the settings of any channel, you must **select** it first.

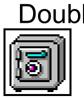
The **state of each channel** is indicated by one of the following **symbols:**

channel **not available**
These channels are not available on the data acquisition board installed in your system. Therefore, they cannot be activated or selected.

channel **not activated**
This channel is available on the data acquisition board, but it is **inactive** and it will not output data.
Double-click the icon with the **left** mouse button to **activate and select** the channel.



channel **activated**
This channel is **active.** Data will be output to the hardware when measurement begins.
The corresponding module symbol on the DAP Box worksheet supplies an input symbol for this channel.
Click the icon with the **left** mouse button to **select** the channel to define specific parameters.
Double-click the icon with the **right** mouse button to **deactivate** the channel.



channel **selected**
This symbol indicates the **active** channel which is **currently selected**.
The **settings** displayed in the boxes (for example, the channel name, etc.) all refer to that channel, and it is the only one that can have parameters defined.
You can **only** deselect this channel by selecting (clicking) another activated channel, or by removing it as described above.

Note: Other channels which are activated though not selected and displayed may be configured differently. To display the settings of any channel, you must **select** it first.

Hint: Configuring **several** channels for **one** module is easy when you use the F7 / F8 function keys.

Input / Output Modules
Module Selection Menu

Channel Name

Each **activated channel** can be tagged with an identifying name of your choice. The name of the **currently selected channel** is displayed in the **Channel Name** box of the module configuration dialog box and can be modified there. It may consist of up to **20** alphanumeric characters. Spaces may be included (each space is one character).

Whenever you install a new module or **activate** another channel, **DASY*Lab*** suggests a default channel name in this box. It indicates the module **function** followed by the consecutive **number** of this **channel** (for example: Generator **1**, Generator **2**, Arithmetic **11**, Arithmetic **12** and so forth). (The description of the module function may be abbreviated because of the limited number of characters.) The default name can be changed by the user.

Click here to read further hints.

Channel Name: Further Hints

- **DASY*Lab*** can **only** number the channel names **within one module.** Hence, these default suggestions are not always unambiguous, but can occur repeatedly, especially within more complex worksheets.
- The **channel name** which is displayed (or modified) in the module configuration dialog box **only** refers to the **currently selected** channel.
- If you press the F7 / F8 function keys to copy parameters, the **channel name** of the **selected** channel will be copied to **all** of the other **activated** channels. It will thus lose its identifying quality.
- Modules which influence the functions of other modules (such as the Action module) do **not** identify their target channel through its **channel name** but through its **number.** For that reason, channel names need not always be **unique.**

F7 / F8 Function Keys

With most modules, up to 16 input/output channels can be activated. It can be quite tedious to set all of their parameters individually. To simplify that task, press the `F7` or `F8` function keys to copy parameters **from the selected channel to all the other activated channels**:

- **F7** to copy only the **selected parameter** (the currently highlighted one).
- **F8** to copy **all the parameters** of the selected channel - including the channel name.

While an experiment is running, these function keys have no effect.

Special Module Functions and Options

Modules with multiple Function Types

Several modules can be operated using different functions.

- In the Module menu such a module is listed **only** showing its **basic** function (also the Module Bar symbol presents only this function).
- In the worksheet only a **special type** of this module is shown, which can only execute **one** of the various functions.

If you select such a module for insertion into a worksheet you must first **specify the function type.**

Since the function types often differ with regard to the required number of the inputs and outputs and their assignments, the selection will also determine the basic **channel configuration** of the module. Also, the function types may feature various **setting possibilities** and **options.**

If the module has been inserted into the worksheet, double-clicking on the module symbol will show the appropriate **module configuration** dialog box.

You cannot **change** the function type of a module once it has been inserted onto the worksheet. To change the present configuration first **delete all** data channel connections to this module. Then **delete** the module itself. Following the deletion the module can be **re-inserted** with **another** specified **function type**.

Copy Inputs to Outputs

The modules of the Display group as well as the modules Write Data and DDE Output feature the **Copy Inputs to Outputs** option. This option provides an output for each input of the module, and the input data is passed **unchanged** to the output for further processing on the worksheet.

- If the output signals of **one** module are to be used by **several** other modules, **without** this function all downstream modules must be connected individually to the source outputs. For this, data channel branches must be created, complicating the worksheet significantly.
- **With** this function, the data can be used in one module (e.g. displayed), and then the data can also be passed through to downstream modules **without any alterations.** Since data channel branches are not required, a linear worksheet layout can be kept and thus the worksheet remains legible.

This option is useful for connecting several modules with multiple inputs and outputs. On the other hand the option should **not** be used **too frequently**, since it will affect performance.

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Input/Output
Module Group

This group consists of the modules for analog and digital input and output.

Analog Input

Analog Output

Digital Input

Digital Output

Counter Input

DDE Input

DDE Output

RS232 Interface

IEEE488 Interface:

- INES or
- IOtech or
- National Instruments

Module Selection Menu

Analog Input

Module

This module inserts the connection between **DASY*Lab*** and the analog input channels of the installed data acquisition hardware onto the worksheet.
It uses the installed data acquisition driver to access the hardware. Data will be acquired by the data acquisition device. The measured values will then be sent to the program using the module outputs of the module.
Double-click on this module symbol in the worksheet to open the module configuration dialog box, where you can enter the number of input channels available on your hardware using the channel bar. Each activated analog input channel increases the number of module outputs, so that each channel can send its data to another module through a separate line.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16 (depending on the data acquisition hardware)
Output Block Size:	same as global block size
Max. Number of Modules:	32 (basic version: 1)

DASY*Lab* supports up to **512** analog input channels in its full version and up to 8 in the basic version.

Use the channel bar to **activate** as many channels as are available. However, you can only select one of them at a time to define the input range and to enter a channel information string.

Click on this function bar icon (or choose the Experiment Setup command from the Experiment menu) to open a dialog box where you can define the global sampling rate, the block size, and other important data acquisition parameters.

Click on this function bar icon to open the Hardware Setup dialog box. The settings are specific to the data acquisition device you specified when installing your **DASY*Lab*** version.

- **Channel Setup**
  If your hardware provides additional channel-dependent features, these can be specified in a separate dialog box which opens when you click on the **Channel Setup** button. You will find help on these settings when you choose **Hardware** from the **Help** menu.
  The **Channel Setup** button remains grey and cannot be activated if the hardware driver does not provide such settings.

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

Channel Information

For each channel, you can enter **up to 100** alphanumeric characters into this field. For example, you might wish to **describe the function** of each channel.

The channel information will be saved with the worksheet configuration.

There is **no default** setting for this box.

Analog Input Module

Input Range A/D Module

Many data acquisition devices provide selectable input ranges and an integrated programmable gain.

- The selectable **Input Range** usually defines the input range of all the activated channels of the device. If the hardware supports this option, the range can be selected in the Hardware Setup dialog box.
- If the data acquisition hardware installed in your system is equipped with a **programmable gain,** you can select the input range **for each channel** in the Analog Input module.

Attention: If required by your hardware, the **Input Range** entered in the **DASY*Lab*** dialog box must correspond exactly to the **hardware** configuration to ensure correct data processing by **DASY*Lab***. For information on jumper and DIP switch settings on your hardware please choose **Hardware** from the **Help** menu.

- If your data acquisition hardware does **not provide amplification,** this box displays the range selected in the Hardware Setup dialog box. This value cannot be changed.

Analog Input Module

Analog Output
Module

This module represents analog output channels if they are available on the installed data acquisition hardware.

In the worksheet, this module can take up to **16** signal lines and connect them to the analog output channels of the installed hardware. The number of channels that can be activated is limited by the installed hardware.

Individual output channels can be activated using the channel bar.

Input and Output Characteristics

Number of Inputs:	up to 16 (depending on the data acquisition hardware)
Input Block Size:	same as global block size
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	2 (basic version: 1)

DASY*Lab* supports up to **32** analog output channels in its full version and up to 16 in the basic version.

This module is useful if your application requires experiment control or the output of analog data for stimulation.

The parameters necessary to define the Output Mode can be set in the Experiment Setup dialog box of the Experiment menu.

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

Digital Input
Module

This module is used to acquire digital input signals using the digital I/O of the installed data acquisition hardware. Up to **16** digital signals can be acquired and provided to the worksheet through separate signal channels.

The digital I/O of the board can be activated using the channel bar.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16 (depending on the data acquisition hardware)
Output Block Size:	any
Max. Number of Modules:	32 (basic version: 1)

DASY*Lab* supports up to **512** digital input channels in its full version and up to 16 in the basic version.

Usually each activated digital input channel will acquire data at the global sampling rate, and its values in **DASY*Lab*** are set according to the TTL definition (0 for low and 5 for high).
Some drivers allow digital and counter input only in asynchronous mode. This is due to the transfer method used. With those drivers typically one digital or counter value is read for one complete block of analog data. The digital and counter input rate thus differs by a factor equal to the global block size. Also, the timing of digital and counter input is not exactly equidistant, which may cause jitter errors.

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

Digital Output

Module

This module is used to set digital I/O on the installed data acquisition hardware. It can take up to **16** digital signals from the worksheet and connect them to the corresponding hardware I/O.

The **number** of I/O channels can be specified using the channel bar.

Input and Output Characteristics

Number of Inputs:	up to 16 (depending on the data acquisition hardware)
Input Block Size:	same as global block size
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	32 (basic version: 1)

DASY*Lab* supports up to **512** digital output channels in its full version and up to **16** in the basic version.

This module is useful if your application requires experiment control or the output of digital data for stimulation.

The parameters necessary to define the Output Mode can be set in the Experiment Setup dialog box of the Experiment menu.

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

Counter Input
Module

This module is used to acquire and count impulses or frequencies. It is available if your data acquisition hardware supports counter measurement.

This module is not included in the basic version.

Up to **16** digital signals can be acquired and provided to the worksheet through different signal channels.

The counters of the board can be activated using the channel bar.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16 (depending on the data acquisition hardware)
Output Block Size:	same as global block size
Max. Number of Modules:	2 (depending on the data acquisition hardware)

DASY*Lab* supports up to **32** counter input channels.

This module can be used to acquire and count digital pulses. The resolution of the timer is 16 bit, with an upper limit of 65,535. In **DASY*Lab*** these values are treated as float values (range up to 10^38).

Usually each activated counter channel will acquire data at the global sampling rate.
Some drivers allow digital and counter input only in asynchronous mode. This is due to the transfer method used. With those drivers typically one digital or counter value is read for one complete block of analog data. The digital and counter input rate thus differs by a factor equal to the global block size.
Also, the timing of digital and counter input is not exactly equidistant, which may cause jitter errors.

DASY*Lab* provides three different counter modes:

- **Single**
  Every acquired sample will represent the counter difference from the preceding value, that is the number of pulses since the last reading. If a counter is read once per second, the values will directly represent the pulse frequency in Hertz.
- **Running**
  The values are read as in the **Single** mode, but the driver directly calculates the sum of all the acquired samples. Since **DASY*Lab*** uses float values for the result of summation, the accuracy will be about 6 to 7 digits, and the range will be up to 10^38.
- **Frequency**
  The values are read as in the **Single** mode, but the driver directly converts them into frequency values.

You can switch between these modes while the measurement is running. Since all the values are calculated by the driver, the active **Running Mode** always represents the number of pulses since the beginning of the measurement, even if the mode has been changed in the meantime.

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

DDE Input

Module

This module is used to **receive data** from other Windows applications (for example, Microsoft EXCEL). It uses the standard Windows DDE interface (**D**ynamic **D**ata **E**xchange).

Inserted into a worksheet, this module can have **up to 16** signal inputs.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	1 or same as global block size
Max. Number of Modules:	up to 16 **DDE Input and DDE Output** modules altogether

How it works

The **DDE Input** module is used to receive data from other Windows applications through up to **16** different channels.

- **DASY*Lab*** acts as DDE **Server** or as DDE **Client** with a **Hot Link** to a DDE **Server.**
  - If you use **DASY*Lab*** as DDE **Server**, start **DASY*Lab*** first, before the application providing the data is started.
  - If **DASY*Lab*** acts as DDE **Client,** configure the DDE **Server** first, and then start **DASY*Lab.***
- Data is expected to be received in **ASCII** format.

Hint: DDE communication is only useful for slow applications (typically only up to 100 Hz).

Establishing the DDE Communication

The topic **DDE Connection** specifies whether **DASY*Lab*** acts as **Server** or **Client**.

- If **DASY*Lab*** acts as **Server,** the **DDE Connection** has to be defined by the **Sender.** The following DDE parameters must be defined in the sending task:
  - **Application:** `DASYLab`
  - **Topic:** `DdeData`
  - **Item:** the `Module Name` of the **DDE Input** module.

  If the program you use for communication with **DASY*Lab*** is able to list all DDE servers, you can choose from this list.
- If **DASY*Lab*** acts as a **Client,** the communication must be set up in **DASY*Lab*** in exactly the same way as in the DDE Output module. **DDE Connection** specifies the receiver of the transferred data. Up to **80** characters can be entered in the **Application, Topic** and **Item** boxes.

Data Transfer

The **DDE Input** module receives one sample in each DDE block for each defined channel. The DDE format used is CF_TEXT; the channels must be separated by space characters and the block should end with a CR/LF character.

If a DDE block contains less than the expected number of channels, the values for all the remaining channels is set to 0.

The **Synchronization** entry specifies the mode for the **DDE Input** module:

- **One Sample per DDE Transfer**
  This mode specifies that the **DDE Input** module generates one **DASY*Lab*** block of size **1** for each DDE block received.
- **Use Global Settings**
  This mode specifies that the **DDE Input** module generates a stream of data corresponding to the

globally defined **sampling rate** and **block size**. The last DDE block received determines the value of the signal.
DASY*Lab* continuously polls the DDE buffer.

- If data is sent faster than **DASY*Lab*** polls, intermediate values are ignored.
- If data is sent slower, some values will be repeated.

- **Master DDE Sync**
  If this switch is set, **DASY*Lab*** tries to synchronize the DDE communication by sending an ACKNOWLEDGE message to the sending program after the received block has been processed. Otherwise, a BUSY message is sent. Not all programs react to these messages.

Hint: The **DDE** module always generates constant blocks of data. The **sampling rate** and **block size** in **DASY*Lab*** should be set according to the expected rate of **DDE** data.

Hint: Since the functionality of the **DDE** module is continuously increased, please review the README file for recent enhancements.

Data Format

Decimal Format specifies whether a **Dot** or a **Comma** is used as a decimal delimiter.

Input / Output Modules
Module Selection Menu

DDE Output

Module

This module is used to **transfer** acquired or calculated **data** to any other Windows application (such as EXCEL) which supports the standard Windows DDE protocol (**D**ynamic **D**ata **E**xchange).

Inserted into a worksheet, this module can take data from up to 16 signal channels and transfer it to another Windows application.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any, but the same for all the activated channels
Number of Outputs:	same as number of inputs (if option is activated)
Output Block Size:	same as input block size (if option is activated)
Max. Number of Modules:	up to 16 **DDE Input** modules **and DDE Output** modules altogether

How it works

The incoming samples are transferred to the other Windows application using the DDE protocol.

- **DASY*Lab*** acts as a DDE **client,** which means that **the receiving program** has to be started **first** and **then** the **DASY*Lab*** worksheet can be run. **DASY*Lab*** maintains the DDE link, initiates all data transfers and finishes the communication at the end.
- All input channels of the **DDE Output** module have be of the same type, the same **sampling rate** and the same **block size.** If this condition is not fulfilled, **DASY*Lab*** displays an error message and the experiment is stopped. The same conditions apply as for the **Write Data** module in ASCII format.
- **DASY*Lab*** will not start to send data before a complete block of data is present at the module input.
- Data is sent in **ASCII** format. Details are described below.
- The option Copy Inputs to Outputs provides the module with one output for each activated entry. Incoming data is provided unchanged at the output.

Hint: DDE in **ASCII** mode is a slow connection between different applications. It is limited to 100 Hz.

Definition of the Communication Channel

The entries under **DDE Connection** specify where to send the data. The **Application** name, the **Topic** and the **Item** must be entered. For details which topics are provided by an application, please check the corresponding documentation.

Data Transfer

Decimal Format defines the format of the data sent by the **DDE Output** module. The **Decimal Delimiter** and **Number of Decimals** can be defined.

DASY*Lab* sends data in the DDE format CF_TEXT, which means all samples are converted into a block of strings. The maximum size of this string is 65,500 characters. This string contains all data of all input channels for one block of data (on each channel); we call it data matrix.

- If the module has more than one input channel, data can be ordered by **Row** and by **Column**.
  - If **Column** is chosen, data are ordered in a way that the samples of one channel form a column in the data matrix. The corresponding samples of the connected channels form one row in the data matrix. So for a DDE output module with 2 channels and a block size of 3, DASYLab will generate a data matrix of 2 columns to 3 rows.

    Tip: An example worksheet for column-ordered DDE connection with EXCEL is contained in the **DASY*Lab*** directory.
  - If **Row** is chosen, data are ordered in a way that the samples of one channel form one row in the data matrix..

- Choosing order by Row or Column does not necessarily mean, that data are arranged in Rows or Columns in Excel. Ecxel needs specific delimiters in order to arrange data in the desired way.

Example Two channels of data with a block size of 3 are sent by DDE. The Samples of the first channel are named A1, A2, A3 and those of the second channel are B1,B2,B3. Ordering by **Row** means that the DDE block contains the values in the sequence A1,A2,A3,B1,B2,B3. Ordering by **Column** results in a sequence A1,B1,A2,B2,A3,B3. All samples are separated by the specified separator.The optional **Final Character** is inserted after A3 and B3 in the first case and after B1,B2,B3 in the second case.

- Each row or column can be ended with a CR/LF character.
- In addition to the data, a **Time Channel** in Microsoft standard format can be sent. Depending on the order, the **Time Channel** forms the first row or first column of the complete block. You can choose between **Time of Day** and elapsed **Time since Start** of the experiment.

Data Format

- **Separators**
  The samples in one string are separated by delimiters. You can choose between **Blank, Tab, Semicolon** or **CR/LF.** These separators are only used within one string and are not appended to the end of the string.
  There is an additional option for appending a CR/LF character at the end of each string.
- **Decimal Format**
  The **Decimal Format** defines the **Decimal Delimiter** and the **Number of Decimals**. The actual number of characters depends on the value of the samples and may be different each time.

Input / Output Modules
Module Selection Menu

Serial Interface

Module

Use this module to scan data coming from the PC's serial ports.

In the worksheet, this module can read data of up to **16** different channels and transfer them to other modules using its signal channels.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	1 or global block size
Max. Number of Modules:	number of available serial ports

For documentation purposes the module can be provided with a description . The module name and the channel name are presetted automatically by **DASY*Lab***. These defaults can be changed by the user.

The serial interface module is able to acquire data in up to 16 channels from any serial interface of the PC that is recognized by Windows. All blocks of data are provided with block size and timing information that is necessary to process data in **DASY*Lab*.**

This module reads strings of data that may contain one or more channels of data. The resulting signal released to **DASY*Lab*** consists of a number of blocks with different time intervalls, with only one data point in each block, and with different starting times. As an alternative, the data can be stored in a separate buffer and can be released to **DASY*Lab*** with the global acquisition rate and block size. This approach allows an easy synchronization of serial and other data. It mainly consists of two steps: each time data are received by the module, the internal buffer is updated with the most recent values and each time **DASY*Lab*** requires a new block of data, the buffer is read for each sample. In general each resulting block of data will be constant.

In addition the acquisition process may be synchronized by **DASY*Lab***. In this case the module sends a data request string to the serial device each time new values are needed. The acquisition frequency can be defined independently from the general acquisition rate within this module

These setting are defined in the options dialog box. In the ComPort dialog box the communication parameters for the serial port can be changed.

The com port is held open by **DASY*Lab*** for the whole time a worksheet with a serial module is loaded. When the experiment is started, the serial interface will be closed and opened again in order to reset the port parameters and in order to use the actual parameter settings. In addition this causes the serial buffer provided by Windows to be flushed, so that data from a previous experiment are deleted.

Hint: This approach has been chosen in order to enable the user to prepare worksheets on one computer that has different serial port settings than the target computer that will run the application.

Tip: If you want to check the settings without starting the measurement you can use the Send **Reset button**. This causes the serial port to be closed and opened again. In addition the defined reset string is sent.

Data Request Command

If the external device needs a data request command, the command string can be defined in this control box. The defined string is sent to the serial device each time **DASY*Lab*** wants to read new samples. If data request is not necessary (can be defined in the options dialog), this control box is grayed out. If the external device needs only one **data request command** in order to send a complete scan of all channels, specify this as the data request string of the first channel and define all other strings as empty strings. If the external device needs separate data requests for different channels, you can specify them independently.

Data Format

The serial interface can only receive data in ASCII format. Please click here for more information on the data format of the interface modules.

Options

Please click here, if you need information about the Options dialog for the serial module. It contains the configuration setup for an external device like optional reset, start and stop commands, synchronization and time out conditions

ComPort

Please click here, if you need information about the configuration of the serial port . These settings are used for the setup of the communication.

Additional Controls

- **Load**
  This option allows to store the complete setup of the module in a separate file for later use. The file extension is SER.
- **Save**
  This option allows to load previously saved setups. It reads files with the extension SER
- **Send Reset**
  Pressing this button causes **DASY*Lab*** to close and reopen the serial port and to send the defined reset command.

String format for **Reset-, Start, Stop** commands and data request

The string may contain control characters. Control characters must start with **\x** followed by a hexadecimal value **(\x0d = return),** or **\0** (backslash zero) followed by an octal value **(\0015 = return),** or **** followed by one of the following abbreviations for controls:

`'r'`	Return
`'t'`	Tabulator (HT)
`'a'`	Signal (BEL)
`'n'`	Line Feed (LF)
`'b'`	Backspace (BS)
`'f'`	Formfeed (FF)
`'v'`	Vertical Tabulator (VT)

Example of a valid reset string: `\x1bRS\r` sends the escape character followed by the ASCII characters RS followed by a return character.

> The Default Path for configuration files can be defined in the **Options**-Menu.

A/D-Input/Output modules
Module selection

Options Serial Module

This dialog box allows the configuration of the communication with the external device, as well as the selection synchronization modes.

Configuration commands

- **Reset Command**
  This string is sent to the external device each time the worksheet is loaded. It can be sent too by pressing the **Send Reset** button in the main dialog box. This string is not sent automatically when the dialog box is closed.
- **Start Command**
  This string is sent to the external device each time the experiment is started. It may be used to configure the external device for each individual experiment.
- **Stop Command**
  This string is sent each time the measurement is stopped.

Data Request necessary

- If you have chosen **Yes**, **DASY*Lab*** will send the data request string to the external device in intervals defined by the **Sample Interval**. If you have selected **No**, the external device has to send its data without any request and the sampling interval can not be defined by the user..
- **Sample Interval**
  This option allows to define the sampling rate independently from the global sampling rate in **DASY*Lab***. Since it uses the PC clock, its resolution is limited to multiples of 55 ms.
  The sampling interval is defined as an interval per channel. If the defined sampling interval is too small for **DASY*Lab*** to process the complete worksheet, the sampling rate is automatically slowed down. Useful values for the sampling interval are 0.5 seconds or larger.

Resend Request if Time-out

If this option is enabled the last data request is repeated if the required samples are not received after twice the sampling interval. The timing of the received data is corrected according to the real acquisition time.

One Sample per

- In the modes **data point** and **line of data** for each received data block a **DASY*Lab*** block of blocksize **1** is generated. In the first case this block is released for each channel< individually. In the second case all samples of the different channels are collected and released together. In this second case the timing information of all channels is the same, whereas in the first case each channel may have its independent time stamp.
- If the mode **Global sample** is used, data are generated according to the global settings for blocksize and acquisition rate. The value received from the serial interface is used to generate the signal for **DASY*Lab*** for each channel. This mode allows to synchronize slow serial inputs directly with faster inputs from DAQ boards

Header Size

This option allows to skip a defined amount of data at the beginning of each measurement.
It is useful if the external device after a reset or start command first send an identification or ready string that does not contain data.

Serial Interface

ComPort Serial Module

This dialog box allows to define the parameters for the com port used by **DASY*Lab***. The default settings are COM2, 9600 baud, 8 data bits, 2 stop bits and a buffer size of 4 K.

Hardware Settings

- **Port**
  This entry defines the used com port. Valid choices are **COM1** to **COM 4**.
- **Baud rate**
  This box allows to define the used baud rate. **300 Baud** to **19200 Baud** is possible.
- **Data bits**
  This entry defines the number of data bits (**5** to **8**).
- **Stop bits**
  This entry defines the number of stop bits (**1**, **1,5** or **2**)
- **Parity**
  This entry defines whether an additional parity bit per character is used. Possible choices are even, odd or no parity.

Buffer Settings

- The receive buffer is the buffer Windows uses to buffer characters received by the serial port. Its size can be defined using this control. This buffer allows to receive data in the background even if a foreground task is active or the user is dealing with windows. The size may vary between **4** kb and **32** kb.
  The send buffer for sending request strings is limited to **512** characters.

Please use the hardware manual of your external device in order to chose the right settings for the communication..

The defined parameters are shown in the main dialog box as a string..

Serial Interface

Data Format RS232 and IEEE488 Interfaces

DASY*Lab* uses the **Data Format** input field of the interface modules to determine how the values supplied by the measurement instrument should be interpreted. The settings always refer to the currently selected channel of the module.

Use the **Format String** to specify the data format:

Data Type	Number of Bytes	Format Designator
ASCII text	any	`a`
Integer with sign	2	`i`
Integer without sign	2	`w`
Long Integer with sign	4	`l`
Long Integer without sign	4	`u`
Floating Point IEEE Float	4	`f`
Floating Point IEEE Double	8	`d`

The data is automatically interpreted in text format if the **ASCII** switch has been selected.

The **serial module** only allows **ASCII** reading of data.

With the **Binary** setting, the data is interpreted in one of the other formats. the **Format Designator** must then be included in the **Format** string.

Additional parameters can be specified if **Binary** has been selected:

- Using the `nx` parameter **any number of characters** can be **suppressed**. `n` specifies the number of characters to be suppressed.
- Additionally, for binary values **certain bits** of the measurement value (such as status information) can be **suppressed**. Specify a **mask value** (in hexadecimal notation) following the **Format Designator.**

Spaces must be inserted into the **Format string** between the individual parameters.

Use the formatting commands to define each channel. For example, if there are two channels of data seperated by a comma and terminated by a return character, the data format for the first channel would be **a**, and the data format for the second channel would be **a\r**.

Examples of **Format** strings:

`2x a 5x`	The characters are interpreted as **ASCII** characters. The first 2 and the last 5 characters received are ignored.
`u`	The received value is interpreted as **Long Integer** number. All characters are included.
`i fff0 2x`	The received value is interpreted as **Integer** number. The following 2 bytes are **ignored**. From the **Integer** value, only the 12 significant bits are masked out and interpreted as a value.

RS232 Interface
IEEE488 Interface

Input / Output Modules
Module Selection Menu

IEEE488 Interface

Module

This module is used to acquire data with an **IEEE488** device.

DASY*Lab* supports boards from several vendors. During the installation procedure you can choose between the different boards.

The following hints are valid for **all** board types. For specific help, click on one of the card types.

- INES
- IOtech
- National Instruments

General Hints

In a worksheet, this module can read data of up to **16** different channels and transfer them to other modules using its signal channels.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	1
Max. Number of Modules:	up to 15

- **Communication Errors**
  If a communication error occurs, **DASY*Lab*** displays a message and stops the experiment.
- **Data Acquisition with more than one Device**
  If data is to be acquired from several IEEE devices, a separate IEEE module must be placed into the worksheet for each device. Each device must have a **unique** IEEE address.
- **Data Format**
  Please click here for more information on the data format of the interface modules.

Hint: You can specify a default directory for the configuration file of the IEEE device (**Options** menu command).

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

IEEE488 Interface: INES

Module

This module is used for the measurement acquisition of units with **IEEE488** interface (IEC bus). **Prerequisites** for this function are:

- an **IEEE488 interface card** from the **INES** company installed in your computer,
- the correct Windows drivers (∗.DLL in the WINDOWS\SYSTEM directory; see the **INES** manual),
- and the **DASY*Lab*** **INES** driver (which must be selected during **DASY*Lab*** installation).

The commands used with this module must conform to the syntax definitions of the **INES** card. For details concerning the syntax, please refer to the **INES** manual.

Depending on the installed hardware, this module can gather data of up to **16** inputs in the worksheet and supply this data to other modules via data channels.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16 (depending on the hardware)
Output Block Size:	same as global block size
Max. Number of Modules:	up to 15

Most of the commands used to communicate with the IEEE card need a **device handle** (synonym for the address specified at Hardware Setup) to talk to the device. Default handles are `user` for the measurement instrument and `ieee` for the card. One of these handles is specified as **command parameter** (in parenthesis) defining the target of the command.

General Module Configuration

- **Start** commands
  This entry field is used to specify commands for the initialization of the IEEE board and the connected acquisition devices. The commands entered here are executed once when the measurement is started.

  Example:

`ABORTIO 7`	stop previous communication processes
`CLEAR 709`	reset interface
`SET 709,1000,9013,9013`	set terminators and delays
`OUTPUT 709, 'xyz'`	initialize devices

- **Stop** commands
  The commands entered here are executed once when the measurement is stopped.
- **Sampling Rate**
  The acquisition rate is taken from the Windows system clock. The maximum rate is 10 Hz or 0.1 seconds delay. If the connected device does not send data at the desired rate, no warning or error message will occur, but the next value will be accepted after the next delay. Every sample is provided with the current system time. The bus delays for the IEEE board must be adjusted using the `INIT` command in accordance with the acquisition rate.
- **Data Format**
  Please click here for more information on the data format of the interface modules.
- **Data Request**
  This command will be sent out whenever a value is requested by a device. The last line must always be `ENTER 7xx,%5`, which is necessary for the communication between **DASY*Lab*** and the IEEE board.

  Example:

`OUTPUT 709,´xxyyzz´`	device-dependent request command

`ENTER 709,%5` read value

In addition, a delay command `WAIT n` may be entered in these input fields, where `n` denotes the delay time in milliseconds. Any value may be entered, but these values are always rounded to multiples of 55 ms according to the cycle time of the system clock.

If a communication error occurs during communication with a device or with an IEEE card, an error message will be displayed, and the acquisition of data will be stopped.

To acquire data from **several devices** you must insert an **individual** IEEE module into the worksheet for each device. Prerequisite for this is that all devices are operated via **one** IEEE board and set to different device addresses. A maximum of **15** devices can be connected to one IEEE board.

Hint: You can specify a default directory for the configuration file of the IEEE device (**Options** menu command).

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

IEEE488 Interface: IOtech

Module

This module is used for the measurement acquisition of with **IEEE488** interface (IEC bus).
Prerequisites for this function are:

- an **IEEE488 interface card** from the **IOtech** company installed in your computer,
- the correct Windows drivers (∗.DLL in the WINDOWS\SYSTEM directory; see the **IOtech** manual)
- and the **DASY*Lab*** **IOtech** driver (which must be selected during **DASY*Lab*** installation).

The commands used with this module must conform to the syntax definitions of the **IOtech** card. For details concerning the syntax, please refer to the **IOtech** manual.

Depending on the installed hardware, this module can gather data of up to **16** inputs in the worksheet and supply this data to other modules via data channels.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16 (depending on the hardware)
Output Block Size:	same as global block size
Max. Number of Modules:	up to 15

Most of the commands used to communicate with the IEEE card need a **device handle** (synonym for the address specified at Hardware Setup) to talk to the device. Default handles are `user` for the measurement instrument and `ieee` for the card. One of these handles is specified as **command parameter** (in parenthesis) defining the target of the command.

General Module Configuration

- **Start** commands
  This entry field is used to specify commands for the initialization of the IEEE board and the connected acquisition devices. The commands entered here are executed once when the measurement is started. A maximum of 50 command lines can be entered.
- **Stop** commands
  The commands entered here are executed when the measurement is stopped. This sequence can be used, for example, to deactivate the remote control (data acquisition via a computer) of a connected device. A maximum of 50 command lines can be entered.
- **Data Format**
  Please click here for more information on the data format of the interface modules.
- **Data Request**
  The commands specified here are executed **once** for each channel before data acquisition takes place. Use this sequence to trigger the data acquisition and transfer of data.

Additional Switches

- By clicking onto the Hardware button a separate dialog box is opened. Use this window to enter the various settings for the actual measurement device.
- The Options button allows other settings to be entered for the **Acquisition Rate** and the **Transfer Mode**.

Notes

- If a communication error occurs during communication with a device or with an IEEE card, an error message will be shown in a separate window, and the entire measurement will be stopped.
- To acquire data from **several devices** you must insert an **individual** IEEE module into the worksheet for each device. Prerequisite for this is that all devices are operated via **one** IEEE board and set to different device addresses. A maximum of **15** devices can be connected to one IEEE board.

Hint: You can specify a default directory for the configuration file of the IEEE device (**Options** menu command).

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

Command Overview IOtech IEEE Board

The following commands are supported **for this card**:

`ABORT`	output an Interface Clear message
`CLEAR`	reset one or all devices
`ENTER`	read in data of one device
`LISTEN`	interface in **Listener** mode, data can be read from the bus
`LOCAL`	send a Go To Local message to all devices
`OUTPUT`	send data to one device
`REMOTE`	set the Remote Enable line
`SPOLL`	serial Poll scanning
`TALK`	interface is in Talker mode, data can be output onto the bus
`TRIGGER`	output a trigger to one device
`UNLISTEN`	reset the Listener mode
`UNTALK`	reset the Talker mode

The following commands are interface card **independent**:

`IF`	Conditional execution, currently only possible with `SPOLL`
`ELSE`	The following condition is executed if the `IF` condition is not satisfied.
`WHILE`	Loop until the status is satisfied, otherwise the same as `IF` but without `BEGIN...END`.
`BEGIN...END`	All commands enclosed by these statements are conditionally executed.
`WAIT`	Following this command the waiting time can be specified in milliseconds. Execution of commands is delayed by the specified time.

Examples:

Command sequences	Explanation

`IF (spoll (user) & 16 == 0)`
`BEGIN`
`   ...`
`END`
`ELSE`
`BEGIN`
`   ...`
`END`
	The `IF` command must be followed by a `SPOLL` command (operator **&**, comparison with == , > , < , >= , <= possible).
	
	You cannot nest `IF` statements.

`WHILE (SPOLL (user) & 16)` `   ...` command	The `WHILE` loop is executed until the condition is satisfied.

IOtech

Hardware IEEE488

In this dialog box for the **IOtech** or **National Instruments IEEE488** interfaces, various settings can be made for the actual measurement:

- The **Device Address** specifies the IEEE bus address set at the measurement instrument.
- The **Secondary Address** is used to specify the second address of the measurement instrument.
- The **Timeout** parameter specifies the time in milliseconds **DASY*Lab*** waits for this data from the measurement instrument. If this time is exceeded, **DASY*Lab*** aborts the measurement.

IOtech
National Instruments

Options IEEE488

In this dialog box for the **IOtech** or **National Instruments IEEE488** interfaces, settings can be made relating to the **Acquisition Rate,** the **Transfer Type** and the **Scan Mode**.
All these settings relate to the interpretation of the data received by **DASY*Lab*** but **not** to the programming of the connected measurement instrument.

- **Storage Settings**
  The settings made here are relevant if the connected IEEE measurement instrument acquires the data independently and sends them to **DASY*Lab***.
  - **Storage Rate**
    The desired acquisition rate for the device can be set in seconds.
  - **Storage Mode**
    Several settings are available:
    - **Single Values**
      One data value is requested for every active channel.
      Set the **Transfer Block Length** and the **Output Block Length** to **1**.
    - **Block mode**

      AAA

      One data block is requested for every active channel.
      The value set for **Transfer Block Length** specifies the block length.

      AAABBBCCC

      All data values are stored block by block in channel **0**. The data of all other channels of the measurement instrument are available at channel **0** of the IEEE-module.
      The **Transfer Block Length** represents the number of values of a channel.
      With a **Transfer Block Length** of **n** the data is present **n** times in channel **0**, **n** times in channel **1**, ... etc., in the output data block.

      ABCABCABC

      All data values are only requested with the command for channel **0**, read in by a Read operation and assigned to the activated output channels.
      The number of output channels are specified under **Transfer Settings.**
- **Transfer Settings**
  The settings made here are in direct relationship with the **Storage Mode** selected in **Storage Settings.**
  The **Transfer Block Length per Channel** specifies the block length the IEEE device uses to transfer data.
  The **Transfer Buffer** specifies the size **DASY*Lab*** reserves for receiving the data block. The buffer size must be sufficiently large to allow for the storage of an entire data block. If the size is below the required amount, the remaining data is read in with the next Read-In command and thus falsely interpreted.
- **Module Settings**
  These settings refer to the **DASY*Lab*** module itself.
  If **Dispatcher Mode** is active, the measurement request commands are sent in intervals specified in seconds under **Acquisition Rate.** The incoming data is then processed. The highest **Acquisition Rate** is 0.1 seconds.
  The **Output Block Length** specifies the block length **DASY*Lab*** uses to transmit the data to other modules. The value specified must be the same or smaller than the **Transfer Block Length** set for the IEEE device.
- **Data Value Acquisition**
  The operating mode of the module is set here.
  When the **Dispatcher Mode** is selected and the measurement is started, **DASY*Lab*** automatically sends the data value Request command in the time intervals set for **Acquisition Rate**.
  When the **Status Request** mode is active, the IEEE device is responsible for the time base **(Acquisition Rate).** In this mode the status of the device must be determined with the measurement request command (`SPOLL` command).

  Example: `IF (spoll (user) & 16 == 1)`

```
ENTER (user)
```

The data is read in if they are ready for transfer (corresponding status).

IOtech
National Instruments

IEEE488 Interface: National Instruments

Module

This module is used for the measurement acquisition of with **IEEE488** interface (IEC bus).
Prerequisites for this function are:

- an **IEEE488 interface card** from the **National Instruments** company installed in your computer,
- the correct Windows drivers (∗.DLL in the WINDOWS\SYSTEM directory; see the **National Instruments** manual)
- and the **DASY*Lab*** **NI** driver (which must be selected during **DASY*Lab*** installation).

The commands used with this module must conform to the syntax definitions of the **NI** card. For details concerning the syntax, please refer to the **National Instruments** manual.

Depending on the installed hardware, this module can gather data of up to **16** inputs in the worksheet and supply this data to other modules via data channels.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16 (depending on the hardware)
Output Block Size:	same as global block size
Max. Number of Modules:	up to 15

Most of the commands used to communicate with the IEEE card need a **device handle** (synonym for the address specified at Hardware Setup) to talk to the device. Default handles are `user` for the measurement instrument and `ieee` for the card. One of these handles is specified as **command parameter** (in parenthesis) defining the target of the command.

General Module Configuration

- **Start** commands
  This entry field is used to specify commands for the initialization of the IEEE board and the connected acquisition devices. The commands entered here are executed once when the measurement is started. A maximum of 50 command lines can be entered.
- **Stop** commands
  The commands entered here are executed when the measurement is stopped. This sequence can be used, for example, to deactivate the remote control (data acquisition via a computer) of a connected device. A maximum of 50 command lines can be entered.
- **Data Format**
  Please click here for more information on the data format of the interface modules.
- **Data Request**
  The commands specified here are executed **once** for each channel before data acquisition takes place. Use this sequence to trigger the data acquisition and transfer of data.

Additional Switches

- By clicking onto the Hardware button a separate dialog box is opened. Use this window to enter the various settings for the actual measurement device.
- The Options button allows other settings to be entered for the **Acquisition Rate** and the **Transfer Mode**.

Notes

- If a communication error occurs during communication with a device or with an IEEE card, an error message will be shown in a separate window, and the entire measurement will be stopped.
- To acquire data from **several devices** you must insert an **individual** IEEE module into the worksheet for each device. Prerequisite for this is that all devices are operated via **one** IEEE board and set to different device addresses. A maximum of **15** devices can be connected to one IEEE board.

Hint: You can specify a default directory for the configuration file of the IEEE device (**Options** menu command).

Module Installation and Configuration (General Hints)

Input / Output Modules
Module Selection Menu

Command Overview National Instruments IEEE Board

The following commands are supported **for this board**:

IBCLR	output an Interface Clear message
IBCMD	send interface commands
IBCONFIG	change interface parameters
IBDMA	set or reset of the DMA mode
IBEOS	change or reset **End of String** transfer mode
IBEOT	set or reset the **End of Transition** transfer mode
IBLOC	switch device to Local mode
IBPAD	change the primary address
IBRD	read in of data into string
IBRPP	parallel Poll scan
IBRSC	set or reset the interface features to output the Interface Clear and Remote Enable message
IBRSP	serial Poll
IBSAD	change the secondary address
IBSIC	send Interface Clear message for 100µs
IBSRE	set or reset the Remote Enable line
IBSTOP	terminate the asynchronous operation
IBTMO	change the Time Out value
IBTRG	trigger a device
IBWRT	send string to a device

The following commands are interface card **independent**:

IF	Conditional execution, currently only possible with IBRSP
ELSE	The following condition is executed if the IF condition is not satisfied.
WHILE	Loop until the status is satisfied, otherwise the same as IF but without BEGIN...END.
BEGIN...END	All commands enclosed by these statements are conditionally executed.
WAIT	Following this command the waiting time can be specified in milliseconds. Execution of commands is delayed by the specified time.

Examples:

Command sequences	Explanation

IF (ibrsp (user) & 16 == 0)
BEGIN
    ...
END
ELSE
BEGIN
    ...
END
	The IF command must be followed by a IBRSP command (operator **&**, comparison with == , > , < , >= , <= possible).
	
	You cannot nest IF statements.

WHILE (ibrsp (user) & 16) ... command	The WHILE loop is executed until the condition is satisfied.

National Instruments

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Trigger Functions

Module Group

This group consists of the modules for software triggers.

Pre/Post Trigger

Start/Stop Trigger

Relay

Module Selection Menu

Pre/Post Trigger
Module

This module is used to generate a trigger signal at its output depending on the input signal conditions.

In the worksheet, this module can have up to **16** signal inputs. For each of them, different range conditions regarding the amplitude or the slope may be defined. To avoid multiple triggering a hysteresis can be defined, too.

Input and Output Characteristics

Number of Inputs:	up to 16 (data signals)
Input Block Size:	any
Number of Outputs:	same as number of inputs (TTL signals)
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module generates a TTL compatible signal at each module output. The output signal is dependent on the trigger conditions defined for the corresponding module entry. Its value is set to **high** (amplitude **5**) if the trigger condition is fulfilled, and it is set to **low** (amplitude **0**) if the trigger condition fails.

The output signals can be used to control a Relay module which may gate the signal flow.

- The trigger range defines the range of amplitude values which will cause the trigger to be set.
- The trigger hysteresis defines the condition which has to be fulfilled before a second trigger event will be accepted. Both conditions consist of two parts: the definition of an **amplitude** or **slope** range, and a **flag** whether a trigger should be set when the signal is **inside** or **outside** the defined range.
- The **Pre** and **Post Trigger Values** define how many **high** values will be set at the corresponding module output and in which way these values are related to the actual position of the trigger event itself.
  - The **Pre Trigger Value** defines how many samples of the output will be set to **high** directly **before** the trigger event.
  - The **Post Trigger Value** defines the number of high samples **after** the trigger event. The duration of the trigger high phase is simply the sum of the **Pre** and **Post Trigger Values**.
    Admitted values are between **0** and **8,192** for the pre trigger and between **1** and **65,535** for the post trigger.

Unlike the Start/Stop Trigger module, this module allows you to control the signal flow continuously.

Module Installation and Configuration (General Hints)

Trigger Modules
Module Selection Menu

Trigger Range Pre/Post Trigger

The **Trigger Range** defines the trigger mode and the upper and lower limits.

If an **amplitude trigger** is used, the incoming data samples will be checked against the specified upper and lower trigger value levels.

- **Inside** will generate a high level output if the signal amplitude enters or is within the specified upper and lower limits, or is equal to these limit values themselves.
- **Outside** will generate a high level output if the signal amplitude leaves or is outside the specified value range.

If a **slope trigger** is used, the slope of the incoming data samples is used instead of the amplitude itself. The slope is calculated as the difference between two successive samples divided by their time difference.

Example: value 1: 3.5, value 2: 3.6, sampling rate: 100 Hz = 0.01 sec.

Slope:

After the measurement has been started, a trigger event will only be detected and evaluated if the following conditions are fulfilled:

- the defined number of pre trigger values must be available,
- for the second and all further trigger events the conditions concerning the hysteresis must be fulfilled.

Pre/Post Trigger

Hysteresis Pre/Post Trigger

This option defines the trigger module's reaction after a trigger event has occurred.

- If **Hysteresis** is switched **off,** the trigger will be activated directly after the defined number of post trigger values has passed the module.
- If **Hysteresis** is switched **on,** the hysteresis condition must be fulfilled, too, before the trigger will be activated again. The same options as for the trigger range apply for the definition of the hysteresis.

This function prevents undesired multiple triggers.

Pre/Post Trigger

Start/Stop Trigger

Module

This module controls the entire measurement by outputting a continuous **high** or **low** signal which is dependent on the input signal conditions (amplitude or slope). Since it switches the output signal only once (from high to low, or from low to high) it may be used to start or stop further analysis of the signal.

In the worksheet, this module can have up to **16** signal inputs. Different trigger conditions and trigger ranges may be specified for each of them.

Input and Output Characteristics

Number of Inputs:	up to 16 (data signals)
Input Block Size:	any
Number of Outputs:	same as number of inputs (TTL signals)
Output Block Size:	same as input block size
Max. Number of Modules:	any

After the measurement has been started, the signals at the module entries are checked against the specified trigger conditions. If the according condition is fulfilled, the output signal will be switched. Every input sample will then cause a TTL compatible output sample.

- In the case of a **start trigger,** this value will be **low** (amplitude **0**) before the condition is fulfilled, and **high** (amplitude **5**) afterwards.
- In the case of a **stop trigger,** the output signal will be **high** (amplitude **5**) before the condition is fulfilled, and **low** (amplitude **0**) afterwards.

Reset is not possible during measurement.

The output signals can be used to control a Relay module, which may gate the signal flow, or as the input of a Stop module, which may stop or pause the measurement.

Module Installation and Configuration (General Hints)

Trigger Module
Module Selection Menu

Trigger Range Start/Stop Trigger

The trigger range defines the trigger mode and the upper and lower limits.

If an **amplitude trigger** is used, the incoming data samples will be directly checked against the specified upper and lower trigger value levels.

- **Inside** will generate a high level output if the signal amplitude enters or is within the specified upper and lower limits, or is equal to these limit values themselves.
- **Outside** will generate a high level output if the signal amplitude leaves or is outside the specified value range.

If a **slope trigger** is used, the slope of the incoming data samples is used instead of the amplitude itself. The slope is calculated as the difference between two successive samples divided by their time difference.

Example: value 1: 3.5, value 2: 3.6, sampling rate: 100 Hz = 0.01 sec.

Slope:

Start/Stop Trigger

Relay
Module

This module can control several data streams by means of one control input.

In the worksheet, this module can have up to **15** signal inputs and one control input.
The number of signal inputs can be specified using the Channel Bar.

Input and Output Characteristics

Number of Inputs:	1 control input, up to 15 signal inputs
Input Block Size:	any
Number of Outputs:	up to 15 (same as signal inputs)
Output Block Size:	same as input block size
Max. Number of Modules:	any

The **Relay** module controls the data stream from its signal inputs by means of its control input. The control signal is expected to be TTL compatible. The control input is tagged **x**.

- If the control signal is TTL **high,** data at the signal inputs can pass to the module outputs.
- If the control signal is TTL **low**, the behavior of the module depends on the settings in **Blocked Data**. If **Remove** is chosen, the flow of data will be stopped; if **Replace with Zeroes** is chosen, the data not belonging to a trigger event are replaced with zeroes.

With **Remove** the **Relay** module rearranges data blocks in such a way that it will always try to send out complete blocks of the global block size. If the control signal switches very fast, the number of blocks at the output side of the module may be greater than at the input side.

With **Replace with Zeroes** the **Relay** module does not rearrange any data blocks. This setting is very useful to combine triggered data channels with "normal" data channels. On the other hand there is no data reduction as with **Remove.**

The **Relay** module is especially useful when combined with the Start/Stop Trigger, the Pre/Post Trigger, the Time Slice, and the Digital Input modules.

Module Installation and Configuration (General Hints)

Trigger Modules
Module Selection Menu

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Mathematics
Module Group

This group consists of modules which perform mathematical functions.

Arithmetic

Trigonometry

Scaling

Differentiation / Integration

Logical Operations

Module Selection Menu

Arithmetic
Module

The **Arithmetic** module performs basic calculations with one or more input signals.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **four** function types:

- Operation with One Operand
- Operation with One Operand and a Constant Value
- Operation with Two Operands
- Operation with Two or More Operands

For **Operation with One Operand, Operation with One Operand and a Constant Value** and **Operation with Two or More Operands,** a maximum of **16** module entries is available.
Operation with Two Operands allows up to **8 pairs** of module entries.

If illegal calculations occur, such as division by zero, or an overflow, this will be indicated in all display functions by strings like **E_NUM, E_MAX** or **E_MIN.** However, the running measurement and analysis will not be stopped.

Module Installation and Configuration (General Hints)

Mathematics Modules
Module Selection Menu

Arithmetic One Operand

This arithmetic module performs **reciprocal**, **square**, **square root** and other calculations.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module performs the following calculations (**Channel** = input signal value):

function	output value
Reciprocal:	one divided by **Channel**
Square:	**In** multiplied by **Channel**
Square Root:	square root of the absolute value of **Channel**
Absolute Value:	absolute value of **Channel**
exp (x):	e to the power of **Channel**
ln (x):	natural (base e) logarithm of the absolute value of **Channel**
lg (x):	decadic (base 10) logarithm of the absolute value of **Channel**
log (x):	dual (base 2) logarithm of the absolute value of **Channel**
Sum (x):	sum of input values (sum of all samples since last reset)
Difference (x):	difference from the preceding **Channel**
NOP:	**Channel**(no operation)

Hint: Running values can be reset during an experiment using the event-driven actions.

Arithmetic Module

Arithmetic Operand and Constant

This arithmetic module performs calculations with one signal and one constant value, such as **multiplication** with a constant value, **offset definition** and others.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

The constant value must be entered in the field in the right half of the dialog box.

This module performs the following calculations (**Channel** = input signal value):

function	output value
Constant + Channel:	constant plus **Channel** (subtraction **=>** addition of a negative constant)
Constant ∗ Channel:	constant multiplied by **Channel** (division **=>** multiplication by reciprocal of constant)
Constant ^ Channel:	constant to the power of **Channel**
Channel ^ Constant:	**Channel** to the power of constant
Channel mod(c):	remainder when dividing **Channel** by constant
Extract bit:	TTL compatible **high**, if the corresponding bit is set for the represented integer, TTL compatible **low** otherwise. >
NOP:	**Channel**(no operation)

Arithmetic Module

Arithmetic Two Operands

This arithmetic module performs calculations with two signals, such as **addition** and **multiplication** of signal values from two channels.

In the worksheet, this module can have up to **8 pairs** of signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	any
Number of Outputs:	up to 8 (same as number of input pairs)
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module performs the following basic calculations:

function	output value
Channel + Channel:	channel 0 plus channel 1
Channel ∗ Channel:	channel 0 multiplied by channel 1
Channel - Channel:	channel 0 minus channel 1
Channel / Channel:	channel 0 divided by channel 1
Channel ^ Channel:	channel 0 to the power of channel 1

Arithmetic Module

Arithmetic Two or More Operands

This module contains functions that are symmetric for more than two operands.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any, but the same for all entries
Number of Outputs:	1
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module applies the chosen function to all of the input channels. The result of the operation is containéd in the output signal. All operations are performed sample by sample.

The following functions are available (**In = all** input signal values):

function	output value
Add:	sum of **In**
Multiply:	product of **In**
OR:	If any input is high, output is high
AND:	If all inputs are high, output is high
Max/Min:	maximum or minimum of **In**
Mean:	the mean value of **In**
Abs. Value:	the square root of the sum of the squares of **In**

Arithmetic Module

Trigonometry
Module

This module performs trigonometric calculations on the input signals.
In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

For **each module entry** one of the following functions can be selected:

- **SINE**
  COSINE
  The output values are calculated as **sine** or **cosine** functions of the input signal values.
  The output range is from **-1** to **1**.
  Input values greater than **10E7** cannot be calculated due to rounding errors of the underlying processor functions.
- **TANGENT**
  The output values are calculated as **tangent** functions of the input signal values.
  The output signal is not bounded.
  The tangent function will be defined for all input values except —,
  —,
  —, ...

DASY*Lab* will substitute these values with reasonable values slightly larger or smaller.
Input values greater than **10E7** cannot be calculated due to rounding errors of the underlying processor functions.

- **ARC SINE**
  ARC COSINE
  The output values are calculated as **arc sine** or **arc cosine** functions of the input signal values, i.e. the inverse functions of **sine** respectively **cosine.**
  Both functions will only be defined for input values between **-1** and **1**. For all other values **DASY*Lab*** will set the output value to **0**.
- **ARC TANGENT**
  The output values are calculated as **arc tangent** functions of the input signal values, i.e. the inverse function of **tangent**.
  The arc tangent function will be defined for all input values.
  Output values will range from — to
  —.
- **HYPERBOLIC SINE**
  HYPERBOLIC COSINE
  HYPERBOLIC TANGENT
  The output values are calculated as hyperbolic functions **(sinh, cosh,** or **tanh)** of the input signal values.
  They will be defined for all possible input values, but since they are based on the exponential function the results may easily cause overflows or rounding errors.
  The definitions of the hyperbolic functions are

The input signals can either be interpreted as **degree** (0-360) or **radian** values ($0-2\pi$). The appropriate unit must be selected in the dialog box.

Module Installation and Configuration (General Hints)

Mathematics Modules
Module Selection Menu

Scaling

Module

Use this module to apply different scaling methods to the signals from the module entries.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **three** function types:

- Linear Scaling with Two Points
- Interpolation using a Table
- Thermocouple Linearization

For all types a maximum of **16** module entries is available.

If illegal calculations occur, such as division by zero, or an overflow, this will be indicated in all display functions by strings like **E_NUM, E_MAX** or **E_MIN.** However, the running measurement and analysis will not be stopped.

Module Installation and Configuration (General Hints)

Mathematics Modules
Module Selection Menu

Linear Scaling

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

You can select one of the following types of linear scaling:

- **Slope and Offset**
  Values are calculated according to the formula **Y = a x + b**.
- **Definition of Two Points**
  A linear scaling with two reference points (X1, Y1) and (X2, Y2) is performed.
  In this case offset and slope are calculated automatically:
- **NOP**
  This function does not calculate on the input values except that they may be cut to the defined upper and lower limits (no operation).

In addition, **upper** and **lower limit** values can be defined. If the output signal exceeds these levels, it will be cut to the respective values.

Scaling

Interpolation

This type linearizes input data by performing an interpolation between different values entered in list form.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module requires a **reference file** with pairs of corresponding input and output values. The file format is explained in detail in the manual.

The input values will be interpolated according to the pairs of reference values. Between these values a piecewise linear interpolation is performed.
If an input value is outside the range defined by the table of input values (i.e. by the maximum and minimum values of the first column), the value corresponding to the maximum or minimum value of the first column will be output.

The reference file can be entered in the dialog box which appears after pressing the **Open** button. The extension of the file must be **∗.DPF**.

Hint: You can specify a default directory for reference files (**Options** menu command).

Scaling

Thermocouple Linearization

This type performs predefined linearizations for different types of thermocouples.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module allows the linearization of temperature signals generated by thermocouples of different types. For proper operation, the data acquisition hardware must be capable of measuring low voltages, and the correct type of thermocouple must be used for measuring.

DASY*Lab* uses its own linearization tables, which are slightly different for each type. The input voltage is converted to a value which represents the temperature in centigrade.

Cold junction compensation can be integrated in different ways:

- **Auto**
  Some data acquisition devices allow direct cold junction temperature measurement. In that case the cold junction mode should be set to **auto**. **DASY*Lab*** will then automatically take the cold junction temperature provided by the device.
- **Manual**
  Another way is to guarantee a constant environmental temperature by heating or cooling the junction point. In this case the temperature can be passed on to **DASY*Lab*** for a correction of the temperature value.
- **Off**
  Cold junction compensation can also be switched off completely (which is the default setting).

Scaling

Differentiation / Integration

Module

This module is used to differentiate or integrate a signal value.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module provides **two** functions:

- **Differentiation:**
  For each sample, the slope of the input signal values is calculated according to the formula

  where **dist** is the time delay between two samples of the input signal. The first sample of the output signal will have the same value as the input signal.
- **Integral:**
  For each sample, the integral of all the input signal values since the beginning of the experiment is calculated according to the formula

  where **dist** is the time delay between two samples of the input signal.

  Hint: Running values can be reset during an experiment using the event-driven actions.

Both functions are the inverse of the other one.

Module Installation and Configuration (General Hints)

Mathematics Modules
Module Selection Menu

Logical Operations

Module

This module performs logical operations with TTL compatible signals.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **two** function types:

- **Unary operations**
- **Binary operations**

For **unary operations,** a maximum of **16** module entries is available. **Binary operations** allow up to **8 pairs** of module entries.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs or up to 16
Input Block Size:	any
Number of Outputs:	
unary operations:	same as number of inputs
binary operations:	same as number of inputs **/** 2
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module performs logical operations on the input signals according to the defined function. The output signal is a TTL compatible signal.

If **Invert Output** is selected, TTL High is output instead of TTL Low, and vice versa.

The table below indicates the values of the outputs based on the input values and the selected function.

channel:	input value:			
a:	0	0	1	1
b:	0	1	0	1
option:	**output value:**			
FALSE	0	0	0	0
Channel a	0	0	1	1
Channel b	0	1	0	1
a and b	0	0	0	1
a or b	0	1	1	1
a xor b	0	1	1	0
a implies b	1	1	0	1
b implies a	1	0	1	1
a equivalent b	1	0	0	1

Notes:

- **0** indicates TTL Low (0V), **1** indicates TTL High (5V).
- If **FALSE** is selected, the output is **always 0** (TTL Low).
- Use the **Invert Output** option to generate further specific output values:
  - **FALSE** plus **Invert Output** => output always TTL High
  - **AND** plus **Invert Output** => **NAND**
- The input signal values may differ from the exact TTL high or TTL low levels. Such signals will be interpreted as **high** if their value is **higher than 1.5** and as **low** if their value is **lower than 1.5.**

Module Installation and Configuration (General Hints)

Mathematics Modules

Module Selection Menu

10.12.94

Statistics

Module Group

This group consists of modules which perform statistical functions.

Statistical Values

Position in the Signal

Histogram

Regression

Counter

Module Selection Menu

Statistical Values

Module

Use this module to calculate various statistical parameters of the input signal.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	1
Max. Number of Modules:	any

The following parameters can be set in the module configuration dialog box:

- **Operation**
  This parameter specifies the statistical operations to be performed, such as the calculation of **Maximum, Minimum,** or **Mean** values.
- **Mode**
  Two different modes are available:
  - **Running** means that the specified statistical value will be calculated on the basis of **all** the data that have been acquired by that channel since the beginning of the measurement or the last reset event.
  - **Block Based** means that the output value will represent the parameter of the defined number of blocks only..
- **Number of Blocks:**
  The Number of Blocks parameter defines how many sample blocks will be collected before the specified statistical parameter is calculated.

Hint: Running values can be reset during an experiment by means of the event-driven actions.

Module Installation and Configuration (General Hints)

Statistics Modules
Module Selection Menu

Statistical Operations Statistics

The following statistical parameters can be calculated:

function	output value
Maximum	maximum value of the signal
Minimum	minimum value of the signal
Max Position	position of the maximum value in the signal
Min Position	position of the minimumvalue of the signal
	These values are given in seconds or Hertz depending on the type of the signal.
Mean	arithmetic mean
RMS value	square mean (**R**oot **M**ean **S**quare)
Variance	
	where **x** is the mean value and **n** is the block size
Standard Deviation	square root of the variance

Statistical Values

Number of Blocks Statistics

If the number of blocks entered **(n)** is greater than **1,** the specified statistical operations will be performed on the basis of groups of **n** input signal blocks. That number of blocks may range from **1** to **8,192.**
At the output, a new value will be generated only every **n** blocks.

Statistical Values

Mode Statistics

This parameter defines the range of values which will be the basis of the specified statistical operation.

- In the **Running** mode, the specified statistical parameter will be calculated on the basis of **all** the data values that have been acquired by that channel since the beginning of the measurement.
  With every block of data, the statistical parameter will be updated, so that the output always represents the most recent evaluation of **all** the data values that have been sampled.
- In the **Block Based** mode, the specified statistical value will be calculated **separately** for each individual block of incoming data samples. No former data samples or calculated values are taken into account.
  Therefore the output always represents the evaluation of the most recent block of samples only.

Statistical Values

Position in the Signal

Module

With this module, up to **15** single values can be extracted from the data block according to their position. The values can then be routed via specially separated module outputs into the worksheet.

In the worksheet, this module can evaluate **one signal channel** via one data channel. It can evaluate **position information** at **up to 15** additional inputs.

Use the channel bar to determine the **number** of **position values** to be extracted from the signal and thus the number of **outputs** of this module.

Input and Output Characteristics

Number of input channels:	1, plus up to 15
Block size at the input:	same as global block size
Number of output channels:	up to 15
Block size at the output:	1
Max. number of modules:	any

With this module **up to 15** single values can be extracted at various positions from the incoming data block. Each extracted value can be output via a separate channel.

The module input to which the incoming data block must be applied is marked with an **X**.

Position Source specifies the origin of the position information:

- At selection of **Setting** the module has only the **input** channel. The positions to be evaluated for are specified for each channel at **Value / Sample No.**
- By selecting **Inputs,** the module is assigned **position inputs** additionally to the **data input.** The number of additional inputs depends on the number of positions to be evaluated. The positions are then defined by the applied position inputs.
  If values **beyond** the specified limits are applied to the **position inputs,** these values are decreased/increased to the maximum/minimum limit values.

With the item **Interpret Value As...** you determine how the **position specification** (i.e. the entry in the **Value / Sample No.** or the value received via the corresponding position input) is interpreted:

- With the **Sample No.** setting the **n**th value in the block is isolated and output.
- With the **Context-Sensitive** setting the position specification is interpreted as time offset for time data and/or as frequency line for frequency data.
  - For **time** data, the value in the block will be isolated which corresponds to the elapsed **scan time** (in seconds) since the start of the data block.
  - For **frequency** data, the value in the block will be isolated at the incoming **frequency line** (Hz).

Statistics Modules
Module Selection Menu

Histogram
Module

This module calculates the histogram of an input signal.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	the **number of classes** as specified (plus fringe classes, if necessary)
Max. Number of Modules:	any

This module divides the amplitude range up into **n** equal classes, and the number of samples with their amplitude values within each class will be counted.

For the definition of a histogram, you must specify an interval (Histogram Range) and the **Number of Classes.** In addition, you can provide two **Fringe Classes** for values below and beyond the range of values to be classified.

The histogram will be calculated for a group of blocks if the number of blocks entered in the dialog box is greater than one.
In addition, the output values can be normalized to a reference value.

Hint: For a convincing display of your histogram, try the Y/t Chart module and choose the **Bar** line style. To change the line style to Bar, chose the display menu in the chart display window and select Colors and Lines. In the Line Style box select Bar. The **Y/t Chart** will process histogram data automatically.

Attention: The output signals of a **Histogram** module **cannot be combined** with the output of most other modules, since they are neither time nor frequency related.

Module Installation and Configuration (General Hints)

Statistics Modules
Module Selection Menu

Histogram Range

In this dialog box you can specify the range and the classes for the division. Enter the amplitude range here, which will be divided up into classes, and the number of classes.

Example: The interval from **-5.0 to 5.0** is to be divided up into **10** classes.
The resulting 10 classes will be:
[-5, -4), [-4, -3), ... [3, 4), [4, 5).

The left (lower) boundary value is always assumed to belong to the class, the right (upper) boundary value is already outside that class. In the example above, the first class will contain the values from **-5** (inclusive) to lower than **-4**; the second class will contain the values from **-4** (inclusive) to lower than **-3**, and so forth.

If two additional fringe classes are generated, they will cover all the values below and beyond the range. In the example above, the lower fringe class will contain all the values between **-∞** and **lower than -5,** the upper fringe class will contain all the values between **5** (inclusive) and ∞.

Hint: For a convincing display of your histogram, try the Y/t Chart module and choose the **Bar** line style. The **Y/t Chart** will process histogram data automatically.

Histogram Module

Block Count Histogram

If a histogram of data over a long period is to be calculated, this option allows the specification of a certain number of blocks to group in one histogram. The number of blocks may range from **1** to **8,192.**

Histogram Module

Normalization Histogram

The **Normalization** option allows the scaling of the Histogram module's results, so that the results of different measurements can be compared.

- If **Normalization** is **enabled,** the result can be scaled
  - with respect to the **Maximum** of the histogram
  - or with respect to the **Total Sum** of counted samples.

  The histogram will be weighted with a factor so that the maximum or the total sum will be equal to the defined reference value.

  Tip: If you want the result in a **percent** scale, set the sum value to **100.** The resulting histogram will contain the percentage of samples in the specified classes.
- If **Normalization** is turned **off,** the result will simply be the number of samples in each class.

Regression
Module

This module will create an output signal which contains a signal with the linear regression line or with the mean value of the input signal for each block.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

- The **Constant Regression** option calculates the mean of an input block and supplies a block of the same length with this constant at the corresponding output.
- The **Linear Regression** option calculates the linear regression line of a block and supplies a signal which represents this line at the corresponding output.

Module Installation and Configuration (General Hints)

Statistics Modules
Module Selection Menu

Counter
Module

This module provides different counting algorithms.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	1, or same as input block size
Max. Number of Modules:	any

This module provides different options for counting events. These types of events can be counted:

function		output value: the current number of ...
Blocks	...	**blocks**
Samples	...	**samples**
Positive Edges	...	edges from **TTL Low** to **TTL High**, i.e. signal changes from **below 0.8** to **above 2.0**
Negative Edges	...	edges from **TTL High** to **TTL Low**
Duration High Level	...	**seconds** since start with level **above 1.5**
Duration Low Level	...	**seconds** since start with level **below 1.5**

- Additionally, specify the **Count Mode**:
  - In **Block Related** mode, only the events in the **current** block will be counted.
  - In **Continuous** mode, the count results will be calculated on the basis of **all** the data values that have been acquired by that channel since the beginning of the measurement.
- Use **Output Mode** to specify if the result is to be provided at the output
  - as a **Single Value** for each block, or
  - as a **Block** of the same length as the input signal, representing the current count for each sample.

Hint: Continuous values can be reset during an experiment by means of the event-driven actions.

Module Installation and Configuration (General Hints)

Statistics Modules
Module Selection Menu

10.12.94

Signal Analysis
Module Group

This group consists of modules which perform frequency analysis.

Filtering

Correlation

Data Window

FFT

Polar / Cartesian

Module Selection Menu

Filter
Module

This module provides digital signal filtering with infinite impulse response filters**.**

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

The filters in **DASY*Lab*** are stable IIR filters with a very steep slope. These filters are used to cut off certain frequency components from the time signal. They are easy to implement and to use, but their disadvantage, as compared to analog filters, is that they cannot be used as anti-aliasing filters. Any anti-aliasing filters would have to be applied before A/D conversion.

DASY*Lab* provides several digital filters of different type, characteristics, and order, with adjustable cut-off frequency.

- The transfer function of the filter is determined by the filter type. You can choose between **lowpass** and **highpass** filters. **Bandpass** and **bandstop** filters can be created by using a combination of lowpass and highpass filters.
  Additionally, you can switch **off** filtering without removing the module (no operation).
- The filter characteristics which can be selected are **Bessel, Butterworth** and **Chebyshev** with different ripples.

Module Installation and Configuration (General Hints)

Signal Analysis Modules
Module Selection Menu

Filter Characteristics

- **Bessel** filters are characterized not only by small overshooting in their step response, but also by very low steepness.
- **Butterworth** filters are maximally flat, with an extremely small passband ripple and medium steepness. They show a strong overshooting in their step response, and their transfer function in the passband is nearly constant.
- **Chebyshev** filters have a defined passband ripple. Compared to the other types they have the greatest steepness. The ripple in the passband can be set to either **0.5 dB** or **2 dB.**

Filter Module

Filter Types

- **Lowpass** filters are important in many signal analysis applications. They cut off or damp high frequencies, while lower frequencies can pass the filter nearly unchanged.

  Note: Digital lowpass filters cannot substitute analog anti-aliasing filters since aliasing is an effect of digitalization itself and not of the following analysis.
- **Highpass** filters work in just the opposite way of lowpass filters. They damp low frequencies and allow frequencies above the cut-off frequency to pass unchanged..
- **Off:** This switch turns digital filtering off without removing the filter module from the worksheet (no operation).

  Filter Module

Cut-off Frequency

For all the filter types, the adjustable **Cut-off Frequency** defines the frequency at which the damping of the filter is exactly **3 dB**. Damping beyond this frequency is dependent on the filter type and the defined order of the filter. The frequencies which can be entered here depend on the global sampling rate. Only frequency values within the following range can be set:

$0.001\ F_N < f_g < 0.9\ F_N$.

F_N is the Nyquist frequency, i.e. the sampling rate divided by two, and **f_g** is the defined cut-off frequency. To avoid stability problems during calculation and application of the filters, **DASY*Lab*** admits a frequency range which is smaller than theoretically possible. If values outside this range are entered, **DASY*Lab*** will prompt with a message and turn off the filters completely. The measurement will not be interrupted.

Filter Module

Filter Order

The filter order defines the number of poles of the filter. Increasing the number of poles increases the steepness, but at the same time increases the phase shift.
The maximum order for lowpass and highpass filters is **10**.

Filter Module

Quality Factor

This function is not implemented in this **DASY*Lab*** version.

Filter Module

Correlation
Module

This module performs the calculation of correlation functions and coefficients as well as the application of the power cepstrum.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **two** function types:

- Correlation Coefficient and Crosscorrelation
- Autocorrelation and Cepstrum

Up to **16** module entries can be activated.

Module Installation and Configuration (General Hints)

Signal Analysis Modules
Module Selection Menu

Correlation Coefficient and Crosscorrelation

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	any; the block sizes of pair members must be identical
Number of Outputs:	same as number of inputs
Output Block Size:	1, or same as input block size
Max. Number of Modules:	any

In the module configuration dialog box you can choose which of the two functions is to be applied to the signal of the selected channel.

- The **Correlation Coefficient** of the pair of input signals is a single value for each block, which always lies between **-**1 and 1.
  - Values **near 1** represent a good correlation; the input signals are of similar shape.
  - Values **near 0** mean that there is no correlation.
  - Values **near -1** represent a good anti-correlation.
- The result of **Crosscorrelation** is a full block for each signal input block. Each one represents the correlation function. The first value is equal to the correlation coefficient, the other values are the correlation coefficients for the periodically shifted signals. The time shift is used as the abscissa of the correlation function.

Correlation Module

Autocorrelation and Cepstrum

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any; the block sizes of pair members must be identical
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

In the module configuration dialog box you can choose which of the two functions is to be applied to the signal of the currently selected channel.

- **Autocorrelation** is the crosscorrelation of an input signal with itself; the same signal is used for both inputs.
  With the **Autocorrelation** function it is possible to detect an inherent periodicity in the signal itself. High values represent a similarity of the signal with its shifted copy.

  The **Autocorrelation** function is scaled so that its first value equals 1.
  It is calculated as the inverse Fourier transform of the signal's power spectrum.
- The **Cepstrum** function is used to detect echoes or multiplicative superpositions in the signal, especially in speech analysis.

  The **Cepstrum** function is scaled so that its first value equals 1.
  It is calculated as the inverse Fourier transform of the signal's logarithmic power spectrum.

Correlation Module

Data Window

Module

This module prepares data for further analysis, especially by an FFT module.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as the defined vector size
Max. Number of Modules:	any

This module prepares data for further analysis in two ways:

- It changes the block size so that an FFT module following after it can be provided with appropriate block sizes (powers of two).
  The Windowing module represents a buffer which can store blocks or parts of blocks. The output block size is independent from the input block size and equal to the defined vector size.
- It can weight the incoming blocks with different window functions. The effect of discontinuities at the edges of the analysis interval on the FFT result will be diminished by this weighting (leakage effect).

The following parameters can be set in the module configuration dialog box:

- **DASY*Lab*** provides a number of different window vectors. Each of these is characterized by certain advantages and disadvantages which recommend it for special types of signals. There is no ideal general purpose window, and we can only provide some rough hints concerning their characteristics and suitability in our list of Window Types.

  Generally speaking, a window vector damps the side lobes of singular spectral lines, which is a desired effect, but it also widens the main lobe, which is an unwelcome effect, since it reduces the spectral resolution and the dynamics of the spectrum.
- Some of the window types need an additional parameter for definition. This value is dependent on the window type itself. You will find further details in the comprehensive table of Window Specifications.
- In addition, you can activate Amplitude Correction in the dialog box.
- In the **Overlap Adjustment** box you can specify the overlap for an ensuing FFT. If the overlap is greater than 0, the defined number of samples will be included in the next block. This causes the module to release more data at its output channels than it receives at its input channels. Overlap is entered in samples.
  The windowing is performed after overlapping. A reasonable value for the overlap is the block size divided by two. However, the decision which is the best value depends on the window function that is used.

Module Installation and Configuration (General Hints)

Signal Analysis Modules
Module Selection Menu

Window Types

- Rectangle
- Bartlet (Triangle)
- Hamming
- Hanning
- Power of Cosine
- Blackman
- Blackman-Harris
- Tukey
- Poisson
- Hanning-Poisson
- Cauchy
- Gauss

Window Specifications
Window Module

Rectangle Window

This window type does not change the signal at all.

Window Types
Window Module

Bartlet Window

This window type weights the signal block with a triangle function, i.e. a piecewise linear function which is **zero** at both ends of the block and **1** in the middle.

Window Types
Window Module

Hamming Window

This window type weights the signal block with a Hamming function. It may be regarded as a modified Hanning window. It is implemented as a **cosine** function with an offset of 0.08 and does not remove the discontinuities completely.

Window Types
Window Module

Hanning Window

This window type weights the signal block with a Hanning function, i.e. a cosine square wave. This window corresponds to the power of cosine window with the parameter 2. It is one of the most frequently used windows with a well-balanced effect on the damping of the side lobes and the widening of the main lobe.

Window Types
Window Module

Power of Cosine Window

This is a generalization of the Hanning window. To define it completely, the exponent must be specified. Frequently used values for the exponent are 1, 2, 3, and 4. Increasing the exponent results in a weighting vector which decreases faster at the boundaries. The damping of the side lobes will be better, but the main lobe will be wider; so the frequency resolution of the spectrum may be lower.

Window Types
Window Module

Blackman Window

The Blackman window is a corrected Hamming window with an additional cosine term. It has a better damping of the side lobes than the Hamming window.

Window Types
Window Module

Blackman-Harris Window

This is a further refined modification of the Blackman window with cosine terms up to fourth order. In general, its effects are more balanced than those of the Blackman window, but it is more complex to calculate.

Window Types
Window Module

Tukey Window

The Tukey window is a combination of the rectangle and the power of cosine windows. It does not influence the amplitude of the time signal in the middle of the transfer block, so the main part of the signal energy and of the information in the signal is preserved.

The necessary parameter may vary between 0 and 1. It defines the size of the constant part of the window vector. A parameter equal to 0 yields the cosine window, while a parameter equal to 1 results in a rectangle window.

Window Types
Window Module

Poisson Window

The defining function of the Poisson window is a two-sided exponential:

$$|n| \leq N/2$$

The parameter (α) determines the damping at the boundaries of the analysis interval. Reasonable values for α are between 1 and 10.

Window Types
Window Module

Hanning-Poisson Window

The defining function of the Hanning-Poisson window is the product of the two functions of Hanning and Poisson. Reasonable values for the parameter (α) are between 1 and 10.

Window Types
Window Module

Cauchy Window

The Cauchy window is calculated according to the formula

$|n| \leq N/2$.

Window Types
Window Module

Gauss Window

The basis of the Gauss window is the Gauss normal distribution function:

$$|n| \leq N/2$$

Reasonable values for the parameter (the deviation value α) are between 0 and 10.

Window Types
Window Module

Window Specifications

The following table lists some of the values characterizing the different window types.
Some of these window types need an additional parameter for definition. Its value depends on the window type itself.

(If this table is not completely displayed on the screen, please resize or maximize this Help window.)

Window function	**Para- meter**	**side lobe level** (dB)	**side lobe slope** (dB/Oct)	**3 dB width of main lobe** (multiples of resolution)	**amplitude damping**
Rectangle	-----	-13	- 6	0.89	1.00
Bartlet	-----	-27	-12	1.28	0.50
Hamming	-----	-43	- 6	1.30	0.54
Hanning	-----	-32	-18	1.44	0.50
Power of Cosine	1.00	-23	-12	1.20	0.64
	2.00	-32	-18	1.44	0.50
	3.00	-39	-24	1.66	0.42
	4.00	-47	-30	1.86	0.38
Blackman	-----	-58	-18	1.68	0.42
Blackman-Harris	-----	-92	- 6	1.90	0.36
Tukey	0.25	-14	-18	1.01	0.88
	0.50	-15	-18	1.15	0.75
	0.75	-19	-18	1.31	0.63
Poisson	2.00	-19	- 6	1.21	0.44
	3.00	-24	- 6	1.45	0.32
	4.00	-31	- 6	1.75	0.25
Hanning-Poisson	0.50	-35	-18	1.54	0.43
	1.00	-39	-18	1.64	0.38
	2.00	-----	-18	1.87	0.29
Cauchy	3.00	-31	- 6	1.34	0.42
	4.00	-35	- 6	1.50	0.33
	5.00	-30	- 6	1.68	0.28
Gauss	2.50	-42	- 6	1.33	0.51
	3.00	-55	- 6	1.55	0.43
	3.50	-69	- 6	1.65	0.37
Window function	**Para- meter**	**side lobe level** (dB)	**side lobe slope** (dB/Oct)	**3 dB width of main lobe** (multiples of resolution)	**amplitude damping**

Window Module

Vector Size Window

The Window module can process signals of any input block size. The output block size will always be the defined vector size. Since this module is generally used in combination with the FFT module, which needs a power of two block size, these values are predefined. The vector size may vary between 16 and 8,192.

Attention: Any other vector size can be put in for purposes which do not need power of two value, but you cannot perform a FFT with these blocks.

Amplitude Correction Window

Since every weighting function except the rectangle has an integral less than one, its application causes lowering of the signals energy by a factor which equals its integral. If **Amplitude Correction** is switched on, this effect will be compensated by a multiplication of the spectrum with the same factor.

Window Module

Fast Fourier Transform

Module

This module provides various FFT functions to calculate and analyze the spectrum of a signal.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **four** function types:

- Real FFT of a Real Signal
- Complex FFT of a Real Signal
- Complex FFT of a Complex Signal
- Cross Spectrum of Two Real Signals

For the **Real FFT of a Real Signal** type, a maximum of **16** module entries is available, a maximum of **8** entries is available for **Complex FFT of a Real Signal**. **Complex FFT of a Complex Signal** and **Cross Spectrum of Two Real Signals** allow up to **8 pairs** of module entries.

Attention: The Fourier transform as well as the algorithms based on it are very powerful but also complex tools for signal analysis. The easy-to-use implementation in **DASY*Lab*** does not completely protect against erroneous results. Please read the general remarks regarding the FFT for further information.

Module Installation and Configuration (General Hints)

Signal Analysis Modules
Module Selection Menu

FFT: General Remarks

The **Fourier Analysis** is based on Fourier's theorem that every periodic signal can be decomposed in a series of harmonic functions. The methods included in this module allow the calculation and analysis of these frequency components.

The fast Fourier transform as well as the algorithms based on it are very powerful but also complex tools for signal analysis. The easy-to-use implementation in **DASY*Lab*** does not completely protect against erroneous results. The following essential conditions should be taken into account:

- **Frequency Components in the signal and the Sampling Rate**
  This is a condition for every digitalization. The sampling rate must be at least twice as high as the highest frequency component in the analog signal (Shannon's theorem). Since this is a theoretical limitation for most applications, it is better to have a larger oversampling. In general, an oversampling of 5 to 10 is sufficient; otherwise amplitude errors may occur due to the digitalization, though the frequency detection may be correct.
- **Limited Analysis Intervals**
  Every digital signal analysis method can only deal with a limited section of the time signal. The signal outside this section is always assumed to be a periodic continuation of that section. The length **T** of the analysis interval determines the basic frequency:

If - as is generally the case - the time signal contains frequencies which are not an integer multiple of that frequency, these frequencies will not be identified as sharp spectral lines but be smeared to several lines. This is often called the **leakage effect**. The selection of a well-suited window vector can reduce this effect, but it will also lead to undesirable side-effects for the analysis, like the widening of the main lobe.

FFT Modules
Real FFT of a Real Signal
Complex FFT of a Real Signal
Complex FFT of a Complex Signal
Cross Spectrum of Two Real Signals

Signal Analysis Modules
Module Selection Menu

Real FFT of a Real Signal

This is a function to calculate and analyze the discrete spectrum of a signal.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	must be a power of two
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size, or half of the input block size
Max. Number of Modules:	any

DASY*Lab* supplies several FFT-based operations in this function type. If necessary, the spectrum may be transformed into a dB scale.

Attention: The Fourier transform as well as the algorithms based on it are very powerful but also complex tools for signal analysis. The easy-to-use implementation in **DASY*Lab*** does not completely protect against erroneous results. Please read the general remarks regarding the FFT for further information.

Signal Analysis Modules
FFT Modules
Module Selection Menu

FFT Operations

The following FFT-based algorithms are provided:

- **Fourier Spectrum**
  The result is the two-sided amplitude spectrum of the signal. The output block size is the same as the input block size.
- **Amplitude Spectrum**
  The result is the one-sided amplitude spectrum. In contrast to the **Fourier Spectrum,** each frequency component except the DC part is twice as large due to the summation of the symmetric frequencies. The output block size is half of the input block size.
- **Power Spectrum**
  The power spectrum is the square of the **Fourier Spectrum,** but only one-sided. The output block length is half of the input block length.
- **Power Density Spectrum**
  The **Power Density Spectrum** differs from the **Power Spectrum** by a factor **b** representing the frequency resolution:
- **Phase Spectrum**
  The result is the phase spectrum of the input signal. The output block size is the same as the input block size. The output signal is normed to 0 to 360º.

FFT Module

dB Transform FFT

If **dB Transform** is switched on, the resulting spectrum will be logarithmically transformed according to the formula

where **x** is the input signal and **b** is one of the following reference values:

- **Definable Reference Value**
- **Maximum of the First Block**
- **Maximum of All Recent Blocks**
- **Maximum of the Current Block.**

Attention: dB scales can only be compared if the reference value is the same for all the spectra. This is generally the case for a defined reference value and for the maximum of the first block, but not for the others.

FFT Module

Complex FFT of a Real Signal

This is a function to calculate and analyze the discrete spectrum of a signal.

Input and Output Characteristics

Number of Inputs:	up to 8
Input Block Size:	must be a power of two
Number of Outputs:	twice the number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

A module of this FFT type provides two outputs for each input. The output signal contains the real component and the imaginary part of the FFT of the real signal.

In addition, you can choose the **Complex Conjugate of the output signal,** which means that for each input the imaginary part of the result will be multiplied by -1.

Up to 8 module entries and 16 outputs can be activated. The input block size must be a power of two; the output block size is the same as the input block size.

Attention: The Fourier transform as well as the algorithms based on it are very powerful but also complex tools for signal analysis. The easy-to-use implementation in **DASY*Lab*** does not completely protect against erroneous results. Please read the general remarks regarding the FFT for further information.

Signal Analysis Modules
FFT Modules
Module Selection Menu

Complex FFT of a Complex Signal

This is a function to calculate and analyze the discrete spectrum of a signal.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	must be a power of two
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

A module of this FFT type provides two inputs and two outputs for each function. You can choose between **Fourier Analysis** and **Fourier Synthesis.**

In addition, you can choose the **Complex Conjugate of the output signal,** which means that for each input the imaginary part of the result will be multiplied by -1.

Up to 8 functions can be performed simultaneously in each module. The input block size must be a power of two at both entries; the output block size at the outputs is the same as the input block size.

Attention: The Fourier transform as well as the algorithms based on it are very powerful but also complex tools for signal analysis. The easy-to-use implementation in **DASY*Lab*** does not completely protect against erroneous results. Please read the general remarks regarding the FFT for further information.

Signal Analysis Modules
FFT Modules
Module Selection Menu

Cross Spectrum of Two Real Signals

This is a function to calculate the cross spectrum of two signals.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	must be a power of two
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

A module of this FFT type provides two inputs and two outputs for each function. It calculates the cross spectrum of the two input signals. This means that the complex spectra are calculated for both input signals, and the first spectrum is multiplied with the complex conjugate of the second.

Up to 8 functions can be performed simultaneously in each module. The input block size must be a power of two at both entries; the output block size at the outputs is the same as the input block size.

Attention: The Fourier transform as well as the algorithms based on it are very powerful but also complex tools for signal analysis. The easy-to-use implementation in **DASY*Lab*** does not completely protect against erroneous results. Please read the general remarks regarding the FFT for further information.

Signal Analysis Modules
FFT Modules
Module Selection Menu

Polar/Cartesian Coordinates

Module

This module converts a pair of input signal values defining a curve in Cartesian coordinates into polar coordinates and vice versa.

In the worksheet, this module can have up to **8 pairs** of signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

Either of the following operations can be selected for each pair of module entries:

- **Cartesian => Polar:** conversion from Cartesian to polar coordinates
- **Polar => Cartesian:** conversion from polar to Cartesian coordinates

The first member of each input or output pair defines the real part or the amplitude respectively, the second member defines the imaginary part or the angle. Angles can be entered in degree (from **-**180 to **+**180) or radian values (from **-**π to **+**π).

Signal Analysis Modules
Module Selection Menu

10.12.94

Control
Module Group

This group consists of modules which perform control functions.

Signal Generator

Switch

Slider

PID Control

Time Delay

Setpoint

Latch

TTL Pulse Generator

Stop

Module Selection Menu

Real Time Output

This switch determines the time base at which data will be transferred to other modules.

Using **Synchronization** (in the Experiment Setup dialog box), you can specify whether the internal **PC clock** or the sampling rate generated by thy underlying **Hardware** is used as time base for all data generating modules (**Generator**, **Slider**, **Switch**, ...)

- If **Real Time Output** is switched **on,** data is output in real time. A block is not sent to the next module until a full block of data values is ready. This period of time is calculated from the block size and the sampling rate as they have been specified in the **Experiment Setup** dialog box. Real time output only applies to slow data generation. It does not check whether data can be generated fast enough. In case of pure simulation applications this is check is left to the user in order to provide him with the ability to change parameters online. In case of data acquisition applications i.e. if any hardware related module is used, timing problems are noticed by the driver interface and result in an appropriate error message and stop of measurement.

  Example: block size **500**
  sampling rate **1000** Hz
  A signal block will be output every **0.5** seconds.

- If **Real Time Output** is switched **off,** data will be provided at the output **as fast as possible,** i.e. as soon as the next modules provide the necessary capacity. The time of experiment grows much faster than the time of day.
  The signals will then be synchronized by the subsequent processing modules, if possible. On the other hand it is possible to run an experiment in a kind of time-lapse mode with this setting.
  To switch **Real Time Output off** is useful, for example, when data signals from a Generator module are to be delivered at a synchronousAnalog Output. Time synchronization is then done in the **D/A** module. The **Generator** module generates data signals quickly enough to provide them in sufficient numbers at the **D/A** module, and **no time delay** will occur at the output.

The speed of generating data depends on the hardware and on the complexity of the experiment setup.

Control Modules
Module Selection Menu

Signal Generator

Module

Depending on the selected function type, this module can generate up to **8** or **16** different standard signals simultaneously. In the worksheet it provides these signals to the other modules using its module outputs.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **four** function types:

- Generator without Modulation,
- Generator with Frequency Modulation,
- Generator with Amplitude Modulation,
- Generator with Frequency and Amplitude Modulation.

You can install several **Generator** modules in one worksheet.

Module Installation and Configuration (General Hints)

Control Modules
Module Selection Menu

Generator without Modulation

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	same as the global block size
Max. Number of Modules:	any

You can enter the following parameters **separately** for each channel:

- the channel name,
- the wave form,
- the signal frequency,
- the amplitude and offset of the signal in Volts,
- the phase shift,
- the Output in Real Time mode.

Generator

Generator with Frequency Modulation

Input and Output Characteristics

Number of Inputs:	same as number of outputs
Input Block Size:	same as the global block size
Number of Outputs:	up to 16
Output Block Size:	same as the global block size
Max. Number of Modules:	any

Each **output** channel is connected to one **input** channel which delivers the **Frequency** for each sample to be generated by that channel.
The setup for **Frequency** and the option **Real Time Output** are disabled, since the output rate is generated from the incoming channel.
The **input** channel must contain normal time data without gaps. The value of the input signal is used to determine the frequency of the generated waveform.

You can enter the following parameters **separately** for each channel:

- the channel name,
- the wave form,
- the amplitude and offset of the signal in Volts

Attention: Since the module computes a phase correction every time the frequency changes, it takes some computation time to modulate the generator with a fast changing signal.

Generator

Generator with Amplitude Modulation

Input and Output Characteristics

Number of Inputs:	same as number of outputs
Input Block Size:	same as the global block size
Number of Outputs:	up to 16
Output Block Size:	same as the global block size
Max. Number of Modules:	any

Each **output** channel is connected to one **input** channel which delivers the **Amplitude** for each sample to be generated.
The setup for **Amplitude** and the option **Real Time Output** are disabled, since the output rate is generated from the incoming channel.
The **input** channel must contain normal time data without gaps.

You can enter the following parameters **separately** for each channel:

- the channel name,
- the wave form,
- the signal frequency,
- the offset of the signal in Volts
- the phase shift,

Generator

Generator with Frequency and Amplitude Modulation

Input and Output Characteristics

Number of Inputs:	twice the number of outputs
Input Block Size:	same as the global block size
Number of Outputs:	up to 8
Output Block Size:	same as the global block size
Max. Number of Modules:	any

Each **output** channel is connected to two **input** channels which deliver the **Frequency** (first **input** channel) and the **Amplitude** (second **input** channel) for each sample to be generated.
The setup for **Frequency** and **Amplitude** and the option **Real Time Output** are disabled, since the output rate is generated from the incoming channel.

The **input** channels must contain normal time data without gaps and with the same **sampling rate** on each of two corresponding channels. The value of the input signal is used to determine the frequency of the generated waveform.

You can enter the following parameters **separately** for each channel:

- the channel name,
- the offset of the signal in Volts
- the wave form,

Attention: Since the module computes a phase correction every time the frequency changes, it takes some computation time to modulate the generator with a fast changing signal.

Generator

Wave Form Generator

The **Generator** module provides several wave forms for standard signals.

Function		The generated signal is a ...
Sine:	...	sine wave of defined frequency, amplitude, offset, and phase shift
Square:	...	square wave of defined frequency, amplitude, offset, and phase shift
Triangle:	...	triangle wave of defined frequency, amplitude, offset, and phase shift
Saw Tooth:	...	saw tooth wave of defined frequency, amplitude, offset, and phase shift
Pulse:	...	periodic one-sample impulse of defined frequency, amplitude, offset, and phase shift
Noise:	...	noise signal of defined maximum amplitude and offset
Constant:	...	constant signal of defined offset

Generator

Frequency Settings Generator

This parameter determines the frequency of the generated signal. The input must be entered in Hertz.

The time resolution, the number of samples per period, is determined by the ratio between the global sampling rate, which can be specified in the Experiment Setup dialog box, and the frequency specified here.

Example:	global sampling rate:	**1000** Hz
	signal frequency:	**10** Hz
	number of samples per period =	**1000 / 10 = 100 samples**

Since signal generation in this module is the digitalization of a mathematical function, the Shannon theorem applies as well as in a data acquisition process. If the signal frequency is too high for proper digitalization, a warning message will appear.

Generator

Amplitude and Offset Generator

These parameters determine the amplitude range of the generated signal.

Depending on the defined wave form, the amplitude of the signal will be within either of the following ranges:

- **Offset minus Amplitude** to **Offset plus Amplitude**
- **Offset** to **Offset plus Amplitude**

A negative amplitude will cause the wave form to be inverted, for example, a pulse with a negative amplitude may be generated.

There are no restrictions on either of these values, but they should be set with care regarding further calculations.

Generator

Phase Shift Generator

This parameter determines the phase shift for periodic signals in degrees. Admitted values are between **0º** and **359º.**

A sine with a phase shift of **90º** is a cosine.

Generator

Switch

Module

This module can generate up to **8** TTL compatible signals. These signals can be switched on and off.

In the worksheet, this module can have up to **8** signal outputs.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 8
Output Block Size:	same as global block size
Max. Number of Modules:	any

This module generates a TTL compatible signal at each of its outputs. In a separate **operation window,** the output can be **switched** manually between **low** and **high**, or it can be set to **high** for the duration of one **block**.
Combined with a Relay module or a Digital Output module, the **Switch** module can be used to control applications and for manual operations in the course of the measurement.

Each module of this type provides an additional operation window for manipulation. That window is initially provided as an **icon** at the bottom of the desktop when the module is inserted into the worksheet. Double-click this icon to open the operation window; then the switches can be used.

Module Configuration

In the module configuration dialog box you can enter the following parameters **separately** for each channel:

- **Switch Type**
  Each channel can be operated as either an **On/Off Switch** or as a **One Shot Switch**.
- Real Time Output

Operation Window

The operation window contains (depending on the **Switch Type**) one or two buttons for each activated channel. Beneath the button(s) you will find a display of the actual status of the channel: **ON** or **OFF**.

- In the **On/Off Switch** mode, the signal can be set to TTL High or TTL Low with the two corresponding buttons.
- In the **One Shot Switch** mode, the signal can be set to TTL High for **one block of data;** after that it will automatically be reset to TTL Low again.

To initialize the state of the channel you can click on the buttons in the operation window. However, ouput will only be generated while the experiment is running.

\> You can integrate several **Switch** modules in one worksheet. Each of them has its own module name, which is shown ...
  - **below** the **icon** representing the **minimized** operation window, and
  - in the **title bar** of that window when it is **activated**.

  Thus the **Switch** operation windows can be easily identified.

\> The function bar icons and menu commands to open, minimize and arrange the display windows of the Display modules also affect **Switch** operation windows.
  Click here for a survey of these special features.

Module Installation and Configuration (General Hints)

Control Modules

Module Selection Menu

Slider
Module

This module generates up to **16** signals of amplitudes that can be manually modified.

In the worksheet, this module can have up to **16** signal outputs.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	same as global block size
Max. Number of Modules:	any

This module generates a signal of adjustable amplitude at its output. The output amplitude can be **adjusted** manually in a separate **operation window;** the overall range of the amplitude is defined by the limiting values entered in the module configuration dialog box.

Each module of this type provides an additional operation window for manipulation. That window is initially provided as an **icon** at the bottom of the desktop when the module is inserted into the worksheet. Double-click this icon to open the operation window; then the slide controls can be used.
The slide controls can be operated using the scrollbar.

Module Configuration

In the module configuration dialog box you can enter the following parameters **separately** for each channel:

- **Min. Value / Max. Value**
  These two entries determine the output range the slider can generate on the selected channel.
- **Resolution**
  Define the resolution of the slider, the number of steps between the minimum and the maximum value. With a resolution of 100, each click on the upper or lower button in the slider changes the output signal about 1%. You can define a resolution from 2 to 9,999 steps.
- Real Time Output

Switches

- **Options**
  If there is more than one active channel in the **Slider** module you can setup the display of the operation window. You can determine the **Number of Rows** in the table of the sliders in the operation window and you can choose to display **With Channel Name.**
- **Colors**
  Click this button to setup the colors for all the parts of the operation window.
- **Font**
  Click this button to select the font type and style for the channel name. The font size will be computed based on the size of the operation window.

Operation Window

The operation window contains one slider and one edit control for each activated channel.

- Use mouse or keyboard to control the slider. (First the slider must get the input focus by clicking on it with the mouse.)
- Or you can type the output value in the edit box below the slider.

If an experiment is running, the **Slider** output changes according to your selection and the value is displayed in the edit control.

> You can integrate several **Slider** modules in one worksheet. Each of them has its own module name, which is shown ...

- **below** the **icon** representing the **minimized** operation window, and
- in the **title bar** of that window when it is **activated**.

Thus the **Slider** operation windows can be easily identified.

> The function bar icons and menu commands to open, minimize and arrange the display windows of the Display modules also affect **Slider** operation windows.

Click here for a survey of these special features.

Module Installation and Configuration (General Hints)

Control Modules
Module Selection Menu

PID Control

Module

This module implements a PID control algorithm.

In the worksheet, this module can have up to **8 pairs** of signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	any, but the same for each pair
Number of Outputs:	number of inputs divided by 2
Output Block Size:	same as input block size
Max. Number of Modules:	any

The PID module can calculate up to **8** control signals depending on the corresponding setpoint and the current value. For each pair of module entries, the first (upper) entry denotes the setpoint, and the lower entry denotes the actual measured value from the controlled system. The output signal of the PID module depends on the parameter values specified for the **P**roportional, **I**ntegral and **D**erivative (P / I / D) components.

The output signal can be limited to avoid instabilities. If Control Limitation is enabled, the output signal will be bounded by the values defined as **Maximum** and **Minimum.**

Attention: The PID control block should be used with small block sizes because the control only affects subsequent blocks.

Module Installation and Configuration (General Hints)

Control Modules
Module Selection Menu

P / I / D Components

The output of the PID module consists of these three components:

- **P** PID proportional control constant
- **I** PID integral mode gain constant
- **D** PID derivative mode gain constant.

The output signal combines these three components according to the following formula:

output = P_comp ∗ DIFF + I_comp ∗ Integral(DIFF) + D_comp ∗ Derivative(DIFF),

where **DIFF** denotes the difference between the setpoint and the measured value and **P_ / I_ / D_comp** denotes the parameters defined for each of the three components.

Control Limitation PID

If **Control Limitation** is enabled, the values specified as **Minimum** and **Maximum** will be used as the lower and upper limits for the output of the PID module. Values outside these boundaries will be cut to the corresponding boundary values.

This feature can be used to avoid instabilities during the control process.

Time Delay
Module

This module generates a time delay in the signal flow by preceding the incoming signal with an adjustable number of blocks of zero values. After these initial blocks, the delayed data will be transferred unchanged.

This module is not included in the basic version.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	same as global block size
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module delays the incoming signal for an adjustable number of blocks. The delayed part of the signal is stored in this module and passed on to the output **n** blocks later. The first **n** blocks are filled with zero values. This module is necessary if an application requires closed data loops.

Module Installation and Configuration (General Hints)

Control Modules
Module Selection Menu

Setpoint

Module

This module generates up to 16 TTL signals. Every module can process 8 or 16 signals at once.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	8 (Signal / Signal) or 16 (Signal / Level)
Input Block Size:	same as global block size
Number of Outputs:	1 Number of Inputs(Signal/Level) or 2 Number of Inputs(Signal/Signal)
Output Block Size:	same as input block size
Max. Number of Modules:	any

The module works as comparator with two different operation modes.

- The output signal switches to **high**, if the inputs signal amplitude exeed a level. The level must be set to a static value and cannot be changed during measurement.
- The output signal switches to **high**, if the inputs signal amplitude (**X**) exeed anothers inputs signal amplitude (**Y**). The comparation (**X>Y** or **X<Y**) cannot be changed during acquisition.

The setpoint module can generate ttl like output signals (**high** = 5V, **low** = 0V). The levels **high** and **low** and may be adapted to other binary output level conventions.

Control Modules
Module Selection Menu

Latch
Module

This module passes an input channel through or keeps the last data value (with constant output) - depending on the state of the control signal.

Integrated into the worksheet this module can process up to 8 data channel pairs.

Using the Channel Bar you can **specify** the **number of channels** and the channel pair to be set (selected channel pair).

Input and Output Characteristics

Number of Inputs:	up to 8 pairs (1 data input and 1 control input)
Input Block Size:	same as global block size
Number of Outputs:	up to 8 (same as input pairs)
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module provides **one** data input and **one** control input per channel for each data output. The upper one of the two inputs is the control input and the lower one the data input.

- If a **TTL high level** (5 Volts) is present at the control input the data at the data input is simply **passed through.**
- If a **TTL low level** (0 Volt) is present at the control input, the last data value (at which the control input was at High level) is latched as long as the Low level signal is present.

At the beginning of the measurement **TTL low** is output until the control input is set to **TTL high** level the first time.

Control Modules
Module Selection Menu

TTL Pulse Generator

Module

This module can generate TTL compatible signals according to the defined duty cycles.

In the worksheet, this module can have up to **16** signal outputs.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	same as global block size
Max. Number of Modules:	any

The module generates TTL compatible signals with definable low and high phases. **TTL high** equals **5**, **TTL low** equals **0**. Similar to the Generator module, this signal is provided at the global block size and sampling rate.

- Using the durations defined as **Phase 1** and **Phase 2,** the low and high cycles will be generated. The phase durations can be defined in **seconds, minutes,** or **hours.**
- The **Start/Stop** switch determines whether **Phase 1** is to be high or low.
- If a value is entered for the **Stop after ... Cycles** option, signal generation will be stopped after the entered number of cycles. If no value is entered or if it is **0**, the time slice will run continuously.

Module Installation and Configuration (General Hints)

Control Modules
Module Selection Menu

Stop
Module

This module can pause or stop the entire measurement if certain predefined conditions are fulfilled.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	any

This module can pause or stop a running measurement following conditions dependent on the data values. The effect is the same as pausing or stopping the measurement using menu commands or their corresponding function bar icons.

Action determines whether the measurement is to be paused or stopped.

The action itself will be performed as soon as the defined conditions are fulfilled:

- **Blocks** after the defined number of data **blocks** (entered as **Parameter**)
- **Samples** after the defined number of **samples** (entered as **Parameter**)
- **secs / mins / hrs** after the defined **time** (entered in the selected unit as **Parameter**)
- **Low Level** at a **TTL low** level of 0.8 (no **Parameter** necessary; same as **Below Limit** with **Parameter** set to 0.8)
- **High Level** at a **TTL high** level of 2.0 (no **Parameter** necessary; same as **Exceeding Limit** with **Parameter** set to 2.0)
- **Below Limit** if signal values fall **below** the defined level (entered as **Parameter**)
- **Exceeding Limit** if signal values **exceed** the defined level (entered as **Parameter**).
- **Never** The action will not be performed at all (no operation). (no **Parameter** necessary)

Module Installation and Configuration (General Hints)

Control Modules
Module Selection Menu

10.12.94

Display
Module Group

This group consists of modules which display or present data.
Each module from this group provides an additional display window to display the data.

Y/t Chart

X/Y Chart

Chart Recorder

Analog Meter

Digital Meter

Bar Graph

Status Lamp

List Display

Special Display Module Features
Customizing the Display Windows
Module Selection Menu

Display Modules

The modules of the Display module group differ from other modules. After selecting a **Display** module from the Module menu or the module bar, it appears with **two** elements: a **worksheet symbol** on the worksheet and an **icon** at the bottom of the screen.

- The **worksheet symbol** is integrated into the worksheet and connected to the other modules by data channels.
- The **icon** represents a **separate window,** which you must **restore** (or "open") whenever you wish to use the display function during an experiment.
  - The display windows present data blocks in a graphical or numerical way.
  - The display windows of some **Display** modules have separate **menu systems** to select display options or functions.
  - While the experiment is running, some of these display options can be influenced by Event-driven Actions if a specified event occurs.
  - The text and numerical value **format** of the display windows is basically determined by the International Settings as specified in the Windows **Control Panel.**

You can integrate several **Display** modules of the same type in one worksheet. Each of them has its own module name for easy identification.

Customizing the Display Windows

Y/t Chart
Module

In a separate Y/t Chart Display Window, this module displays blocks of data as time or frequency dependent curves.

In the worksheet, this module can have up to **16** signal inputs.

Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	none or same as inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module is most useful for displaying **fast** data, since it always processes at **least one complete block** of input signals to display at one time. Using it with very slow signals may cause long acquisition pauses. For slower data inputs, the Chart Recorder module would be more appropriate.

Module Configuration

Global Settings

These settings apply to **all** activated channels.

- You can specify the Display Width and X (Time) Scaling.
- If **Auto Scaling** is selected (in the Display menu of the display window), all values of the data block are tested for maximum and minimum values before they are displayed. The chart is scaled and displayed using these values.
  Use this function to ensure that peaks will be displayed regardless of value.
  Note that the scaling can change continuously and will slow down the display speed.
- Set **Zooming Options** to constrain how zooming expands the display area:
  - **X and Y Direction**
    The display area is expanded exactly as selected.
  - **Only X Direction**
    The display area zooms only in **horizontal** direction as selected. The scale of the Y axis remains as defined.
  - **Only Y Direction**
    The display area zooms only in **vertical** direction as selected. The scale of the X axis remains as defined.
- The **number of curves** to be displayed can be chosen using the channel bar.
- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.

- The switch **Display Channel** activates or deactivates the display of the currently selected channel.
- The **Unit** and Amplitude Scale can be specified.
- If you choose the **logarithmic scaling,** the Y axis is scaled using a logarithmic scale. Use this option, for example, to display FFT data channels.

Display Window

The data values from all the module entries will be displayed in a display window tagged with the same module name. TheY/t Chart Display Window can be opened by double-clicking its icon at the bottom of the desktop.

The **global parameters for the display** can be entered in the **module configuration** dialog box. These parameters define the scaling of the X (time) axis and the types of X axes, as well as curve-dependent values including amplitude scaling and the selection of units.
The **number of curves** to be displayed can be chosen using the channel bar.

Some of these parameters may also be modified in the display window menu system. These menus offer several additional display options, including the selection of **colors, fonts** or **line styles.** In addition, all the necessary commands for interactive graphical analysis of curves, like zooming or measuring cursors, are available.

Attention: **DASY*Lab*** distinguishes between different types of data: time-dependent, frequency dependent, histogram, continuous, or triggered data. Signals of different types cannot be displayed simultaneously in one **Y/t Chart** display window.
If your experiment setup yields data signals of different types which you wish to display, use at least one **Y/t Chart** module for each type.

Module Installation and Configuration (General Hints)

Customizing the Display Windows

Display Modules
Module Selection Menu

Y/t Chart Display Window

This is the display window associated with the Y/t Chart module.

It can display up to **16** signal curves simultaneously in one chart.

The data values are always displayed in blocks. As soon as a new block is complete, the previous display is deleted and the new values are displayed.

The display style and interactive graphic commands can be chosen from the menu or the function bar.

Axes

Time Scale

Y Scale

Scaling Options

Display

One Chart

Mutiple Charts

Only Curves

Waterfall

Setup Waterfall

Colors and Lines

Font Style

Copy to Clipboard

Print

Grid

Function Bar

Display Y Unit

Show Legend

Show Header

Setup Legend

Setup Header

Survey

Freeze

Continue

Zoom

Unzoom

Cursor

Extended

Horiz.Cursor

Text

Show

Font, Color and Frame

Edit New Text String

Delete All Text Strings

Customizing the Display Windows

Y/t Chart Module

Time Scale Y/t Chart

These settings modify the scaling options for the X axis of the diagram.

All the displayed curves use one joint X axis. It may be chosen either from the module configuration dialog box of the Y/t Chart module or from the menu or function bar of the corresponding Y/t Chart display window.

These options for scaling the X axis are available:

- **Running Time Scale**
  This option sets the X axis labeling to seconds, minutes and hours from the start of the measurement. The X axis will be updated for each block.
- **Fixed Time Scale**
  This time scale uses the internal time scale of each displayed block. The axis will be the same for each block starting at 0.
- In addition, the duration of the interval to be displayed at one time can be specified in the dialog box.
  The input can be switched between **blocks** and **seconds**.
  The default is the display of exactly one block.
  - If the length is entered in **blocks,** the corresponding number of blocks will be collected and displayed simultaneously.
  - If the length is entered in **seconds,** data will be collected and displayed according to the defined time.

  If the display interval is too short to contain more than one sample, every sample will be displayed as a straight horizontal line.

You can switch between the scaling options while the experiment is running.

The maximum number of samples which can be simultaneously displayed in one curve is **60,480.**

Note: While a minimum limit does not exist, only one line for every sample is drawn if the chosen display width is less than or equal to the sampling rate of a data channel. The maximum setting depends on the sample distance of the display channels. A maximum of **60,480** data values per channel can be displayed. The experiment stops with an error message if the number of blocks or time specification is too large, causing more than 60,480 data values to be displayed.

Y/t Chart Display Window

Amplitude Scaling

Choose this command to define the scale ranges for each curve.

- The left part of the dialog box displays the channel list. Each channel activated in the module configuration dialog box is represented as **Input X** (X denoting the number of the activated channel).
  In that list, select (highlight) the channel whose settings you wish to modify.

\> For **X/Y Charts,** only every second input is offered for selection, as only these inputs are scalable in the Y direction.

- The boxes on the right of the dialog box display the scaling parameters for the highlighted channel. The values for the **Lower** and **Upper Limits**, the Channel Name and the channel **Unit** can be entered in these boxes.
- If you deactivate **Display Channel,** that curve will not be drawn, and the drawing area for that curve will remain empty (although signals are correctly received at the module input). If you have selected that channel's scale to be displayed, it will still be provided in the display window in the One Chart mode (although none of the traces actually drawn might really refer to it).
  If you choose the **logarithmic scaling,** the Y axis is scaled using a logarithmic scale. Use this option, for example, to display FFT data channels.

\> If only one Y scale, but several channels are displayed in one **Y/t Chart** module, you can select a single channel to display its scale by clicking the **left** mouse button inside the corresponding color or legend area (fast switch).

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Scale Assignment

Use this dialog box to determine how many scales, and which ones, are to be provided in the display window.

These settings affect multi-trace display, where more than one channel has been activated for display. Only the One Chart mode will be affected, unless you turn scaling off completely.

Up to four different amplitude scales can be assigned for each display window. These scales can be related to the inputs which are to be displayed. The scaling boundaries of these curves are then displayed on the related scales.

In the Multiple Charts mode, an appropriate scale (derived from the display range values in the Amplitude Scale dialog box) will always be placed next to the curve display to which it belongs.
In the One Chart mode, no more than **four** different scales can be activated (to leave enough space for the drawing area). The scales will be arranged next to each other on the left and on the right of the drawing area for the concentrated traces.

- The left part of the dialog box displays the channel list. Each channel activated in the module configuration dialog box is represented as **Input X** (X denoting the number of the activated channel).
  In that list, select (highlight) the channel you wish to assign to a scale. (Note that those already assigned cannot be reused.)

> For **X/Y Charts,** only every second input is offered for selection, as only these inputs are scalable in the Y direction.

- Then press one of the four arrow buttons on the right. At first, you must assign the scales in ascending order. But once they have been assigned a channel from the list, you may change any entry anytime.
- To turn a scale off, choose **Off** in the channel selection list and "assign" it to that scale. You can only turn the **last** of the assigned scales off. If you turn them all off one by one, no scale will be displayed.

Attention: A scale selected here will be displayed even if the associated graph is not displayed because you have deactivated **Display Channel** in the the Amplitude Scale dialog box.

Attention: As a consequence of the restriction of four scales in the **One Chart** mode, there may be traces drawn in the drawing area for which exact scaling is not possible, as their corresponding scales cannot be displayed. Their values may differ considerably from the values which those scales suggest that *are* displayed.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

One Chart / Multiple Charts

One Chart / combined diagram of all the traces

Multiple Charts / individual diagram for each of the traces

- In the **One Chart** mode, all the curves will be displayed in one combined diagram. The individual traces may cross each other.
  - The advantage of this mode is that maximum resolution of the amplitude is available for each curve.
  - Its disadvantage may be that the diagram becomes confused and that not every scale will be displayed.
- In the **Multiple Charts** mode, each curve is assigned its own area in the display window. This enhances the clarity of the display, but the resolution of the amplitudes may be poorer.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Only Curves

This command enables you to turn off the scale display and to display just the curves.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Waterfall Display

This command switches the **Waterfall** mode on or off.

Instead of being completely deleted after each block, the traces are shifted slightly to the upper right, and the trace for the new block will be added to the diagram. As a result, the individual blocks will create a waterfall display of the whole signal.

Waterfalls cannot display more than one signal. If the **Waterfall** switch is used in a diagram with more than one signal, only the first will be displayed.

The shape of the waterfall display can be modified by choosing the **Setup Waterfall** command.

- **Number of Stored Blocks**
  The number determines how many blocks or traces in the waterfall display will remain in the buffer memory for the reconstruction of the display when the window must be redrawn. (For example, redrawing is necessary whenever the window is resized and whenever an overlapping window is closed.)
- **Remove Hidden Lines**
  If this flag is set, the waterfall will be drawn without hidden lines. Removing hidden lines intensifies the 3D effect of the diagram.
- **X Shift Offset**
  Previous curves will be shifted to the right according to this parameter.
- **Y Shift Offset**
  Previous curves will be shifted upwards according to this parameter.

Y/t Chart Display Window

Colors and Lines

In this dialog box, you can modify the colors and line styles for all the elements of the display window.

To modify the settings for an object, the object must be first selected in the **Object List.** Depending on the object type, different options are available.

Click on the **Color** button to open the Windows color definition box for the selected object.

To modify the **Line Style** and **Thickness** of the actual traces, first select these items from the list; they are always represented as **Input X** (where X is the number of the activated channel).

> You can choose all the colors of the display window elements directly. Press the **right** mouse button inside a display element to open the **color selection** box.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Font Style

This command opens the Windows dialog box for font styles, where you can select the **font** and **font style** (plain, **bold**, or *italics*) as well as the **font size.**
These settings apply to the **scales** and to the displayed **units** (if they are to be displayed).

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Grid

This switch toggles the display of a grid in the diagram. The **Color** and **Line Style** of the grid can be selected in the Colors and Lines box.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Function Bar

The function bar displays icons which provide easy access to frequently used functions and options from the display window menus. Just click on the icon representing that function.
All the commands represented on the function bar are also available from the menus.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window
List Display Window

Display Y Unit

If this flag is set, the corresponding unit of each channel will be displayed in the list or chart.

- In a List Display, the unit is displayed underneath the channel name.
- In a Chart Display, the unit is displayed above the Y axis.

For displays with several charts, multiple charts mode will usually be more suitable.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window
List Display Window

Show/Hide Legend

The **Legend** function displays the channel name and the **unit** at the left bottom of the window. If the legend is hidden, only the channel numbers are displayed.

The **Setup Legend** menu function changes the display characteristics of the legend.

- The **Font** setting changes the font, style and size of the font. These settings determine the height and width of the legend area.
- The **Color** setting changes the color of the legend text.
- The **Unit** setting shows or hides the chosen unit after the channel name.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Show/Hide Header

The **Header** function shows or hides an additional text area at the top of the display window.

The **Setup Header** menu function changes the display characteristics of the legend text.

- The **Text** menu function allows you to edit the text string of the header.
- The **Font** setting changes the font, style, and size of the font. These settings determine the height and width of the legend area.
- The **Color** setting changes the color of the header text.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Copy to Clipboard

This command copies the contents of the window to the Windows clipboard. The curve or list will be copied including scaling information. The background color will be maintained (except for List Displays).

From the Windows clipboard, you can paste the diagram or list into other Windows applications or documents, including PaintBrush and Word for Windows. To do so, choose the appropriate command from the target application menu (usually **Paste** from the **Edit** menu).

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window
List Display Window

Print Display Window Contents

Choose this command to print the contents of the current window on the default Windows printer.

On black and white printers, the background color will be ignored, and all objects will be printed in black.

> Choose Page Format from the **File** menu to select additional information to be included in the printing and to specify the page layout and page frames.

> Choose Printer Setup from the **File** menu to select paper size and paper source, orientation, printer resolution, and specific settings for your active printer model.

> To activate a different printer model connected to your system, or to install and configure a new printer, choose the **Printers** option in the Windows Control Panel. Please refer to your Windows documentation for further information.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window
List Display Window

Freeze Display Window

This function freezes the current display. Although the measurement is continued, the diagram or list will not be updated until **Freeze** is turned off.

The Continue function unfreezes the display window.

This function is useful for detailed visual analysis with measuring cursors, or before zooming is performed.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window
List Display Window

Continue

This function continues the display in a frozen display window. The current data will be displayed again.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window
List Display Window

Zoom / Unzoom

Zoom

Unzoom

- When the **Zoom** button is pressed, a zoom cursor appears, and a zoom window can be defined in the diagram area by pressing the left mouse button and dragging the cursor.
  The coordinates of the zoom window will be used as the new boundaries for the axes.
  Zooming can be performed several times.
- **Unzooming** is independent of freezing.
  Unzooming always returns to the original scaling. You cannot unzoom in steps, even if you zoomed in steps.
  Continuing a frozen and zoomed display will not unzoom it.
- **Zooming Options** can be specified in the Y/t Chart configuration dialog box. You can constrain zooming to **Only X Direction, Only Y Direction,** or **X and Y Direction.**

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Measuring Cursor

This command inserts two measuring cursors into the diagram and opens a cursor window. The cursors can be positioned by dragging them with the mouse or by using the cursor keys of the keyboard.

The cursor window displays the current cursor values. If several traces are drawn in the display window, the cursor window offers a channel selection field.

- If the **Extended Cursor** mode is selected from the menu, additional calculated values will be shown.
- If **Horizontal Cursors** is selected from the menu, two horizontal cursors will be inserted in the display window in addition to the two vertical cursors.
- These values are **always** displayed in the cursor window:

Yn	the amplitude value under cursor **n** (**n** can be 1 or 2)
tn	the time corresponding to the position of cursor **n**
dt	the time difference between the two cursors
f	the frequency between the two cursors.

- The following additional values are **only** displayed in the **Extended Cursor** mode:

dY	the difference between the amplitude values
dY/dt	the mean slope between the cursor positions
Min/Max	the minimum and maximum of the interval between the cursors
Integral	the integral of the curve between the cursors
RMS	the **R**oot **M**ean **S**quare value between the two cursors.

Y/t Chart Display Window
Chart Recorder Display Window

Text

This function allows you to place up to 20 text strings onto the display window for documentation - such as before copying to the clipboard or before printing.

- Activate the option **Show** in the **Text** menu. You can now create a text string. You can freeze the chart, if desired, and you can also edit while the experiment is running.
- Choose **Edit New Text String** in the **Text** menu. Click the left mouse button at any place in the window. A separate dialog box appears, where you can enter the text string (up to 50 characters).
  Press the **OK** button and the new text will appear inside the display window.
  You can change the text position by clicking the left mouse button and dragging the text to any place in the window.
  Up to 20 text strings can be created.
- The appearance of the text string can be configured with the menu functions Font, Color and Frame.
- Print the chart with all text strings now, or copy it into the clipboard, freeze and unfreeze the display window or move the text strings, and so on.
- You can hide all the text strings by deactivating the menu function **Show** in the **Text** menu. The text strings are not deleted by hiding them.
- You can delete all text strings by choosing the menu function **Delete All Text Strings** in the **Text** menu.
- The text strings are not saved with the worksheet.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

Format Text

The **Text** menu provides functions to change the display characteristics of the
Text strings in a display window.

- The **Font** setting changes the font, style, and size of the font. These settings determine the height and width of the Text string rectangle.
- The **Color** setting changes the color of the text.
- The **Frame** menu function surrounds the text with a simple frame.
- For a 3D effect, activate the menu function **3D Frame**.
- After you activate the **Frame** function, you can change the **Frame Color**.

Y/t Chart Display Window
X/Y Chart Display Window
Chart Recorder Display Window

X/Y Chart

Module

In a separate X/Y Chart Display Window, this module displays blocks of two dependent signals as an X/Y plot.

In the worksheet, this module can have up to **8 pairs** of signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 8 pairs
Input Block Size:	any
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	any

This module displays blocks of two dependent signals as an X/Y plot. The data values are displayed as complete data blocks.

Module Configuration

Global Settings

These settings apply to **all** activated channels.

- You can configure the scaling of the X axis and the Y axis.
- Use the display option **Delete Curves after n Blocks** to display more the one data block in a window, without deleting previous curves. The display window is reset before displaying the **n+1st** curve.
- The **X Unit** and X Scale can be specified.
- If you choose **logarithmic scaling,** the Y axis is scaled using a logarithmic scale.
- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.

- The switch **Display Channel** activates or deactivates the display of the currently selected channel.
- The **Unit** and Amplitude Scale can be specified.
- If you choose the **logarithmic scaling,** the Y axis is scaled using a logarithmic scale. Use this option, for example, to display FFT data channels.

Display Window

The data values from all the module entries will be displayed in a display window tagged with the same module name. The X/Y Chart display window.can be opened by double-clicking its icon at the bottom of the desktop.
Some of these parameters may also be modified in the display window menu system.

Attention: DASY*Lab* distinguishes between different types of data: time-dependent, frequency dependent, histogram, continuous, or triggered data. Signals of different types cannot be displayed simultaneously in one **X/Y Chart** display window.
If your experiment setup yields data signals of different types which you wish to display, use at least one **X/Y Chart** module for each type.

[Module Installation and Configuration (General Hints)](#)

[Customizing the Display Windows](#)

[Display Modules](#)
[Module Selection Menu](#)

X/Y Chart Display Window

This is the display window associated with the X/Y Chart module.
It can display up to **8** pairs of dependent signals as X/Y diagrams.
The display style and interactive graphic commands can be chosen from the menu or the function bar.

Axes

X Scale
Y Scale
Scaling Options

Display

One Chart
Mutiple Charts
Only Curves
Colors and Lines
Font Style
Copy to Clipboard
Print
Grid
Function Bar
Display Y Unit
Show Legend
Show Header
Setup Legend
Setup Header

Survey

Freeze
Continue
Zoom
Unzoom

Text

Show
Font, Color and Frame

Edit New Text String

Delete All Text Strings

Customizing the Display Windows

X/Y Module

X Axis Scale X/Y Chart

This function determines the scaling of the X axis in an X/Y Chart display window.

All X channels are scaled with the chosen X scaling.

You can select the **Unit**, the display limits **Display from...** and **Display to...** and the display mode **Logarithmic Scaling**.

Chart Recorder

Module

In a separate Chart Recorder Display Window, this module displays curves of data acquired at a low speed.

In the worksheet, this module can have up to **16** signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	any

This module works with complete blocks of data, but continuously shifts the displayed curve from the right to the left. It may be used to display the current value of a signal together with its history.

Module Configuration

The **module configuration** dialog box can be opened by double-clicking on the module symbol.

Global Settings

These settings apply to **all** activated channels.

- Choose the display size with the Display Time parameter. (You can also change the parameter using the display window menu.)
- The **Display Area** selects the time area where the data is displayed. Enter a numerical value at the **Display Time** parameter, and the unit **Seconds**, **Minutes**, **Hours** or **Days.**
- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.

- The switch **Display Channel** activates or deactivates the display of the currently selected channel.
- The **Unit** and Amplitude Scale can be specified.

Display Window

The data values from all the module entries will be displayed in a display window tagged with the same module name. The Chart Recorder display window can be opened by double-clicking its icon at the bottom of the desktop.
Some of these parameters may also be modified in the display window menu system. These menus also offer additional display options.

Attention: A **Chart Recorder** cannot display frequency-dependent data or histogram data, but it can display continuous and triggered data simultaneously in one chart.

Module Installation and Configuration (General Hints)

Customizing the Display Windows

Display Modules
Module Selection Menu

Chart Recorder Display Window

This is the display window associated with the Chart Recorder module.
It can display up to **16** curves simultaneously in one chart.
The display style and customization commands can be chosen from the menu or the function bar.

Axes

Time Scale

Y Scale

Scaling Options

Display

One Chart

Mutiple Charts

Only Curves

Colors and Lines

Font Style

Copy to Clipboard

Print

Grid

Function Bar

Display Y Unit

Show Legend

Show Header

Setup Legend

Setup Header

Survey

Freeze

Continue

Zoom

Unzoom

Cursor

Extendt

Horiz.Cursor

Zoom between Cursor

Text

Show

Font, Color and Frame

Edit New Text String

Delete All Text Strings

Customizing the Display Windows

Chart Recorder

Time Scale Chart Recorder

These settings modify the scaling options for the X axis of the diagram.

All the displayed curves use one joint X axis. It may be chosen either from the module configuration dialog box of the Chart Recorder module or from the menu or function bar of the corresponding Chart Recorder display window.

These options for scaling the X axis are available:

- **Running Time Scale**
  This option sets the X axis labeling to seconds, minutes and hours from the start of the measurement. The X axis will be updated with every shift of the curves in the display.
- **Fixed Time Scale**
  This option fixes the starting point of the X axis at 0. The labeling will not change during recording.
- **Time of Day**
  Use this option to label the X axis with the current system time in the format of **hh:mm:ss**. The labeling will be updated with every shift of the curves in the display.

Attention: If the measurement has been paused and continued, it will be ignored for the labeling of the **Time of Day** axis.

- **Display Time**
  Choose the display time size of the **Chart Recorder.** The parameter can be entered in the units **Seconds, Minutes, Hours** or **Days**. The maximum display time refers to the data block size, sample rate and the available memory size.

The parameter **Start at Left** is selectable in the **Time Axis** field:

- If **Start at Left** is selected, the curve will be displayed from the left to the right without shifting until the right boundary is reached.
- Otherwise the display will start at the right boundary and shift the curve into the window.

Chart Recorder Display Window

Zoom between Cursor

If the Cursor function is active, you can zoom into the curve between the cursor pair. The zooming area is limited to the actual cursor positions.

Analog Meter

Module

In a separate display window, this module displays data from up to **16** channels.

In the worksheet, this module can have up to **16** signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module displays values in up to **16** channels in a separate display window.

Module Configuration

The **module configuration** dialog box can be opened by double-clicking on the module symbol **or** on the display window.

Global Settings

These settings apply to **all** activated channels.

- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.

- **Display from/to**
  These values limit the display range of the instrument. The parameter **from** refers to the lower, the parameter **to** refers to the upper range border.
- **Unit**
  Display the unit in the instrument.
- **Lower/Upper Mark**
  The color of the scale can be adjusted. If this function is active, the areas below and beyond the mark values are displayed in an additional color, making a simple limit control possible.
- The **Analog Meter** module displays one value from a block of data. The value to be displayed can be selected from the following options:

function	displayed value
Last	the **last** value of the current block
Minimum	the **minimum** value of the current block
Maximum	the **maximum** value of the current block
Mean	the **mean** value of the current block
RMS	the **R**oot **M**ean **S**quare value (**RMS**) of the current block

- **Mode**
  - Activate the **Trend** parameter to display two **arrows** in the display of the selected channel. If the displayed value differs from the new value, the color of the arrow changes. If the value is equal, no color change appears.
  - Activate the **Peak Hold** parameter to add an additional pointer marking the current **Maximum** and

Minimum values since the start of the experiment. The additional pointers are set to the inverse range maximum when the experiment is started.

Button

The buttons at the bottom of the dialog box open separate dialog boxes to configure the display window.

- Choose Options
  - to change the digits and decimals of the numerical value,
  - to show/hide the display of the channel name and unit,
  - to change the arrangement of the individual instruments if more than one channel is displayed.
- Select Color and Font to change the display of the text, pointers and numerical displays.

The **format** of the numerical values is based on the country-specific settings as specified in the **International** dialog box of the Windows **Control Panel.**

Display Window

Double-click on its icon to open the display window.
Click on the **right mouse button** to change color settings.

Module Installation and Configuration (General Hints)

Display Modules
Module Selection Menu

Options Analog Meter

You can select the following options to customize the appearance of the Analog Meter display window:

- **Numerical Value**
  - If **Show Digital Value** is activated, the current numerical value is displayed at the bottom of the instrument. The **Number of Digits** and the number of **Decimals** can be specified.
  - **With Unit** shows or hides the selected unit at the bottom of the instrument.
- **Display:**
  - If more than one instrument is activated in the module, you can change the **Number of Columns.** The arrangement of the individual instruments within the display window is determined using this setting.
  - **With Channel Name** shows or hides the channel name at the top of the instrument.
  - **Pointer Size** changes the size of all pointers in the display window.

Colors Analog Meter

You can define the colors of the Analog Meter. Click on one of the elements of the instrument to open the color selection dialog box.

- **Color Change**
  The scaling area above and below the selected limits is shown in the selected color. If values fall below or exceed the specified limits during the experiment, the color of the numerical output switches to the selected color.
- **Background**
  Select the color of the background of the **Numerical Value**, the channel name and the **Unit** display.
- **Text**
  Select the color of the output of the **channel name**, the **scale** and the **value.**
- **Drawing Elements**
  Select the color of the **pointer** and the **trend** display.
- **Peak Hold**
  Select the color of the maximum and minimum **Peak Hold.**

Font Analog Meter

Select the font used to display the channel name and the numerical values in the Analog Meter.
The font size is **not** adjustable. It is automatically adjusted to fit the window size.

Digital Meter
Module

In a separate display window, this module displays the numerical values of up to **16** input signals.

In the worksheet, this module can have up to **16** signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module is used to display up to 16 data channels as a **numerical display**, like the display of a digital meter, in a **separate window**.

Module Configuration

The **module configuration** dialog box can be opened by double-clicking on the module symbol **or** on the display window.

Global Settings

These settings apply to **all** activated channels.

- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.

- **Unit**
  Display the unit in the instrument.
- **Lower/Upper Mark**
  The coloring of the displayed digits can be adjusted. If this function is active, values above or below the set values are displayed in an additional color, making a simple limit control possible.
- The **Digital Meter** module displays one value from a block of data. The value to be displayed can be selected from the following options:

function	displayed value
Last	the **last** value of the current block
Minimum	the **minimum** value of the current block
Maximum	the **maximum** value of the current block
Mean	the **mean** value of the current block
RMS	the **R**oot **M**ean **S**quare value (**RMS**) of the current block

- Activate the **Trend** parameter to display an **arrow** in the selected channel if the displayed value differs from the new value. If the value is equal, no arrow is displayed.

Button

The buttons at the bottom of the dialog box open separate dialog boxes to configure the display window.

- Choose Options

    - to change the digits and decimals of the numerical value,
    - to show/hide the display of the channel name and unit,
    - to change the arrangement of the individual instruments, if more than one channel is displayed.
- Select Color and Font to change the display of the text and numerical displays.

The **format** of the numerical values is based on the country-specific settings as specified in the **International** dialog box of the Windows **Control Panel.**

Display Window

Double-click on its icon to open the display window.
Click on the **right mouse button** to change color settings.

Module Installation and Configuration (General Hints)

Display Modules
Module Selection Menu

Options Digital Meter

You can select the following options to customize the appearance of the Digital Meter display window:

- **Numerical Value**
  - The **Number of Digits** and the number of **Decimals** can be specified.
- **Display**
  - If more than one instrument is activated in the module, you can change the **Number of Columns.** The arrangement of the individual instruments within the display window is determined using this setting.
  - **With Channel Name** shows or hides the channel name at the top of the instrument.

Colors Digital Meter

You can define the colors of the Digital Meter. Click on one of the elements of the instrument to open the color selection dialog box.

- **Color Change**
  If values fall below or exceed the specified limits during the experiment, the color of the numerical output switches to the selected color.
- **Background**
  Select the color of the background of the **Numerical Value**, of the channel name and of the **Unit** display.
- **Text Output**
  Select the color for the **numerical output**.

Font Digital Meter

Select the font used to display the channel name and the numerical values in the Digital Meter.
The font size is **not** adjustable. It is automatically adjusted to fit the window size.

Bar Graph
Module

In a separate display window, this module displays data in bar graph form.

In the worksheet, this module can have up to **16** signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This module is used to display up to 16 data channels, in bar graph form, in a **separate window**.

Module Configuration

The **module configuration** dialog box can be opened by double-clicking on the module symbol **or** on the display window.

Global Settings

These settings apply to **all** activated channels.

- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.

- **Display from/to**
  These values limit the display range of the instrument. The parameter **from** refers to the lower, the parameter **to** refers to the upper range border.
- **Unit**
  Display the unit in the instrument.
- **Lower/Upper Mark**
  The color of the displayed bar can be adjusted. If this function is active, the bar area above or below the marks are displayed in an additional color, making a simple limit control possible.
- Three different bar graph **styles** can be selected:

function	Values will be displayed by ...
Bar	... a vertical bar.
Triangle	... a small triangle pointing at the scale.
Thermometer	... a vertical bar in the shape of a thermometer.

- The **Bar Graph** module displays one value from a block of data. The value to be displayed can be selected from the following options:

function	displayed value
Last	the **last** value of the current block
Minimum	the **minimum** value of the current block
Maximum	the **maximum** value of the current block
Mean	the **mean** value of the current block
RMS	the **R**oot **M**ean **S**quare value (**RMS**) of the current block

- Activate the **Trend** parameter to display an **arrow** in the selected channel if the displayed value differs from the new value. If the value is equal, no arrow is displayed.

Button

The buttons at the bottom of the dialog box open separate dialog boxes to configure the display window.

- Choose Options
  - to change the digits and decimals of the numerical value,
  - to show/hide the display of the channel name and unit,
  - to change the arrangement of the individual instruments if more than one channel is displayed.
- Select Color and Font to change the display of the text, bars and numerical displays.

The **format** of the numerical values is based on the country-specific settings as specified in the **International** dialog box of the Windows **Control Panel.**

Display Window

Double-click on its icon to open the display window.
Click on the **right mouse button** to change color settings.

Module Installation and Configuration (General Hints)

Display Modules
Module Selection Menu

Options Bar Graph

You can select the following options to customize the appearance of the Bar Graph display window:

- **Numerical Value**
  - If **Show Digital Value** is activated, the current numerical value is displayed at the bottom of the instrument. The **Number of Digits** and the number of **Decimals** can be specified.
  - **With Unit** shows or hides the selected unit at the bottom of the instrument.
- **Scale**
  - Specify the scale of the bar graph. Possible scales are **Per Channel**, only **one** scale in front of the **1st channel** or a display completely **Without Scale**. The **Number of Characters** and the number of **Decimals** can be specified.
- **Representation**
  - If more than one instrument is activated in the module, you can change the **Number of Columns.** The arrangement of the individual instruments within the display window is determined using this setting. The number of **lines** will be computed from this setting and from the number of activated instruments.
  - **With Channel Name** shows or hides the channel name at the top of the instrument.

Bar Graph

Colors Bar Graph

You can define the colors of the Bar Graph. Click on one of the elements of the instrument to open the color selection dialog box.

- **Color Changes**
  If values fall below or exceed the specified limits during the experiment, the colors of the bar and of the numerical output switch to the selected color.
- **Background**
  Select the color of the background of the **Bar Graph Column,** of the **Numerical Value**, of the channel name and of the **Bar Graph.**
- **Text Output**
  Select the colors for the output of the **channel name**, for the **scale,** and for the **numerical output**.
- **Drawing Elements**
  Select the colors of the **Columns** and of the **Trend** display.

Font Bar Graph

Select the font used to display the channel name and the numerical values in the Bar Graph.
The font size is **not** adjustable. It is automatically adjusted to fit the window size.

Status Lamp

Module

In a separate display window, this module displays the alternating state of up to **8** input signals along with a state-specific alphanumeric string and status light.

In the worksheet, this module can have up to **8** signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 8
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

A **separate window** displays the alternating state of up to **8** input signals along with a state-specific text string and status light. The limit which causes the state change is the numerical value 1,5.

Module Configuration

The **module configuration** dialog box can be opened by double-clicking on the module symbol **or** on the display window.

Global Settings

These settings apply to **all** activated channels.

- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.

Channel Specific Settings

These settings apply to the selected channel only.
For each activated channel, this module shows the state of the digital input signal by displaying different lights and alphanumeric strings for low and high states.

Display Window

The data values from all the module entries will be displayed in a display window tagged with the same module name. The display window can be opened by double-clicking its icon at the bottom of the desktop.

For each channel, the display window contains its channel name, an area for displaying the status string, and the light symbol.

Module Installation and Configuration (General Hints)

Customizing the Display Windows

Display Modules
Module Selection Menu

List Display
Module

In a separate List Display Window, this module displays the values of its input signals in list form.

In the worksheet, this module can have up to **16** signal inputs.

 Click here for a survey of special display module features.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	any

This module displays numerical data in a table. Data values are updated in blocks, so only few values of large data blocks are displayed, depending on the window size and the selected module data buffer. If a small block size is selected (e.g. 1 or 2), the old list scrolls up and the new values will be added in the list.
This module can store 9,999 data values/channel.

Module Configuration

Global Settings

These settings apply to **all** activated channels.

- The option Copy Inputs to Outputs provides the module with one output for each activated input channel. Incoming data is provided unchanged at the output.
- **Memory** specifies the number of samples which are stored in the **List** module for each channel. The maximum memory size is 9,999 samples for each channel. This parameter also determines how far back you can scroll.
- If **Show Units** is activated, the physical units specified for each channel will be displayed above the corresponding columns of the list.

Channel Specific Settings

These settings apply to the selected channel only.

- The switch **Display Channel** activates or deactivates the display of the currently selected channel.

Button

- Choose Options
  - to change the number of digits and decimals of the numerical value,
  - to change data format between decimal, scientific or engineering notation.
  - to show/hide the time channel.

Display Window

The data values from all the module entries will be displayed in a display window tagged with the same module name. The List Display Window can be opened by double-clicking its icon at the bottom of the desktop.
Some of these parameters may also be modified in the display window menu system.

Module Installation and Configuration (General Hints)

Customizing the Display Windows

Display Modules
Module Selection Menu

Options List

You can select the following options to customize the appearance of the List display window:

- **Numerical Value**
  - **Characters**
    This display defines the number of characters to be displayed for each data channel. In addition to **Font** and **Font Size,** you can set the width of the display window. The text can have a length of 5 up to 20 characters.
  - **Decimals**
    Specify the number of decimal places (0 to 5) to be shown for normal measurement values.
  - **Memory Depth**
    This value specifies the length of the list.
    If this value exceeds the maximum number of values to be displayed, a scroll bar will be shown at the left side of the list box. Use this scroll bar to select the section of the list to be displayed.
    The maximum memory depth per channel is 9,999.
- **Output Format**
  Specify how the measurement value is to be displayed: in the **Normal Format,** in the **Exponential** or in the **Engineering Format**. The **Engineering Format** corresponds to the **Exponential** representation but as an exponent only 3 or a multiple thereof is used.
- **Representation**
  - **With Time Channel**
    Activating this switch displays a Time Channel in addition to the list of numerical values in the display window. With **Time Channel Type** the values to be displayed are specified.
  - **With Unit** shows or hides the selected unit below the **Channel Name**.

List Module

List Display Window

This is the display window associated with the List Display module.

It can display the values of up to **16** channels simultaneously in one list.

The display style and interactive commands can be chosen from the menu or the function bar.

Text

- List to Clipboard
- Print

Display

- Time Channel
- Freeze
- Continue
- Function Bar
- Font Style
- Text Color
- Background Color
- Show Unit

List Module

Time Channel List

A time channel for a data list can be defined in this submenu.

The time can be listed in three different modes:

function	displayed time value
Time of Day	the current time when the sample was acquired
Measurement Time	the elapsed time since start of the measurement
Sample Number	a continuous numbering of all the lines in the list

The time **format** of the **List** display window is basically determined by the International Settings as specified in the Windows **Control Panel.**

Color List

This command opens the color selection dialog box. The **List** module allows you to change the color of the displayed text and lines and the color of the background.

Font List

Select the font used by the List Module.
You can select the **Font,** the **Font Style** (plain, **bold**, *italics* and underlined) and the **Font Size.**
These settings apply to the displayed **characters** and the **title.**

10.12.94

Files
Module Group

This group consists of modules for reading and writing data.

Read Data

Write Data

Data Archiving

Module Selection Menu

Read Data
Module

This Module is not available in the Demo Version.

Module Installation and Configuration (General Hints)

File Modules
Module Selection Menu

Cut Out

This Module is not available in the Demo Version.

Write Data

Module

This Module is not available in the Demo Version.

Module Installation and Configuration (General Hints)

File Modules
Module Selection Menu

Multiple Files Write Data

This Module is not available in the Demo Version.

Write Data

ASCII Format Write Data

This Module is not available in the Demo Version.

Write Data

DASY*Lab* Format Write Data

This Module is not available in the Demo Version.

DADiSP Format Write Data

This Module is not available in the Demo Version.

DIA/DAGO Format Write Data

This Module is not available in the Demo Version.

Famos Format Write Data

This Module is not available in the Demo Version.

IEEE 32 Bit Format Write Data

This Module is not available in the Demo Version.

Remus Format Write Data

This Module is not available in the Demo Version.

Signalys Format Write Data

This Module is not available in the Demo Version.

Backup Data

Module

This Module is not available in the Demo Version.

File Modules
Module Selection Menu

10.12.94

Data Reduction
Module Group

This group consists of modules which reduce data in various ways.

Average

Block Average

Separate

Multiplexer / Demultiplexer

Cut Block

Time Slice

Module Selection Menu

Average
Module

This module calculates different average values of input signals.
In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any, but fixed
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size, or as specified
Max. Number of Modules:	any

The type of average and the number of samples to average can be specified in the module configuration dialog box:

- **Arithmetic Mean**
  - **Block Mean**
    The result of this function is one value for each block of **n** samples, where **n** is defined by **Average Samples**. This value equals the arithmetic mean of the block.
    This function performs a data reduction with a factor **n**. Use **Change Block Length** to change the output block length to the desired value.
  - **Running**
    This function calculates the running average over **n** samples, where **n** is defined by **Average Samples**. The start segment contains the mean of the first data sample.
    The number of output samples equals the number of input samples.
  - **Summing**
    For each sample, this function calculates the mean value of **all** the previous data. The number of output samples equals the number of input samples.
    Check **With Reset** to reset the internal value to 0 and to restart the computation periodically after every **n** samples. The value **n** is specified by **After ... Samples.**
- **Quadratic Mean**
  - **Block Mean**
    The result of this function is one value for each block of **n** samples, where **n** is defined by **Average Samples**. This value equals the quadratic mean of the block.
    This function performs a data reduction with a factor **n**. Use **Change Block Length** to change the output block length to the desired value.
  - **Running**
    This function calculates the running average over **n** samples, where **n** is defined by **Average Samples**. The start segment contains the mean of the first data sample.
    The number of output samples equals the number of input samples.
  - **Summing**
    For each sample, this function calculates the mean value of **all** the previous data. The number of output samples equals the number of input samples.
    Check **With Reset** to reset the internal value to 0 and to restart the computation periodically after every **n** samples. The value **n** is specified by **After ... Samples.**
- **Exponential Weighted Mean**
  With this function you compute the (running) mean with the following formula:

  $$s\,(\mathrm{Tau}, \mathbf{n}) = \mathrm{sqrt}\,(\exp\,(\mathbf{-k}) \ast \mathrm{sqr}\,(s\,(\mathrm{Tau}, \mathbf{n}\text{-}1)) + \mathbf{k} \ast \mathrm{sqr}\,(x(\mathbf{n}))\,),$$

  where
  - **n** is the sample number,
  - x(**n**) is the sample at sample number **n**,
  - **k** is the sample distance divided by Tau,
  - and Tau is the specified time constant.

Hint: Running values can be reset during an experiment by means of the event-driven actions.

Module Installation and Configuration (General Hints)

Data Reduction Modules
Module Selection Menu

Block Average

Module

This module calculates the block average of its input signals.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any, but fixed
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

This function calculates the arithmetic means of blocks. The output will always represent the mean value of the different blocks.

Example: block size 4, average of 3 blocks, single values

One new block will be calculated on the basis of the three blocks (a, b and c) as follows:
e1 = (a1 + b1 + c1) / 3
e2 = (a2 + b2 + c2) / 3
e3 = (a3 + b3 + c3) / 3
e4 = (a4 + b4 + c4) / 3

The following averages are provided:

- **Single Values**
  Each output block represents the mean of the specified number of input blocks (see example).
  Attention: The number of output blocks will be lower than the number of input blocks.
- **Running**
  This function recalculates the running mean for each input block. The output block always represents the current block mean of all the previous input blocks.
- **Running with Restart**
  This function works similarly to the **Running** average, except that a reset will be performed after **n** blocks, where **n** is the specified number of blocks.

Hint: Running values can be reset during an experiment by means of the event-driven actions.

Module Installation and Configuration (General Hints)

Data Reduction Modules
Module Selection Menu

Separate
Module

This module achieves data reduction

- by skipping an initial number of samples or blocks,
- then repeatedly passing one sample or block to the connected modules,
- then skipping a number of samples or blocks again.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size, entered block size
Max. Number of Modules:	any

- Behavior at **Start of Experiment**
  At start of experiment the specified number of samples or blocks (**Ignore ... once**) is skipped once. The next sample or block will be passed to the connected modules.
  With this function you can perform an initial skip.
- Behavior while **Experiment is running**
  After **one** sample (or block) has been **passed** to the module output, the number of samples (or blocks) specified under **Ignore ...** is read in but **not passed** to the connected modules.
  The next sample (or block) is passed again, then the defined amount of data is **ignored,** etc.

The **Output Block Size** can be set from 1 to 8,192 if the data reduction is based on samples and not on data blocks.

This module is very useful if you need channels with high and low acquisition rates in one flow chart. Most drivers only support equal sampling rates for all channels; then this module can perform the necessary data reduction for the slow channels very easily.

Module Installation and Configuration (General Hints)

Data Reduction Modules
Module Selection Menu

Multiplexer / Demultiplexer

Module

Using this module different data channels can be sequentially applied to **one** data channel, or the values of **one** data channel can be **distributed** to up to 16 channels.

Input and Output Characteristics

Number of Inputs:	up to 16, or 1
Input Block Size:	any
Number of Outputs:	1, or more
Output Block Size:	same as input block size
Max. Number of Modules:	any

Since this module provides **2 basic operations,** you must first select the function type when you install the module.

- **Multiplexer**
  With a **Multiplexer** module, **up to 16** channels can be multiplexed **onto one** channel.
  The number of input channels and the multiplex factor are set using the channel bar.
  The start time, the block size and the sampling rate must be the **same** for all channels. The generated channel will then have the same **block size**; the **sampling rate** is multiplied by the number of channels.
- **Demultiplexer**
  With a **Demultiplexer** module, **one** channel is distributed to a number of channels specified by using the channel bar.
  The **sampling rate** of the output channels is divided by the number of channels.

Use this module to route a large amount of data through one channel. The data can also be processed partially if a **Multiplexer** module is inserted at the beginning of the channel and a **Demultiplexer** module at its end. Thus the worksheet can be simplified to a large extent.

Module Installation and Configuration (General Hints)

Data Reduction Modules
Module Selection Menu

Cut Block

Module

With this module a specified range of values can be extracted **unchanged** from a data block and routed to the output. The remaining values are set to **0**.

One module can process up to 16 data channels with different settings.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

Use **Extraction** to specify the values for each channel which should be passed on **unchanged** to the output. All other values within the data block are set to **0**.

If the limits are set to a size exceeding the block size of the data channel, the data is passed on **without** any modification.

Example:	global block size:		**512**			
	data from sample no.		**10**	up to	**500**	
	>	the values	**1**	to	**9**	are set to **0**;
		the values	**10**	to	**500**	are passed on **unchanged**;
		the values	**501**	to	**512**	are set to **0** again.

This function can be used to extract only certain frequency parts of an FFT signal and pass those on for display or further processing.

Module Installation and Configuration (General Hints)

Data Reduction Modules
Module Selection Menu

Time Slice
Module

This module can combine signal segments from different channels by a defined time schedule.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	1
Output Block Size:	same as input block size
Max. Number of Modules:	any

The **Time Slice** module can be used to combine streams of different signals from several input channels according to the defined time slice.

Independent of the number of inputs, the module generates only one output signal, which consists of signal segments taken consecutively from the activated input channels. The first segment is always taken from module entry **0**, the second from module entry **1**, and so forth.

The size of these segments can be specified for each individual input channel in the module configuration dialog box. Their duration (or length) can be defined either as a period of time or as a number of blocks.

After one segment of the specified size from each activated input channel has been output, the first cycle is completed. The **Restart at the End of the Cycle** flag then determines the output signal:

- If this flag is **set,** another cycle will start beginning with a segment from channel **0**.
- If this flag is **not set,** the signal from the last activated channel will be output further.

Module Installation and Configuration (General Hints)

Data Reduction Modules
Module Selection Menu

10.12.94

Special Modules
Module Group

This group consists of modules for special purposes.

Black Box:

General Remarks

New Black Box

Export/Import Module

(Black Box Files)

Event-driven Actions:

General Remarks

Action

Message

further Special Modules:

Time Base

Signal Adaptation

Module Selection Menu

Black Box: Concept and Handling

With **DASY*Lab***'s Black Box concept you can set up worksheet elements which are repeatedly required in your experiments, integrate them into one module (the **Black Box**), save them to file, and insert them into future worksheets as ready-to-use units. Similar to an integrated circuit or subroutine, a **Black Box** module contains an encapsulated portion of the worksheet.
Using **Black Box** modules, you can easily implement standardized modules which perform custom algorithms not normally provided in **DASY*Lab***.
This modular concept helps to simplify and clarify even the most complex experiment setups by considerably reducing the number of elements (modules as well as data channels) to be installed and controlled in the worksheet. It also saves time, as subordinate standard tasks need not be set up from scratch again and again.

The **Black Box module** itself has an "inside" and an "outside":

- **Inside,** it contains a complete **worksheet,** with modules arranged on a workpad and connected with each other through data channels. The complexity of that worksheet is the same as that of any other **DASY*Lab*** worksheet. This means, for example, that it may contain **up to 256 modules**.
- **Outside,** the **Black Box** module looks like any other module on the worksheet of which it is an element. It can be installed and handled in a similar way, it may be configured with several inputs and outputs, and it can be connected to the other modules as usual.

Black Box modules offer some additional features:

- On a **Black Box** worksheet you can insert another **Black Box** module, which can then contain a **Black Box** module again, and so forth. Thus, the worksheet becomes three-dimensional in a way, with the **Main Chart** (on the actual **DASY*Lab*** work area) and several layers of subordinate **Black Box** levels, each one embedded into the preceding one.
- You can freely move up and down between levels using menu commands and a function bar icon.
- Data is exchanged between a worksheet and a **Black Box** worksheet embedded into it using the Export and Import module. This module may be provided with up to 16 inputs and outputs.
- Each **Black Box** module can be saved separately, so that you can easily edit, manage, and insert several of them independently.

Various menu commands are available to **create, save, open** and **edit Black Boxes**. These Help pages will give you further information:

Creating and Editing a Black Box

Export and Import Module

Opening and Saving a Black Box

Black Box Info

Leaving a Black Box

Special Modules
Module Selection Menu

Creating and Editing a Black Box

To insert a Black Box module into your worksheet, choose **New Black Box** from the **Special** module group on the Module menu. The **Black Box** module symbol appears on the **DASY*Lab*** work area like any other module, but at this initial stage it does not yet possess any input or output symbols.
(The **Black Box** module can also be integrated on the module bar to be easily inserted later on.)

Creating a Black Box Worksheet

Double-click the **Black Box** module symbol in the work area to open the **Black Box** module. Where other modules now display their module configuration dialog box, the **Black Box** module presents an **empty worksheet.** The work area looks like that of the main chart in **DASY*Lab*** except for the background color, which is different to indicate the new level.

In this work area, you can now create the **Black Box** worksheet by installing modules, configuring and connecting them in the usual way.

Like any other **DASY*Lab*** worksheet, a **Black Box** worksheet may contain **up to 256 modules,** among them any number of **Black Box** modules.
Further **Black Box** worksheets can be embedded down to any level.

Connecting the Black Box Worksheet to the Main Chart

Data is transferred between the main chart and the subordinate **Black Box** worksheet embedded into it using a special Export and Import module. This module can be selected in the usual way from the **Special** module group on the Module menu (or from the module bar).

Each **Black Box** worksheet can only contain **one Import** module and **one Export** module.

- The **Import** module provides **only outputs** (to deliver data **coming in** from the main chart);
- the **Export** module provides **only inputs** (to take up data **going out** to the main chart).

The module symbol of that **Black Box** in the preceding worksheet (of which the **Black Box** is an element) provides the corresponding number of input and output symbols respectively.

Configuration

A **Black Box** can have **up to 16 inputs** and **up to 16 outputs.** These are not selected using a **Channel Selection Bar,** as is the case with most of the other modules, but they are created automatically when **Export/Import** modules are installed on the **Black Box** worksheet.

The number of inputs is **independent** of the number of outputs; the input block sizes and input rates are independent of the output block sizes and output rates.

Returning to Preceding Black Box Levels

A **Black Box** may be closed either by clicking this function bar icon, or by choosing the corresponding command from the **Black Box Module** submenu on the Edit menu.
This command can have **two names:** It is either **Back to the Main Chart** (if the current **Black Box** is an element of the Main Chart), or it is **To Preceding Black Box Level** (if the current **Black Box** is itself an element of another **Black Box** worksheet).

Note: You can **enter** a **Black Box** (i.e. activate its worksheet for editing) **only** by double-clicking its module symbol on the worksheet.

Note: If you start an experiment from a **Black Box** worksheet, the program will first return to the Main Chart before acquisition begins.

Colors

By default, the worksheet of a new **Black Box** has a **blue background color.** But all the usual color settings can be selected for each **Black Box**. Choose the Colors command from the Options menu to do so.

These settings will also be saved with the **Black Box** worksheet.

Hint: It is a good idea to use the background color as an indicator of the **Black Box** level. You will make it easier to find your way through several worksheet levels without losing orientation by assigning a clearly defined background color to each of these levels. For example, a color code could be: the lower the level, the darker the color.

Module Bar

For each **Black Box** you can freely configure its own module bar. You can create several customized module bars specially adapted for each **Black Box** task, save them to files and open them again later on. Choose the commands from the Module Bar submenu on the **Edit** menu to do so.
These settings will also be saved together with the **Black Box** worksheet.

Black Box Overview

Special Modules
Module Selection Menu

Export / Import Module Black Box Module

This module provides the connection between a **Black Box** worksheet and the main chart (or the preceding worksheet) of which that **Black Box** is an element. It transfers data between these two worksheet levels.

To establish the connection, the module must be **present on both** worksheet **levels:**

- there is the **Export** or **Import** module symbol itself (in the **Black Box** worksheet);
- while the module symbol of that **Black Box** in the main chart provides the corresponding number of output or input symbols respectively.

This module can **only** be inserted into a **Black Box** worksheet. Choose **Export/Import Module** from the **Black Box** module group on the Module menu.
(The **Export/Import** module can also be integrated on the module bar to be inserted easily later.)

Each **Black Box** worksheet can contain only **one Import** module and **one Export** module.

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **two** function types:

- Import Data
  The **Import** module provides **only outputs** (to deliver the data **coming in** from the main chart).
- Export Data
  The **Export** module provides **only inputs** (to take up data **going out** to the main chart).

Up to **16** module entries or outputs can be activated.

Unlike most other modules, the number of inputs is **independent** of the number of outputs; the input block sizes and input rates are independent of the output block sizes and output rates.

Black Box Overview

Special Modules
Module Selection Menu

Export Module (Black Box)

Using this module, the **Black Box** transfers data from its own worksheet to the main chart (or the worksheet on the preceding level).

- The **Export** module provides **only inputs** (to take up the data **going out** to the main chart).
- The **Black Box** module provides the corresponding number of **outputs** (to deliver the data from the **Black Box** worksheet to the main chart).

Each **Black Box** worksheet can contain only **one Export** module.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	1

Export and Import Module
Black Box Overview

Import Module (Black Box)

Using this module, the **Black Box** receives data from the main chart (or the worksheet on the preceding level) to process in its own worksheet.

- The **Import** module provides **only outputs** (to deliver the data **coming in** from the main chart to the **Black Box** worksheet).
- The **Black Box** module provides the corresponding number of **inputs** (to take up data **from** the main chart and to transfer them to the **Import** module on the **Black Box** worksheet).

Each **Black Box** worksheet can contain only **one Import** module.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	any
Max. Number of Modules:	1

Export and Import Module
Black Box Overview

Saving and Opening a Black Box

Open

Black Boxes which are saved to files can be opened (inserted into a worksheet) in three different ways:

- The **first 20 Black Box** files in the **DASY*Lab*** directory automatically appear as menu items on the **Black Box Module** submenu of the Module menu. Simply choose the command to install that **Black Box** in your worksheet.

  Attention: **DASY*Lab*** can only list a **Black Box** file on that menu if a module name was entered for that **Black Box** before saving it.
- You can insert **any Black Box** - saved in any directory - into your worksheet by choosing **Open...** from the **Black Box Module** submenu of the Edit menu. The Windows file selection dialog box appears, displaying all the **Black Box** files (standard extension: **∗.DBB**) in the **DASY*Lab*** directory. You can then select or enter the name, directory, and drive of the file to be opened. For details, please see the Help page concerning the Open... command from the **File** menu.
- You can also include **Black Box** files - like any other module - in a custom module bar. If you click on a button in the module bar with the **right** mouse button, a dialog box will list all the modules available in **DASY*Lab*** including the **first 20 Black Box** files in the **DASY*Lab*** directory. Scroll through the list using the scroll bar, choose a **Black Box** by clicking it with the **left** mouse button, and choose **OK** to confirm your choice. The module bar button now displays the icon of the **Black Box** assigned to it.
  When you have customized your module bar, to add one of the **Black Boxes** to your worksheet just click the icon which symbolizes that **Black Box.**

Save

To save a **Black Box**:

- **First, open** the **Black Box** you wish to save. (The work area must display the **Black Box** worksheet. You cannot save a **Black Box** while the **DASY*Lab*** main chart is active.)
- Make sure you have entered a **Module Name** and an **ID Tag** in the Black Box Info dialog box.
  - **DASY*Lab*** can only list a **Black Box** file on the Module menu if a **Module Name** has been entered for that **Black Box** before saving it.
  - **DASY*Lab*** can only install a **Black Box** icon on the module bar if an **ID Tag** has been entered for that **Black Box** before saving it. If the identifying tag is missing, the **Black Box Info** dialog box will appear when you try to save the **Black Box**.
- Choose **Save As...** from the **Black Box Module** submenu of the Edit menu. The Windows dialog box appears, where you can then specify the name, directory, and drive of the file to be saved. **DASY*Lab*** automatically adds its standard extension for **Black Box** files (**∗.DBB**). For details, please see the Help page concerning the Save As... command from the **File** menu.

Attention: If you save a worksheet containing a **Black Box,** that **Black Box** will be completely included in the file, not just as a reference to a separate **Black Box** file.
If you modify the **Black Box** file independently, the **Black Box** embedded in the worksheet will **not be updated** automatically when you open it again. (You would have to delete the previous **Black Box** version from the worksheet and insert the new version then.)
The advantage of this system is that if you modify or delete the separate **Black Box** file, this will not cause errors in the worksheets incorporating (and possibly based on) the functions and settings of the original **Black Box**.

Black Box Overview

Special Modules
Module Selection Menu

Black Box Info

In this dialog box you can enter descriptive text and identifying tags for the **Black Box** module.

- The **Module Name** helps to identify the module symbol in the worksheet.
  - The **Black Box** module symbol in the main chart (or the preceding worksheet level) displays this name in its **title bar.**
  - The **first 20 Black Box** files in the **DASY*Lab*** directory automatically appear as menu items on the **Black Box Module** submenu of the Module menu. Their **Module Names** appear as **menu commands**.
- In the **Description** box you can enter a short comment on the functions implemented in the **Black Box**.
- The **ID Tag** is a string of **up to 3** characters. It is used to identify the **Black Box** module in the module bar. The module bar icon representing that **Black Box** displays that tag.

Attention: A **Black Box** can only be saved if an **ID Tag** has been entered. If the identifying tag is missing, the **Black Box Info** dialog box will appear when you save the **Black Box**.

Black Box Overview

Leaving a Black Box

A **Black Box** may be closed either by clicking this function bar icon, or by choosing the command from the **Black Box Module** submenu on the Edit menu.
This command has **two names:** It is either **Back to the Main Chart** (if the current **Black Box** is an element of the Main Chart), or it is **To Preceding Black Box Level** (if the current **Black Box** is itself an element of another **Black Box** worksheet).

After a **Black Box** has been closed, the worksheet on the preceding level is activated.

Note: If you start an experiment from a **Black Box** worksheet, the program will first return to the Main Chart before acquisition begins.

Note: You can **enter** a **Black Box** (i.e. activate its worksheet for editing) **only** by double-clicking its module symbol on the worksheet.

Black Box Overview

The Event-driven Actions Concept

The concept of event-driven actions represents a powerful new set of tools for the automation of actions in **DASY*Lab***. Based on user-determined conditions, a wide variety of module actions can be triggered, including hardcopy of **Display** instruments, resetting internal values of the **Mathematics** modules, logging of events etc.

Click here for a complete **overview** of the possible **actions**, of the **modules** which could trigger such actions and of the parameters required.

Sender / Receiver

An event-driven action involves 2 partners: a sender and a receiver.

The **sender** is an Action module which evaluates an incoming data channel with respect to various conditions. It **initiates** the desired action.

The **receiver** (specified in the **Action** module) is the module which performs the action or it is the main window in **DASY*Lab***.

The assignment of action and receiver is made in the **Action** module via the Module Name of the receiver. The assignment to the action is lost if the **Name** of a module performing an event-driven function is changed after setting the action.

Synchronous / Asynchronous Actions

There are two types of event-driven actions: **synchronous** actions and **asynchronous** actions.

- **Synchronous Actions**

  Synchronous actions are performed on the data block where the actions occurred. This requires that the data stream triggering the action must be synchronous to the data stream the action should influence.
  (For example, it is not possible to apply a synchronous action which has been initiated by a **Relay**-triggered data stream to an untriggered data stream. Such tasks are only suited for asynchronous actions.)

  Synchronous actions are reasonable in cases where actions must occur at an exact point in time in a data stream. A good example is the printout of a special data block.

  Further notes:

  - Synchronization has to be understood as an additional internal data channel and thus requires computing time even if no actions are initiated.
  - The action always relates to the beginning of the block if the position within the data block is of importance to a synchronous event (for example, at a resetting action).
  - The action is performed just once for the evaluated data block if the condition to initiate an action is satisfied within an evaluated data block more than once.
  - For synchronous actions, the data must arrive at the **Action** module and at the **Receiver** module with the same block start time. Otherwise, **DASY*Lab*** will generate an error message.

- **Asynchronous Actions**

  Asynchronous actions are performed immediately, disregarding whether the data initiating the action was already processed by the module which should perform the processing.
  (If, for example, the **Printing** action is sent as an asynchronous action to the **Y/t Chart** module, it could be that the corresponding data block is not being printed but an earlier or later data block.)

  Asynchronous events feature a larger flexibility and are faster in their execution behavior. Therefore, they should be used in such cases where the execution at the time of a certain data block is not required. A good example is the activation/deactivation of channels in a display window.

  Please note that the processing of asynchronous actions does **not** require any additional computing time if no action is initiated (with the exception of the **Action** module evaluating data, of course).

Action Module

Action List

Special Modules
Module Selection Menu

Action

Module

This module is used to initiate various actions in DASY*Lab* or in DASY*Lab* modules. Click here for more information on the Event-driven Actions concept.

Once integrated into the worksheet, this module can initiate up to 16 different actions via one data channel.

Input and Output Characteristics

Number of Inputs:	1
Input Block Size:	any
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	any

The **Action** module can initiate up to 16 different event-driven actions based on one input channel. Use the channel bar to specify the **number** of event-driven actions to be initiated.

The following specifications are required for each action to be initiated:

- the **Event** condition,
- the Receiver for the action,
- the Action itself and
- the action-depending Parameters.

Event

Use **Event** to specify the condition for which the input data block is evaluated. The following options are available:

Function	The action is initiated ...
Rising Edge:	... at the transition from TTL Low (numerical value 0) to TTL High (numerical value 5).
Falling Edge:	... at the transition from TTL High (5) to TTL Low (0).
Threshold Overflow:	... at exceeding the specified threshold value.
Threshold Underflow:	... at falling below the specified threshold value.
TTL High Level:	... at TTL High (5).
TTL Low Level:	... at TTL Low (0).
Input larger than Threshold:	... as long as the input value is larger than the threshold value.
Input smaller than Threshold:	... as long as the input value is smaller than the threshold value.
Start/Stop of Measurement:	... at the beginning and/or at the end of the measurement.
Always:	The action is constantly initiated.
Never:	The action is never initiated (NOP).

Threshold specifies the threshold value required for the corresponding conditions.

Note: Use the conditions **Rising/Falling Edge** and **Threshold Overflow/Underflow** as much as possible, since a hysteresis is applied to the condition.
For example, a slowly rising signal will trigger an action at the **Action** module with **Threshold Overflow** only if the threshold is really exceeded. The next action will only be triggered after the signal has dropped below the lower threshold and then exceeds it again.
With **Input larger than Threshold** in contrast, an action is initiated for every **block** for which at least one value is larger than the set **Threshold**. This means the action is initiated whenever a block exceeds the **Threshold** value and for every following block until the signal value falls below the **Threshold** value. Under certain circumstances this can initiate many undesired actions, requiring a significant amount of computing time.

Receiver

The **Receiver** entry specifies the module which is to execute the initiated action.

- In the pull-down list box **Module** all the modules in the worksheet (which can perform actions) are listed together with the main window of **DASY*Lab***.
- Use **Channel** to specify which channels of the selected module are to perform the actions. **Individual** channels can be separated with **spaces** or **commas**. **Channel groups** are entered with **hyphens**.

Example: To use the channels 1, 3, 7 and 9 up to 12 of the **Receiver** module for the event, enter:
`1 3 7 9-12` or `1,3,7,9-12`

This setting does not influence actions relating to the entire module.

Action

Specify the **Action** which is to be initiated if the set condition is satisfied.

- In the pull-down list box, all the actions are listed which the selected **Receiver** module can perform.
- After selecting an **Action,** you can specify whether it is to be performed synchronously or asynchronously.

If the **Receiver** module can only **asynchronously** perform the selected action, this setting is selected automatically. The **synchronous** option is disabled.

Parameter

If the selected **Action** requires additional settings, these can be entered using the Parameter item. This area of the dialog box contains options adapted to the selected **Action**. Depending on the selected **Action,** 1 **text** parameter, up to 4 **integer** parameters or up to 4 **floating point** parameters can be entered. Above each input, a header explains the purpose of the **Parameter**.

Event-driven Actions
Action List

Special Modules
Module Selection Menu

Action List

This is an **overview** of the event-driven actions, of the modules which can perform such actions and of the required parameters.

Action	Receiver	Description	Parameter
Select Window Arrangement	global function	activates previously stored display window arrangement	number of **Window Arrangement**
Load Worksheet	global function	loads another worksheet after stopping the current one	file name of the worksheet
Load and start worksheet	global function	loads and starts another worksheet	file name of the worksheet
Print Display Window Contents	**Y/t, X/Y, Chart Recorder, List**	prints contents of display window	---
To Clipboard	**Y/t, X/Y, Chart Recorder, List**	copies contents of display window to clipboard	---
One Chart	**Y/t, X/Y, Chart Recorder**	switches display mode to One Chart mode	---
Multiple Charts	**Y/t, X/Y, Chart Recorder**	switches display mode to Multiple Charts mode	---
Fade out Channel	**Y/t, X/Y, Chart Recorder, List**	deactivates the display of one or more channels	list of channels
Fade in Channel	**Y/t, X/Y, Chart Recorder, List**	activates the display of one or more channels	list of channels
Set Title	**Y/t, X/Y, Chart Recorder**	sets new title for the display window	any text
Reset	with the PID Control, Time Base, Arithmetics, Integral, Average, Statistical Values, Counter, Timer, Time Slice modules	resets the internal value	---
Set Value	Slider	sets the regulating value to a specific size	---
Set Value	Generator	sets, adds or multiplies frequency, amplitude or offset values	---
Message	Message	displays a **Message** and/or logs it (printer/file)	any text
Message with Acknowledge-ment	Message	displays a **Message** and/or logs it (printer/file). This message must be acknowledged by the user before it is erased from the screen.	any text
Next File	Write Data	switches to the next file in multifile mode	---

For some actions you can specify whether the action is to be performed synchronously or asynchronously.

Please refer to the notes in the README file since the features of this module are under constant development.

Action Module
Event-driven Actions

Message

Module

This module is used to display and output messages initiated by one or several Action modules.
This module does not have any inputs or outputs.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	---
Output Block Size:	---
Max. Number of Modules:	any

With the **Message** module you can receive text messages from **Action** modules and output those on the **screen** or on a **printer** or write the information into a **log file**.

Use **Options** to activate or deactivate additional global functions.

- **Manual Input for Messages** opens a text input window. Using this window, text messages can be generated without influencing the measurement execution speed.
  The text can be typed in at the **Message to be entered** field. After clicking on the **Send** button the message is sent to the connected module and the text is deleted from the input field.
- In the Action module you can select between normal text messages and text messages which must be acknowledged after their display in the message window.
  - With messages which must be acknowledged, a dialog box is displayed for acknowledging the message. Message and acknowledgment are logged in the log file and on the log printer.
  - If **Deactivate Acknowledgment** is selected, messages which must be confirmed are not required to be acknowledged any more. Messages are not logged in the log file if the message to be acknowledged is not confirmed until the occurrence of the next message.
- Use **Message Output Device** to determine to which output device the message will be sent. Any combination of output devices is possible.
  With **Options** specific settings for the output devices Message Window, Log Printer, and Log File can be made.

Special Modules
Module Selection Menu

Message Window Options

These options influence the appearance and the format of the text to be displayed by the Message module in the message window.

- Use **Window Options** to determine the behavior of the message window when new messages are coming in.
  Windows (starting with version 3.1) differentiates between two priorities for the display of windows: normal windows (which can overlap and cover each other) and constantly visible windows (e.g. Windows Clock or Help windows if the **Always on Top** setting is activated).
  - **Window Always on Top:** In any case the message window is displayed on top of all other windows (also on top of dialog boxes, menus etc.). Legibility is thus guaranteed.
  - **Open Window at Message:** The message window is displayed on top as soon as a new message arrives. A minimized message window (icon) will be enlarged.
- Use **History Options** to specify the representation of the window.
  - **Display only Last Message:** A new message will always overwrite an existing message. Thus, only one message is visible - the newest.
  - **Message with History:** All incoming messages are stored. You can page within the already received messages.
  - **Empty at Message Start:** At a stop or restart of the message the internal buffer of the message window is emptied. In the course of a measurement the buffer contents is preserved.
- Use **Additional Information** to select further information which will be displayed with the actual message.
  - **Date and Time:** The time the message came in will be displayed with the message.
  - **Time Representation:** The time the message came in can be output in **Real Time** (the current date and time) or as the elapsed **Time since Start of Measurement.**
  - **Message Number:** The number of the current message is logged.
  - **Sender Module:** The name of the module sending the message is output.
- Use **Text Formatting** to select whether the additional information is to be displayed **in a separate line** and whether an **empty line** is to be inserted between messages.
- Use the **Font** switch to select the font, the font type, the font size and the color. Use the **Color** switch to set the color of the background. By default, the messages are black on a white background.

Message

Log Printer Options

These options influence the appearance and the format of the text to be output by the Message module on the log printer.

For this function **DASY*Lab*** does **not** use the Windows Print Manager nor the default printer selected with the Windows Control Panel. The selected log printer is accessed **directly** and **immediately** for outputting a log message. The program does **not** wait until a page is full before it starts printing.

Note: A simple matrix printer or ink jet printer with fan-fold paper is certainly well suited for this application. Please note, however, that this printer must **not** be used for other applications at the same time.

- Use **Printer Options** to specify the settings for the connected log printer.
  - The communication port the log printer is connected to is selected with **Interface**.
  - With the settings **Lines per Page, Lines at Top of Page** and **Lines at Bottom of Sheet** you can influence the page format of the log printer. Please refer to your printer manual for the relevant information.
    DASY*Lab* always tries to print the entire message on one page. If the message does not fit completely onto the remaining lines of a page already printed on, **DASY*Lab*** will begin a new page for the new text.

    Tip: Select **72 Lines per Page** for a normal DIN A4 size sheet.
- Use **Additional Information** to select further information which will be printed with the actual message.
  - **Date and Time:** The time the message came in will be printed with the message.
  - **Time Representation:** The time the message came in can be output in **Real Time** (the current date and time) or as the elapsed **Time since Start of Measurement.**
  - **Message Number:** The number of the current message is printed.
  - **Sender Module:** The name of the module sending the message is printed.
- Use **Text Formatting** to select whether the additional information is to be printed **in a separate line** and whether an **empty line** is to be inserted between messages.

Message

Log File Options

These options influence the appearance and the format of the text to be output by the Message module into the log file.

- Use **File** to specify the name of the log file to be written.
- Use **File Options** to specify the behavior of **DASY*Lab*** at the start of a measurement. If **Stop if File exists** is selected, the measurement will not be started at all and a warning message will be displayed if the selected file exists.
- Use **Additional Information** to select further information which will be output with the actual message.
  - **Date and Time:** The time the message came in will be output with the message.
  - **Time Representation:** The time the message came in can be output in **Real Time** (the current date and time) or as the elapsed **Time since Start of Measurement.**
  - **Message Number:** The number of the current message is logged.
  - **Sender Module:** The name of the module sending the message is output.
- Use **Text Formatting** to select whether the additional information is to be output **in a separate line** and whether an **empty line** is to be inserted between messages.

Message

Time Base
Module

This module either extracts time information from a data channel or from the global sampling rate and applies it to the output.

Function Types

Since this module provides **different basic operations,** you must first select the function type when you install the module.
This module provides **two** function types:

- The first function type Extract Time Base from Data Channel provides a module **with inputs**. Time information is extracted from the data stream of **up to 16** data channels and for every data value it is applied as time value to the corresponding output.
- The second function type Generate Global Time Base provides a module **without inputs**. The time information is derived from the global acquisition rate.

Settings

Format sets the type of the output data per channel.

- **Measurement Time since Measurement Start** specifies the number of **days** which have elapsed since the start of the experiment as related to the current channel. Multiplied by 86,400 (seconds per day) this value will express the time in seconds.
- **X Base in Seconds, Hertz or Pieces** outputs ...
  - ... for the **first** function type, the additional information of the time, of the frequency or of the number of values for this channel. If, for example, frequency data of an FFT module is involved, the frequency of a value will be made available at the output.
  - ... for the **second** function type, the global time information in seconds.

  In addition, the output values can be **reset** after a **specified** number of blocks.

With this module various possibilities open up for further evaluation and control of sequences.

Special Modules
Module Selection Menu

Time Base extracted from Data Channel

This function type of the Time Base module extracts time information from up to 16 data channels and applies it to the output.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	same as input block size
Max. Number of Modules:	any

Generate Global Time Base

This function type of the Time Base module extracts time information from the global acquisition rate and applies it to the output.

Input and Output Characteristics

Number of Inputs:	---
Input Block Size:	---
Number of Outputs:	up to 16
Output Block Size:	same as global block size
Max. Number of Modules:	any

Signal Adaptation

Module

This module synchronizes data streams which have different sampling rates, block sizes or starting times.

In the worksheet, this module can have up to **16** signal inputs.

Input and Output Characteristics

Number of Inputs:	up to 16
Input Block Size:	any
Number of Outputs:	same as number of inputs
Output Block Size:	input block size of the first channel
Max. Number of Modules:	any

This module changes parameters like the block size, the sampling rate or the start time of a signal representation. The first channel (channel 0) is used as a reference. Its parameters are copied to all the other channels (channels 1 to 15).

This module does **not** perform any calculation of the signal, but it changes its internal representation.

In this version, three adaptation modes are provided. Please note that you cannot switch these modes while an experiment is going on.
You can choose one of the following modes:

- **Adapt Time only**
  DASY*Lab* provides its data blocks with a time stamp representing the start time of the block.
  Calculations like addition or multiplication can only be performed on blocks with equal parameters like the sampling rate, the start time and the block size.
  This mode synchronizes the **start time** only. It is useful if the other parameters are equal and interpolation calculations are to be avoided.
- **Full Interpolation**
  Many modules cannot process data blocks acquired at different sampling rates or block sizes if they have not been synchronized.
  The **Full Interpolation** option synchronizes differing data streams by interpolation, by modifying their block sizes or their sampling rates as much as necessary for further processing.
  The **first** channel (channel 0) is used as a **reference**.
- **Off**
  No changes are performed at all. Output data will have the same representation as input data.

Special Modules
Module Selection Menu

10.12.94

Experiment Menu Commands

The commands of this menu allow you to start, to pause and resume, and to stop an experiment. In addition, you can set hardware and global experiment parameters here.

The most frequently used commands of this menu can also be chosen by clicking the corresponding **icons in the** Function Bar or by using keyboard shortcuts.

Start Experiment F5

Stop Experiment CTRL+F5

Pause Experiment CTRL+F6

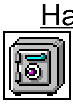
Resume Experiment CTRL+F6

Start/Stop Experiment at Time

Auto Start

Select Driver

Hardware Setup



Experiment Setup

Main Menu Options

Start Experiment

Experiment menu command: **Start**

Choose this command, or click the function bar icon, or press `F5`, to start an experiment.

Click these function bar icons, or choose the corresponding commands from the **Experiment** menu, or press the shortcut keys, to ...

stop the experiment **completely:**
Stop `CTRL+F5`

pause the experiment:
Pause `CTRL+F6`

resume the experiment:
Resume `CTRL+F6`

Experiment Menu Commands

Pause Experiment

Experiment menu command: **Pause**

Choose this command, or click the function bar icon, or press `CTRL+F6`, to pause an experiment.
(√ indicates that the experiment has been interrupted.)
This command stops the acquisition of **new** data, for example from a signal generator module, an A/D or digital input module, a PID or manual control. Data already acquired and still in the pipes will be retained, however, and processed completely.
The **Pause** command is available only if the worksheet does not contain any module accessing the data acquisition hardware. The reason is that **DASY*Lab*** derives its own clock from the board's master clock. This is not available if the measurement is paused. To **pause** a running experiment, use the Stop module.

Click these function bar icons, or choose the corresponding commands from the **Experiment** menu, or press the shortcut keys, to ...

resume the paused experiment:
Resume `CTRL+F6`

start a **completely new** experiment:
Start `F5`

stop the experiment **completely:**
Stop `CTRL+F5`

Experiment Menu Commands

Resume Experiment

Experiment menu command: **Pause**

Choose this command, or click the function bar icon, or press `CTRL+F6`, to resume an interrupted experiment. (√ indicates that the experiment has been interrupted and can be continued. After the experiment has been resumed, this menu command will be unselected.)
This command resumes the acquisition of **new** data, for example from a signal generator module, an A/D or digital input module, a PID or manual control.

Click these function bar icons, or choose the corresponding commands from the **Experiment** menu, or press the shortcut keys, to ...

pause the resumed experiment again:
Pause `CTRL+F6`

start a **completely new** experiment:
Start `F5`

stop the experiment **completely:**
Stop `CTRL+F5`

Experiment Menu Commands

Stop Experiment

Experiment menu command: **Stop**

Choose this command, or click the function bar icon, or press `CTRL+F5`, to stop an experiment completely. All data will be cleared from the pipes.

Click these function bar icons, or choose the corresponding commands from the **Experiment** menu, or press the shortcut keys, to ...

start a **completely new** experiment:
Start `F5`

pause the experiment:
Pause `CTRL+F6`

resume the paused experiment:
Resume `CTRL+F6`

Experiment Menu Commands

Start/Stop Experiment at Time

Experiment menu command: **Start/Stop at Time**

Choose this command to start, stop, and repeat an experiment at a specified time.

The dialog box which opens when you choose this command provides three fields where you can specify the time at which an experiment is to start, the duration of that experiment, and the interval after which that experiment is to be repeated.

Before you can enter any values, you must first **select** the corresponding function by clicking its option button (**Start Experiment at Time,** and/or **Stop Experiment after Time,** and/or **Restart Experiment after Time**). A check mark (√) in the option button indicates that a function has been activated.
Then you can enter the time specifications:

- **Start Experiment at Time:**
  Specify the **point in time at which the experiment is to begin.** The default setting is the current date and time plus five minutes.
  You may either type the values for the date, the hour, the minutes, and the seconds, or you can press the UP ARROW or DOWN ARROW key to scroll, or you can choose the values from the drop-down list.
- **Stop Experiment after Time:**
  Specify the **duration of the experiment,** i.e. the space of time after which the experiment is to stop. The default setting is a duration of five minutes.
  Again, you may type or scroll through and choose the values.
- **Restart Experiment after Time:**
  Specify the **interval after which the experiment is to be repeated.** There is no default setting for this interval.
  Again, you may type or scroll through and choose the values.

  When this function has been activated, the experiment will be repeated according to the specified data until you
  - stop the experiment, or
  - de-activate this function by clearing the option button in this dialog box, or
  - modify the current worksheet, or
  - open or create another worksheet.

While any of the **Start/Stop by Time** functions is active, a message is displayed in the status bar reminding you of the time at which an experiment is due to start or stop.

Experiment Menu Commands

Auto Start

Experiment menu command: **Auto Start**

Choosing this option (indicated by √) prepares the **experiment setup** (the worksheet you have saved to file) for an automatic start later on. Enter the **DASY*Lab*** command **followed by the worksheet file name** (for example, in the **Command Line** box of the **Program Item Properties** dialog box of the Windows Program Manager) to start the experiment directly.

See Starting a **DASY*Lab*** Experiment Automatically for further hints.

The setting specified here is **not part of the worksheet file** when you choose the Save or Save As... commands from the **File** menu. However, it will be saved together with information about the window size and position when you exit the program.

Experiment Menu Commands

Hardware Setup

Experiment menu command: **Hardware Setup**

If you have installed a data acquisition board in your system, you must set its parameters in this box.

The values entered here **must correspond exactly** to the board configuration to ensure correct data processing by **DASY*Lab*.**

Choose **Hardware** from the **Help** menu to obtain further help on this box. The information you will find there refers to the data acquisition board type you have declared when ordering your **DASY*Lab*** version.

Experiment Menu Commands

Experiment Setup

Experiment menu command: **Experiment Setup**

In this box, set general parameters for data acquisition and measurement control.

Together with the resources provided by your system and the size of the worksheet you have designed, these settings have decisive influence on the overall data processing performance as well as on the response time of the individual functions.

The parameters to be specified here are:

- the sampling rate per channel (If you operate channels at differing sampling rates, enter the **highest** sampling rate here.);
- the global block size;
- the global settings for analog output and digital output;
- the **Synchronization** mode, which determines the clock source for all internal data sources of **DASY*Lab*** (**Generator, Slider,** etc.). The two modes available are **PC Clock** and **Data Acquisition Hardware**;
- options for Disk Streaming;
- the **Driver Settings,** which contain - depending on the installed hardware - the driver buffer size, the acquisition mode and the connected parameters **Blocks per Series** and **Delay**.

Experiment Menu Commands

Sampling Rate

Set the **Sampling Rate per channel** here.

The value entered here always defines the sampling rate for **all** the channels.

You can specify whether this value represents **Hertz, Kilohertz** or **Megahertz** or **minutes, seconds** or **milliseconds** respectively.

If you wish to operate channels at **lower** rates, you must reduce their data rate by using Separate or Average modules. However, this procedure always yields channel rates which are true divisors of the fastest rate (i.e. the global rate).

If you specify a sampling rate which is **too high** for the data acquisition board type in your system, or if the **overall sampling rate** is too high because you have specified too many channels at high sampling rates, you will be warned by **DASY*Lab*,** either before exiting this box, or before exiting the analog channel selection box. Automatically, the sampling rate will then be rounded up or down to the nearest accepted value.

With most of the data acquisition boards supported by **DASY*Lab*,** the sampling rate is generated by the board itself. It is therefore easily possible that you enter a **value not supported by the hardware.** However, these values will **automatically** be adjusted by **DASY*Lab*** without further information to the user.

If you use **interrupt driven boards** at acquisition speeds too high for the system, some interrupts and the corresponding samples may get lost. The indicator on the status bar at the bottom of the **DASY*Lab*** window, next to the buffer indicator, shows whether **DASY*Lab*** has detected such a situation: If this indicator flashes in yellow, interrupts have been lost. If the amount of lost samples is greater than 2%, the experiment is aborted.

Some boards cannot indicate lost interrupts by a hardware flag. In these cases **DASY*Lab*** tries to look for lost interrupts by software. This software solution cannot guarantee, however, that all lost samples will be detected. With these boards it is therefore possible that samples are lost without any indication.

Experiment Setup
Experiment Menu Commands

Driver Buffer

Specify the driver buffer memory size here which the acquisition board driver can use to store data temporarily. The value entered here is in kilobytes.

You can enter any driver buffer value between **4 KBytes** and **16,384 KBytes.** The default setting is **64 KBytes.** If the on-board memory resources of your computer are limited, you should enter a smaller value here. You will be warned if the value you have entered is not valid.

Experiment Setup
Experiment Menu Commands

Block Size

The **Block Size** determines the number of values that will be computed by the worksheet modules during a single processing cycle. Any value from **1** to **8,192** can be entered here, though powers of 2 are preferred.

The modules will not process the data **completely** until the number of values specified here has been provided by **all the inputs** of that module.

The concept of computing the data in blocks **increases** the **speed** of the measuring process considerably; on the other hand, it strongly influences the **real-time performance** of the system. Therefore, the block size should be selected with great care, taking these principles into account:

- **large block size** > long latency period (i.e. the response of ensuing modules - like control modules - will be slower)
  > high data transfer rate
- **small block size** > short latency period (i.e. the response time of ensuing modules will be shorter)
  > low data transfer rate

As the actual data transfer capacity of a system depends upon many factors, a general formula of how to determine the ideal block size cannot be provided.
As a general rule, it may be said that **fast** data acquisition operations require **large** block sizes, while **small** block sizes may be of advantage for **slow** data acquisition and control operations.

We suggest setting a block size of half the sampling rate for a start, then trying out various other values to find the best value for your individual task.

Experiment Setup

Acquisition Mode

Specify the **Acquisition Mode** here. The available modes depend on the installed hardware and the modes supported by the driver.

- **Continuous**:
  After the experiment start, the data will be acquired **without interruption** at the specified sampling rate and processed by **DASY*Lab*.**
- **One Series**
  After the start of the experiment, the data will be acquired without interruption at the specified sampling rate until a **certain amount of data** defined by the Blocks per Series setting has been reached.
- **Running Series**
  This mode is a repetitive **One Series** mode. After the specified number of blocks the acquisition is interrupted for at least the time specified by **Delay.** If the delay is too short for **DASY*Lab*** to process all the data, the acquisition will be delayed for a longer time.
  The delays are not recognized by the display instruments. This means that in this mode there is no time of day correspondence for the data.They are treated as **continuous** in **DASY*Lab***.
  This mode is especially useful for fast scope applications.
- **Isolated Series**
  This mode is essentially the same as the **Running Series** mode. The only difference is that the gaps are recognized by **DASY*Lab***. The resulting data stream is **not continuous.**

Quite obviously, this method leads to **acquisition gaps** between the blocks. Their size depends on the number of active channels, on the block size, on the complexity of the ensuing processing arrangement, and on the hardware resources.
This mode may be useful in cases where a high sampling rate is essential, while continuous high-speed data acquisition and processing cannot be realized, e.g. due to limited hardware resources.
If you wish the acquisition to stop after a certain time, enter the corresponding number of values in the **Count** field. (This value can be freely specified for each channel.) After that number of data has been acquired, the acquisition will be stopped automatically.
(The default setting for this field - **zero** - means that the acquisition process is **not** supposed to be aborted when a certain number of values has been acquired.)

Experiment Setup
Experiment Menu Commands

Analog Output and Digital Output

In this dialog box, set the general **output** parameters for **analog** and **digital** output **individually**.

- **Output Mode**

  The **Output Mode** determines whether the data are sent out **synchronously** at the acquisition rate, or **asynchronously,** which means as fast as possible but in undetermined intervals.
  - In the **synchronous** mode, data is sent out according to the acquisition rate specified for each output channel.
  - In the **asynchronous** mode, data is sent out as fast as possible. The maximum rate depends on your hardware, the speed of your PC and the complexity of the worksheet. You should experiment with these rates to find out the best combination for your individual task.
- **Output Buffer**
  - If the **Fill once** option is selected, the output buffer will be filled only once, with the **first** block of data coming in after the experiment start. When the buffer is full, that first block of data will be sent out repeatedly, always beginning with the first data again. Any further values coming in from the worksheet will be ignored.
  - If **Continuous refill** is chosen, the output buffer will continuously be filled with the data coming in from the worksheet, and these will then be sent out.
- **Output Rate**

  The output frequency defined in this list box only takes effect when the **synchronous** mode is selected.

  Only frequencies which are an integer divider of the global acquisition rate are allowed.

  Changing the global acquisition rate also affects the output rate.
- **Output Start**

  The value entered in the **Output Start** list box defines the number of samples which are to be collected before the analog output actually starts. This value must be the same as the global block size, or a multiple of it.

  This feature can be used for a defined delay or to synchronize the values which come from the worksheet.

Analog Output Module
Digital Output Module
Experiment Menu Commands

Disk Streaming

Using this menu item of the Experiment Setup window, the **fast storage of measurement values** can be enabled or disabled.

General Notes

Disk Streaming opens up an additional possibility to write **DASY*Lab*** data onto mass storage media. While the Write Data module writes data of the data stream of **up to 16** channels into a file, **Disk Streaming** stores the data of **all channels** in a highly compressed 2-byte integer format. Thus the amount of required storage space is reduced and the writing procedure is speeded up since only a fractional part of the data amount is produced. Additionally, the integer data of the driver need not be converted into the floating point data of **DASY*Lab***. This is the main reason why **Disk Streaming** can write data gathered at a high acquisition rate to the mass storage device. (No other channels should be connected to the A/D, Digital or Counter Input modules, since this would significantly reduce the time advantage.)

Activation

Disk Streaming settings are made entirely in the **Experiment Setup** dialog box.
In the lower part of the dialog box, **Disk Streaming** can be enabled or disabled. The name of the next **file** for storing data is displayed to the right of these buttons.
Select the **File Name** button to change the name of the streaming file. Then, a file selection window opens which contains all the provisions to enter a new file name.

You can set the default directory for disk streaming files in the **Options** menu.

Data is stored in the **DASY*Lab*** data format (universal format 0). (For a description of this data format, please see **chapter 6** of the Owner's Manual.)

Options

Using the **Options** button further settings can be made for **Disk Streaming**.

- **Stop if channels are connected**
  If this option is enabled, a warning message will be issued and the measurement will immediately be stopped if channels are connected to the **analog, digital** or **counter** inputs. All channels from all analog inputs on the worksheet are streamed rapidly to disk without connecting any wires. This check box will alert the user that wires are connected from some analog inputs and streaming to disk will be much slower.
- **Stop if file is to be overwritten**
  This option prevents overwriting an existing **Disk Streaming** file. If a file with the specified name exists and would be overwritten, the measurement will be stopped immediately after it has been started, and a message will be issued.
- **Ring Buffer**
  This option implements a buffer containing the last **n** measurement values per channel. **n** is specified at **Samples per Channel**.

Open Data Files

Disk Streaming files are opened - like other data files too - by using the Read Data module. If the file to be opened is a **Disk Streaming** file, the **Universal 0** format information is shown in the **Data Format** field of the **Read Data** module's dialog box. (**DASY*Lab*** data written without **Disk Streaming** are stored in the **Universal 1** data format.)
Using the **Channel Group** combo box you can select which channels you want to be read from the data stream: **Analog 0** identifies the first 16 scanned analog channels, **Analog 1** the next 16 scanned analog channels, and so on. The same applies to **Counter X.** For **Digital Port X** the selected port will always be displayed, as it was saved with the original worksheet.

Experiment Menu Commands

Automatic Program/Experiment Start

DASY*Lab* features several possibilities to start an **experiment** automatically. The following survey informs you about relevant **menu commands** which allow you to control an experiment automatically under **DASY*Lab***. In addition, you will find tips on how to set up automatically controlled experiments by making use of batch files and Windows resources.

Hint: The concept of event driven actions enlarges the capabilities of **DASY*Lab*** in the field of automatic measurement control. An Action module can react on detected events with certain activities, such as opening and starting a new worksheet, printing displays, resetting values etc.

Start/Stop via DDE

DASY*Lab* experiments can be controlled by other applications using DDE. (The menu command which had to be selected in former **DASY*Lab*** versions is no longer necessary.)
Additional information regarding DDE can be found in **Chapter 6** of the manual.
For demonstration purposes the **DASY*Lab*** disks contain a small Windows application using DDE to start and stop **DASY*Lab***.

Start/Stop at Time

Choose the Start/Stop at Time option from the **Experiment**-menu to start, stop, and repeat an experiment at a specified time.
The dialog box which opens when you choose this command provides three fields where you can specify the time at which an experiment is to start, the duration of that experiment, and the interval after which that experiment is to be repeated.

Using the Auto Start Function

Choosing the Auto Start option from the **Experiment** menu prepares the **experiment setup** for an automatic start later on.

- Activate the **Auto Start** option from the **Experiment** menu (indicated by √).
- Choose Save or Save as... from the **File** menu, or click the corresponding function bar icon, to **save** your worksheet.
- When you end your **DASY*Lab*** session, the setting of the **Auto Start** option will automatically be saved together with other window settings.
- When you **start DASY*Lab*** the next time, type its program file name at the command line **together with the file name of the worksheet** which is to be opened and activated automatically.

  Example: `DASYLAB D:\WRKSHEET\EXPMT1.DSB`

  where `WRKSHEET` is the directory on drive `D:` where your worksheet files are saved, and `EXPMT1.DSB` is the experiment setup file which is to be started automatically.

  Thanks to the **Auto Start** function, **DASY*Lab*** will not only open that worksheet, but it will also **start the experiment at once.**

You may now wish to customize this start-up mode to perfection:

- Create a **batch file** containing the command line described above (including the worksheet file name). Save it under a telling file name.
- Add the option to the **DASY*Lab*** icon displayed in the **Windows Program Manager,** or even create a **special icon** for that experiment to be always at hand in your **DASY*Lab*** program group in the Windows Program Manager:
  - Copy the **DASY*Lab*** icon in the **DASY*Lab*** program group of Windows Program Manager (press `F8`, or choose **Copy** from the Program Manager **File** menu).
  - Select this new copy by clicking it **once**, then press `ALT+ENTER`, or choose **Properties** from the Program Manager **File** menu.
  - Add the worksheet file name (including its path) to the **DASY*Lab*** command in the **Command Line** box of the **Program Item Properties** dialog box of Windows Program Manager, and close the box by pressing the `ENTER` key.
  - Thus you can even provide several **DASY*Lab*** icons with different worksheets and experiment

setups for automatic starts.

- You can now start any of these experiments directly by clicking the corresponding Program Manager icon (or by typing the batch file name).

Starting an Experiment at the same time as Windows

If you copy one of the experiment icons described in the section before to the AUTOSTART group of Windows Program Manager, the respective experiment will be started immediately **as soon as Windows is started.**

Starting an Experiment at the Boot-Up of your Computer System

If then you add the Windows command to your AUTOEXEC.BAT file, the experiment will even be started when you switch on your computer system. This offers you many interesting possibilities to perform measuring tasks automatically.

Main Menu Options

Select Driver

General Notes

DASY*Lab* supports a wide range of data acquisition hardware from different vendors. You will typically need a different hardware driver for each manufacturers data acquisition hardware. If you have more then one hardware driver installed on your system you may switch between them using the **Select Driver** function.

Note that only one driver can be used at a time.

Activation

The **Select Driver** dialog box lets you select one out of the installed hardware drivers. The change does not take place immediately, but only after leaving and entering **DASY*Lab*** once again.

Experiment Menu Commands

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View Menu Commands

The commands of the **View** menu allow you to change the appearance of the **DASY*Lab*** worksheet.

Some of these functions can also be chosen by clicking on the **icons** on the function bar.

Overview

Hide

Show Display Windows

Hide Display Windows

Animation

Function Bar

Module Bar

Save Window Arrangement

Select Window Arrangement

Delete current Window Arrangement

Main Menu Options

Overview

View Menu Command: **Overview**

Choose this option to display the **complete DASY*Lab* worksheet** at a **reduced size** in a separate window. (√ indicates that this function has been chosen.)
The additional display gives you an overview of your complete worksheet. However, you **cannot edit or change** it in that separate window.
The display is automatically scaled to the size of the worksheet to be presented.

The **DASY*Lab*** Screen
View Menu Commands

Hide

View Menu Command: **Hide**

Choose this function or click on the icon on the function bar, to reduce the **DASY*Lab*** worksheet window to its minimum size.

In its place, a minimized **control panel** appears which contains only the status bar (displaying the current time and the buffer status) and the control icons from the function bar, which allow you to start, stop, pause and continue the experiment.

Additionally, all **active** display windows (analog/digital meters, scopes etc.) are displayed on screen**.**

This option allows you to concentrate on those elements which are essential for the control and evaluation of the actual experiment.

You can **restore the original window size** by clicking the **Restore Size** arrow in the upper right hand corner of the control window.

> Please note that the effect of clicking this arrow may differ from the effect which you know from other Windows applications: The control window is not necessarily enlarged to full screen size, but only to the size the worksheet window had when the **Hide** function was chosen.

View Menu Commands

Show Display Windows

View Menu Command: **Show Display Windows**

Choose this function or click on the icon on the function bar, to **activate all the** display windows contained in the worksheet.
All the display windows still in icon form will be restored.

Attention: When you activate **several** display windows **of the same type** (eg. **Y/t Charts** or **Bar Graphs**) using this function, they will all be automatically opened in the center of the screen, on top of each other. Drag the top window to one side to view the next display window.

> To **restore only one** display window**,** double-click its **icon** at the bottom of the computer screen.

> To **minimize all** the display windows contained in your worksheet **simultaneously,** choose Hide Display Windows from the **View** menu, or click the function bar icon.

View Menu Commands

Hide Display Windows

View Menu Command: **Hide Display Windows**

Choose this function or click on the icon on the function bar, to **minimize all the** display windows contained in the worksheet. Each one is represented by an icon at the bottom of the screen.
All the activated display windows will be minimized.

> To **minimize one** display window **individually,** click its **Minimize** button (in the upper right-hand corner of the display window).

> To **activate all** the display windows contained in your worksheet **simultaneously,** choose Show Display Windows from the **View** menu, or click the corresponding function bar icon.

View Menu Commands

Animation

View Menu Command: **Animation**

Choose this option to switch the **animation** of the worksheet **on or off** (√ indicates that this function has been activated.)
When **Animation** is active, the data flow will be visualized by the small bar indicators below the output symbols of the respective modules.
Data may be processed slower with the **Animation** function activated, because graphics operations always require a considerable part of the system resources.

The **DASY*Lab*** Screen
View Menu Commands

Function Bar Display

View Menu Command: **Function Bar**

Choose this option to display the Function Bar below the main menu bar of the **DASY*Lab*** window. (√ indicates that this function has been chosen.)
To **enlarge** the work area for your worksheet,. remove the function bar from the screen.
To redisplay the function bar, choose this command from the **View** menu.

The function bar provides easy and convenient access to several functions which you may frequently require in your experiment: Just click the icon representing the function.

If you have removed the function bar, you can still use the functions by using the menu commands.

When the mouse pointer is pointing at a function bar icon, a little **QuickInfo** tag with the name of that function will appear. (You will find such tags in all of the module windows providing a function bar, such as the display windows of the Y/t Chart or the List Display modules.)

The **DASY*Lab*** Screen
View Menu Commands

Module Bar Display

View Menu Command: **Module Bar**

Choose this option to display the Module Bar on the left hand side of the **DASY*Lab*** window. (√ indicates that this function has been chosen.)
By removing the module bar you can **enlarge** the work area for your worksheet.
To redisplay the module bar, choose this command from the **View** menu.

The **DASY*Lab*** Screen
View Menu Commands

Save Window Arrangement

View Menu Command: **Save Window Arrangement**

By choosing this function or clicking the icon on the function bar, you can save the **sizes** and **positions** of all the activated display windows and define an identifying tag for that arrangement.

Using this function you can easily switch between different display window arrangements even while an experiment is running. You can save **up to 8** different display window setups.

To activate this function,

- click the above function bar symbol, or
- press `ALT+SHIFT+`**Arrangement Number** (`1-8`) on your keyboard, or
- choose the **Save Window Arrangement** command from the **View** menu.

The **Window Arrangement** dialog box appears, displaying the **Arrangement Number** and **Text** either of the current setup, or - if you have used the keyboard shortcut - of the setup whose number you have typed after `ALT+SHIFT`.

You can now save the current arrangement under any **Arrangement Number** from 1 to 8 and add a name or short description of your choice in the **Text** field. Click **OK**, or press `ENTER`, to complete the procedure.

If an arrangement has already been saved under this number, you will be warned.

The name or description you have entered in the **Text** field appears in the list of window setups on the function bar.

> Choose Select Window Arrangement to re-arrange the display windows in one of the ways you have saved before.

> Choose Delete current Window Arrangement to delete the current setup from the list of saved arrangements.

Customizing the **DASY*Lab*** Screen
View Menu Commands

Select Window Arrangement

View Menu Command: **Select Window Arrangement**

Choose this function to re-arrange the activated display windows on the screen in one of the arrangements you have saved before. Each of the activated display windows immediately appears in exactly the same **position** and **size** which has been saved.

Additional display windows (**not contained** in the arrangement when it was saved) remain in their positions while the others return to their defined places on the screen.

To activate this function,

- click on the list box on the function bar (or on the down arrow on its right), or
- press `ALT+0` on your keyboard, or
- choose the **Select Window Arrangement** command from the **View** menu.

In the function bar list box, the **name tags** of all the saved arrangements are listed. Click on the name of the arrangement which you want to restore, or choose that tag by pressing the arrow keys on your keyboard; then press `ENTER`.

Using a keyboard shortcut, you can select any of the saved arrangements **directly:**

- Press `ALT+`**Arrangement Number** (`1-8`).

Attention: If you restore one of the saved window arrangements as described, the sizes and positions of the **current** display windows will be lost, unless you have saved them under another **Arrangement Number.**

Attention: If you **delete** one of the display modules contained in the saved window arrangement from the worksheet, its display window is **irrevocably removed** from the saved arrangement, too. To restore the original setup, you must not only re-install the display module in the worksheet, but also save the display window arrangement again as it was before.

> Choose Save Window Arrangement to save the current **sizes** and **positions** of all the activated display windows.

> Choose Delete current Window Arrangement to delete the current setup from the list of saved arrangements.

Customizing the **DASY*Lab*** Screen
View Menu Commands

Delete current Window Arrangement

View Menu Command: **Delete current Window Arrangement**

Choose this function, or click the icon on the function bar, to delete the currently displayed setup of display windows from the list of saved arrangements.

Only the **information** concerning the **sizes** and the **positions** of the display windows are removed; the display windows themselves remain in the worksheet unchanged.

To activate this function,

- click the above function bar symbol, or
- press `ALT+STRG+`**Arrangement Number** (`1-8`) on your keyboard, or
- choose the **Delete current Window Arrangement** command from the **View** menu.

You will be asked to **confirm** your decision before the information is actually deleted.

> Choose Save Window Arrangement to save the current **sizes** and **positions** of all the activated display windows.

> Choose Select Window Arrangement to re-arrange the display windows in one of the ways you have saved before.

Customizing the **DASY*Lab*** Screen
View Menu Commands

Options Menu Commands

The commands of the **Options** menu allow you to change the display of the **DASY*Lab*** worksheet, select default directories for all the program and data files, switch the **Autorouter** function on and off, and define and edit passwords for your worksheets.

Window Setup

Default Directories

Colors

Autorouter

Password Protection

Password Definition

Main Menu Options

Window Setup

Options Menu Command: **Window Setup**

Choose this command to change your **DASY*Lab*** screen settings and program start options.

- **Window Type**
  Choose whether you wish the worksheet background to be a **grid**.
- **Type of Grid**
  If you have activated the grid, choose the **Type of Grid** in the next field:
  - **Dots:** Only the grid **intersections** will be marked by dots.
  - **Lines:** A **complete grid** will be displayed.
- **Spacing**
  Choose the measure for the screen grid in the next field.
  This is also the minimum **distance** between modules.
  The modules you install **afterwards** will be placed according to this setting (between 8 and 48 points).
  If you change the spacing value, this will **not affect** the existing worksheet. If, however, you **move** one of the original modules, it will be positioned according to the **new** settings.
  The distance selected here should not be less than **16** to leave enough space for the data channels between module symbols.
- **Start Options**
  - By default, a **DASY*Lab*** copyright information is displayed at program start. In the **Show Copyright Information** box you can choose if you wish this information to be displayed each time or not.
  - When you open a flow chart, the module bar settings which were saved with it will be loaded, too, possibly modifying the current module bar settings which you'd rather maintain.
    Activate the **Load Module Bar with Flow Chart** box if the current module bar configuration is to be **replaced** with the new one from the worksheet file.
    Deactivate this box if you wish to **retain** the current module bar configuration whenever you open a worksheet file.

The settings specified here are **not part of the worksheet file** when you choose the Save or Save As... commands from the **File** menu. However, they will be saved with information about the window size and position when you exit the program. When you start **DASY*Lab*** the next time, you will find the same work environment.

Customizing the **DASY*Lab*** Screen
Colors
Options Menu Commands

Default Directories

Options Menu Command: **Default Directories**

Using this menu item you can set and modify the **locations** of drives and directories which **DASY*Lab*** uses by default for loading or saving files. **Different directories** can be set up for various **file types**. When you select this menu item, a dialog box is opened, displaying each file type with the currently valid directory. The setup can be changed by clicking on the respective switches.

Default drives and default directories can be specified for the following file types:

Item	file type
• **Worksheet**	**DASY*Lab*** worksheet files (extension **∗.DSB**)
• **Streaming**	data files for fast disk streaming
• **Data**	data files of the Write Data module
• **Devices**	configuration files of the serial interface and of the IEEE interface
• **Other**	module bar, interpolation and other files

By clicking on a switch a dialog window opens allowing the selection of a drive and a directory. New directories can also be created here.

The drives and directories specified here are only used as **defaults.** If a file name must be assigned while working with **DASY*Lab*,** these pre-set locations are shown in the input window for the respective file type. If required, a different drive and directory can be selected.

After the initial installation the **DASY*Lab*** installation directory is taken for all default settings.

The settings made here are saved in the DASYLAB.INI file in the Windows directory.

Options Menu Commands

Colors

Options Menu Command: **Colors**

Choose the colors for your **DASY*Lab*** worksheet display. You can specify colors for the **background,** the **grid** and the data channels (wire **core** and **sleeve** separately):

- Select the item the color of which you want to change.
- Point to the color of your choice in the **Standard Colors** palette, and then click it using the left mouse button. Then click **OK.**
- If you prefer to create your own custom color, click Edit Colors.

The settings specified here are **not part of the worksheet file** when you choose the Save or Save As... commands from the **File** menu. However, they will be saved with information about the window size and position when you exit the program. When you start **DASY*Lab*** the next time, you will find the same work environment.

Customizing the **DASY*Lab*** Screen
Options Menu Commands

Edit Colors

Options Menu Command: **Colors** / **Edit Colors**

You can create custom colors for the **background,** the **grid** or the data channels (wire **core** and **sleeve** separately):

- Select the item you want to change.
- From the Standard Colors or the Custom Colors palette, choose the color you want to edit by clicking it using the left mouse button.
- Choose **Edit Colors.**
- - To increase or decrease the amount of primary color, brightness and/or saturation used in a color, drag the crosshairs and/or the vertical scroll bar with the left mouse button pressed.
  - Or type new numbers from 0 to 255 in the corresponding boxes.
  - The resulting custom color is displayed in the Custom box.
  - To reset all the values for the standard color which comes nearest to the custom color you have just defined, double-click the **Standard** box.
- Choose the **OK** button to change the color of the selected screen element to the custom color.
  To return to the color originally displayed on the screen, choose the **Cancel** button.

The settings specified here are **not part of the worksheet file** when you choose the Save or Save As... commands from the **File** menu. However, they will be saved with information about the window size and position when you exit the program. When you start **DASY*Lab*** the next time, you will find the same work environment.

Customizing the **DASY*Lab*** Screen
Options Menu Commands

Save Custom Colors

- To save the custom color you have defined for later use:
  - Click any of the boxes in the **Custom Colors** palette first.
  - Then modify its color as described above.
  - Click **Add Color to Palette.**
  - Specify further colors from the **Custom Colors** palette and modify them.
  - Choose the **OK** button to change the color of the selected screen element to the custom color. To return to the color originally displayed on the screen, choose the **Cancel** button.

Autorouter

Options Menu Command: **Autorouter**

Choose this option to switch the Autorouter function **on or off** (√ indicates that this function has been activated.)

- When the Autorouter is **active, DASY*Lab* automatically** finds the correct paths for your data channels. **DASY*Lab*** ensures that the data channels do not run across modules or hide other data channels. A control window on the Status Bar displays the progress of the autorouting operation.
- When the Autorouter is **not active,** you can determine the paths of your data channels yourself.

Please note that the Autorouter function **cannot** automatically rearrange existing data channels so that they will take the **shortest** or the **direct** way between modules. If, for example, you wish to rearrange a data channel or move a junction to a different position to improve the clarity of your worksheet structure, you must do this manually.

Creating data channels
Deleting data channels
Rearranging data channels
Options Menu Commands

Password Definition

Options Menu Command: **Password Definition**

This option allows you to protect a **worksheet** against unauthorized use or modification.

This protection is activated by:

- clicking the Password Protection command (√ indicates that this function has been chosen),
- specifying the password itself (using the **Password Definition** command),
- and then saving the worksheet.

Password Protection always affects the entire current worksheet.

If **Password Protection** has been activated and the worksheet has been stored, it can only be opened again by entering the correct password.

A password consists of **at least 4** and **up to 10** alphanumeric characters. If the number of entered characters is less than 4, a warning message will appear when you close the dialog box.

For security reasons the password must be entered **twice.** If the two entered passwords are not identical, they will both be deleted and you can enter them again.

While you type the password, the characters you are entering appear as stars (∗).

Please note that password recognition is **case-sensitive.**

A correctly entered password is valid until:

- you exit **DASY*Lab***, or
- a different password is entered, or
- you open a different worksheet requiring a (probably different) password, and you enter that new password correctly.

If **Password Protection** is activated without a password being entered at the same time, the user will be prompted to specify the password when the worksheet is to be stored.

Attention: If you have forgotten or do not know the password of a protected worksheet, you will not be able to use it again. Please take this into consideration when you choose a password, and take adequate precautions so that you will always remember your passwords.

Options Menu Commands

Password Protection

Options Menu Command: **Password Protection**

This option allows you to protect a **worksheet** against unauthorized use or modification.

This protection is activated by:

- clicking the **Password Protection** command (√ indicates that this function has been chosen),
- specifying the password itself (using the Password Definition command),
- and then saving the worksheet.

Password Protection always affects the entire current worksheet.

If **Password Protection** has been activated and the worksheet has been stored, it can only be opened again by entering the correct password.

This function is only relevant when you save a worksheet. It does not affect any other function or module.

Attention: If you have forgotten or do not know the password of a protected worksheet, you will not be able to use it again. Please take this into consideration when you choose a password, and take adequate precautions so that you will always remember your passwords.

Options Menu Commands

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DASY*Lab* Glossary

Click the term on which you would like to obtain further information.

Attention: A line indicates the end of each definition. If you cannot find the line at the bottom of a text box, your Help window is too small to display all of the text. Enlarge its size by dragging its borders or corners pressing the left mouse button, and click the term again.

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Autorouter

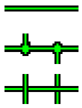
The Autorouter **automatically** finds the correct paths for the data channels. **DASY*Lab*** prevents the data channels from running across modules and from hiding other data channels.

When the Autorouter is **not active**, you can determine the paths of the data channels.

Please note that the Autorouter function **cannot** automatically rearrange existing data channels so that they will take the **shortest** or the most **direct** way between modules. If, for example, you wish to rearrange a data channel or move a junction point to a different position to improve the clarity of your worksheet structure, you must do this manually.

Related topics:
- Creating data channels
- Deleting data channels
- Rearranging data channels
- Options Menu Commands

Branches



data channel

junction points and branches

no connections

A branch is a data channel segment which branches off from another data channel at a junction point.
Branches allow you to **connect** the output of **one** module to the inputs of **several** other modules.
Data is transferred between modules via these connections.
Data channels and branches are symbolized by lines as shown above.

By creating branches each module output can be connected to **up to 16** inputs of other modules.

Related topics:

- Creating data channels
- Deleting data channels
- Rearranging data channels
- Autorouter

Clipboard

The following **DASY*Lab*** commands allow you to copy information from **DASY*Lab*** onto the Windows clipboard. (You can also click the function bar icons, which has the same effect but is much more convenient than choosing the commands from the menus.)

Worksheet to Clipboard (**Edit** menu command)

To Clipboard (**Display** menu command in the display windows of the Y/t chart, X/Y chart, and Chart Recorder modules)

List to Clipboard (**Edit** menu command in the display window of the List Display module)

Clipboard button in the File Info... dialog box from the **File** menu

Once you have copied the information to the Windows clipboard, you can paste it from the clipboard into other Windows applications or documents, like PaintBrush or Word for Windows. To do so, choose the appropriate command from the target application menu (usually **Paste** from the **Edit** menu).

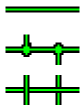
Country-specific Settings

When displaying **text,** Windows uses **country-specific formats** for the **time,** the **date,** and **numbers.** (These can be specified in the Windows **Control Panel.** Choose the **International** icon.)

When **DASY*Lab*** displays **text** on the screen, or writes to a file, the following formats will be used as specified in the Windows **International** dialog box:

- The **Number Format** settings (decimal separator, leading zeros) affect:
  - the **axes** display in the display windows of the Y/t Chart, X/Y Chart and Chart Recorder modules;
  - the display of **numbers** in the display windows of the List Display, Digital Meter, Bar Graph and Analog Meter modules;
  - the formatting of **data** when **Writing Data** in the ASCII format;
  - the display in all of the **dialog boxes** requiring numerical input.
- The **Time Format** settings (12/24 hour, separator, leading zeros) and
- the **Short Date Format** settings (order, separator, leading zeros) affect:
  - the **time axis** display in the display windows of the Y/t Chart, Chart Recorder and List Display modules;
  - the formatting of the **time axis data** when **Writing Data** in the ASCII format;
  - the display of the current **time** in the status bar.

Data Channels



data channel

junction points and branches

no connections

A data channel is the **connection** between the **output** of a module and the **input** of another module.
Data is transferred between modules via these connections.
Data channels and branches are symbolized by lines like the ones shown above.

By creating branches each module output can be connected to **up to 16** inputs of other modules.

Related topics:
- Creating data channels
- Deleting data channels
- Rearranging data channels
- Autorouter

DMA

Direct Memory Access (DMA) improves the system performance by allowing external devices to directly transfer information to or from the system memory without operation of the system CPU.

Some board drivers supported by **DASY*Lab*** use DMA.

Depending on the hardware, the D/A transfer capabilities may be restricted.

Driver Buffer

The driver buffer temporarily stores data coming in from the data acquisition hardware before it is processed by the software.

The driver first stores the acquired data to this buffer (this is done in the background); then **DASY*Lab*** reads it from there.

During time-consuming operations - such as moving windows on the screen - the driver continues writing data to that memory area, so that no data is lost.

Data acquisition will be stopped automatically if the buffer memory is full.

The memory segment selected here will be claimed completely by the board driver; neither **DASY*Lab*** nor Windows can access it.

The value entered for the driver buffer size in the Experiment Setup dialog box of the Experiment menu should be increased if you use a high global acquisition rate. Note, however, that a driver buffer setting of about 50 to 75% of the total physical memory available should not be exceeded.

Function Bar

The Function Bar is below the main menu bar of the **DASY*Lab*** window. It contains icons which provide easy access to several functions which you may frequently require in your experiment. Just click the icon representing that function.
When the mouse pointer is pointing at a Function Bar icon, a tag with the name of that function will appear. (You will find **QuickInfo** in all of the module windows which provide a Function Bar.)

All the Function Bar icons symbolize **menu commands.** Click here for a list of the icons currently integrated and the menu commands they represent.

By removing the Function Bar you can **enlarge** your worksheet.

Related topics:
The **DASY*Lab*** Screen
View Menu Commands

Functions of Multiple Input Channels

The following conditions must be fulfilled if data values acquired by **two input channels** are to be processed simultaneously and output through **one channel:**

- identical block size for both input channels,
- identical data type for both input channels (continuous acquisition, trigger etc.),
- identical sampling rate for both input channels,
- identical call-up time of blocks for both input channels.

These conditions (except for the last one) are automatically checked at the beginning of an experiment. So, if **one** of these conditions is not fulfilled, you will get an error message from that module.

IRQ (Interrupt Request Level)

The data acquisition board informs the driver about the termination of an operation (e.g. an A/D-conversion) using the IRQ channel.

As the IRQ function is quite time-consuming, especially under Windows, the **DASY*Lab*** data acquisition rate in IRQ mode is limited to a maximum of 20 KHz.

Latency Period

The time between the **acquisition** of the data and the **completion of its processing,** e.g. by display or analog/digital output..

Module Symbols

Each of the modules available in **DASY*Lab*** can appear in **two forms,** both indicating the module's function in an experiment: Module Bar **icons** and worksheet **symbols.**

- **Icon:** an element in the Module Bar, at a slightly reduced scale.
  - **Click** on the Module Bar **icon** with the **left** mouse button to **add** that module to the worksheet, where it takes the first available free space.
  - **Click** on a Module Bar **icon** with the **right** mouse button to assign any of the modules available in **DASY*Lab*** to that button.
- **Symbol:** a complete symbol in the worksheet. This symbol also displays the input and output channels you have selected.
  - **Double-click** with the **left** mouse button on the **symbol** to configure the module.
  - **Double-click** with the **right** mouse button on the **symbol** to delete the module from the worksheet or to delete its input/output data channels.
  - Use the **left** mouse button to **drag and drop** the symbol to any position on the worksheet (depending on the spacing value entered in the Window Setup box of the **Options** menu).
  - The modules from the Display group also have an additional display window symbol.

Please click here for further information on module configuration.

Module Bar

The Module Bar, on the left hand side of the **DASY*Lab*** window, displays a selection of frequently used modules. To add a module to your worksheet, use the **left** mouse button to click on its icon.

When the mouse pointer is over a module bar icon, the name of the module is displayed above the module bar.

When you click on a button in the Module Bar with the **right** mouse button, you can assign it to any of the available modules. You can configure several Module Bars customized for individual experiment tasks and save them to files to open them again later. There is also a Default Module Bar provided by **DASY*Lab*.**

To **enlarge** the work area for your worksheet, you can remove the Module Bar from the screen. After you have removed the Module Bar, you can still install the modules by choosing the respective **Module** menu commands. (To install a **Signal Generator** module, for example, select **Control** from the **Module** menu, then choose **Generator,** or press the `ALT`, `M`, `C`, `G` keys.)

All the Module Bar settings are **saved together with the worksheet file** when you choose the Save or Save As... commands from the **File** menu. The window size and position will also be saved when you exit the program. When you start **DASY*Lab*** the next time, you will find the same work environment as before.

NOP Function (No Operation)

The NOP function provided by some modules leaves all the incoming data unchanged. This function allows you to compare performance with and without operation by temporarily "switching off" the module without having to delete it from the worksheet.

Worksheet

The worksheet graphically displays the complete experiment setup or measurement procedure, including all the modules and channels.

The modules represent individual **operations** beginning with the acquisition or the generation of data up to its presentation on screen or printer. A worksheet can contain **up to 256 modules.**

The **maximum size** of a worksheet in pixels is 2000 (vertically) by 2000 (horizontally) regardless of the screen resolution.

The data channels represent the **connections** between modules. By creating branches each module output can be connected to **up to 16** inputs of other modules.

If the complete experiment setup is too large to be displayed on the screen, choose the Overview option in the **View** menu to **show the complete arrangement** in a reduced size.

To provide more space for the display of the worksheet, you can also **switch off** the display of the Module Bar and/or the Function Bar (both options in the **View** menu).

To **print** the worksheet, choose the Print option in the **File** menu. Be certain that the correct printer driver and setup has been configured in the Windows configuration menu before you print.

Related topics:

Customizing the **DASY*Lab*** Screen

Worksheet Examples

During the **DASY*Lab*** setup procedure, a number of **demo worksheets** are copied to the **DASY*Lab*** directory on your hard disk.

You can open these files by choosing the Open command from the **File** menu, or by clicking the corresponding icon in the Function Bar.

These worksheet examples can give you some ideas of the wide range of measuring tasks that can be solved by **DASY*Lab*.**

If you choose the File Info command from the **File** menu, or click the corresponding icon in the Function Bar, you will find information on that worksheet in the **Worksheet Information** box.

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