BECKHOFF New Automation Technology

Manual | EN

Scope View

TwinCAT 2 | System

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1 Foreword

1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

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The documentation has been prepared with care. The products described are, however, constantly under development.
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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

⚠ DANGER

Serious risk of injury!

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

⚠ WARNING

Risk of injury!

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

⚠ CAUTION

Personal injuries!

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

NOTE

Damage to the environment or devices

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.

Tip or pointer

This symbol indicates information that contributes to better understanding.

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2 General

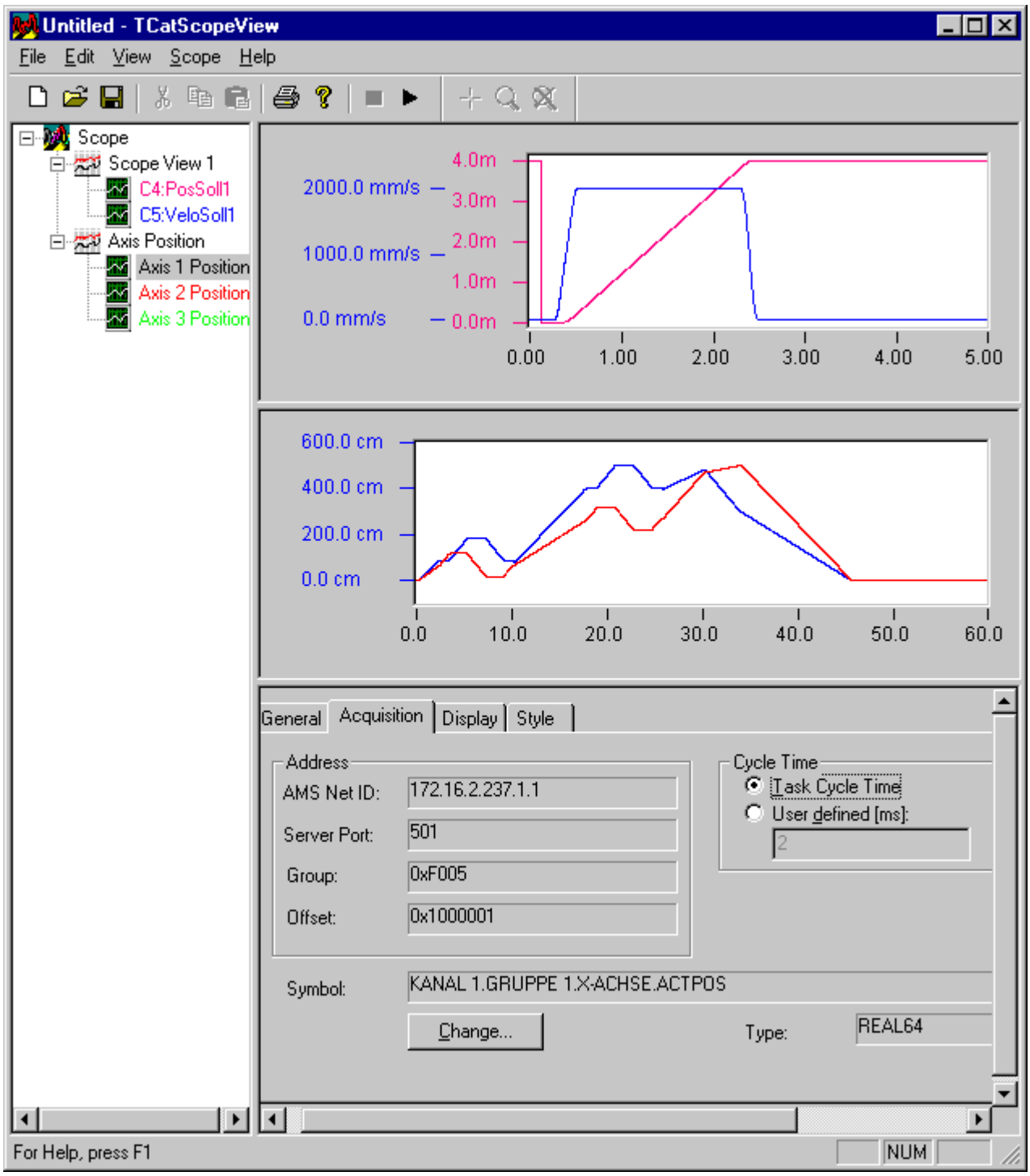
TCatScopeView is an analysis tool with which it is possible to display variables from various software tasks (such as PLC tasks) graphically. Curves can be drawn versus time, or you can choose to see XY displays.

Each Scope View can utilize several channels, the number being limited only by the memory size and computing capacity. For time displays, one variable is assigned to each channel. Two variables per channel are assigned for an XY display.

Structure of the TwinCAT Scope View

TCatScopeView is divided into 3 main windows. A tree structure is visible on the left, where all the Scope Views and their channels are listed. The Scope Views themselves are on the right, and contain plots of the selected channels.

The lower window displays the properties of the element currently selected in the tree structure.

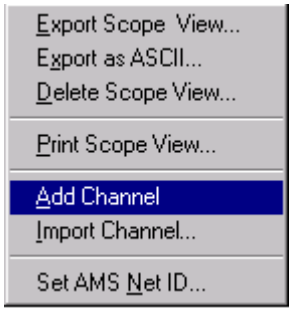

Untitled - TCatScopeView
File Edit View Scope Help
Scope
Scope View 1
C4:PosSoll1
C5:VeloSoll1
Axis Position
Axis 1 Position
Axis 2 Position
Axis 3 Position
2000.0 mm/s
1000.0 mm/s
0.0 mm/s
4.0m
3.0m
2.0m
1.0m
0.0m
0.00 1.00 2.00 3.00 4.00 5.00
600.0 cm
400.0 cm
200.0 cm
0.0 cm
0.0 10.0 20.0 30.0 40.0 50.0 60.0
General Acquisition Display Style
Address
AMS Net ID: 172.16.2.237.1.1
Server Port: 501
Group: 0xF005
Offset: 0x1000001
Cycle Time
Task Cycle Time
User defined [ms]:
2
Symbol: KANAL 1.GRUPPE 1.X-ACHSE.ACTPOS
Change...
Type: REAL64
For Help, press F1
NUM

3 General operating facilities

In order for TCatScopeView to be able to record variables from a software task, a configuration must either be loaded or created.

This section describes the creation of a new configuration and the possible settings associated with that process.

Context menu



Insert tree elements

Tree elements can be inserted by means of the context menu. The base element under which the new element is to be inserted must first be selected.

The context menu can be opened with the right hand mouse button, or with the **<ALT + Enter>** key combination. Each element at which it is possible to insert a sub-element has a corresponding item in the context menu.

Delete a tree element

There are several possible ways to delete a tree element. The first step to deleting an element is that it is selected in the tree structure.

- **<Del>** key
- Context menu: each element in the tree structure that can be deleted has a corresponding item in the context menu.

Rename a tree element

There are several ways to rename a tree element. The first step here again is that the element is selected.

- **<F2>** key
- Mouse: click with the left mouse button on the element's text field

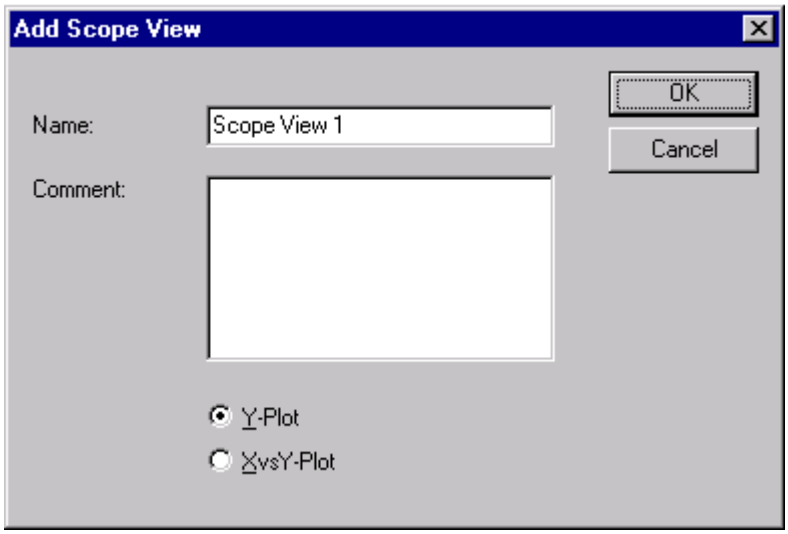
Using the keyboard to change window

With the **<F6>** key you can switch back and forth between the tree structure and the property pages.

4 Inserting a Scope View

The way in which a Scope View element can be inserted into the tree structure is described under "General operating facilities [▶ 10]".

Click on "Add a Scope View.." , which will open the following dialog:

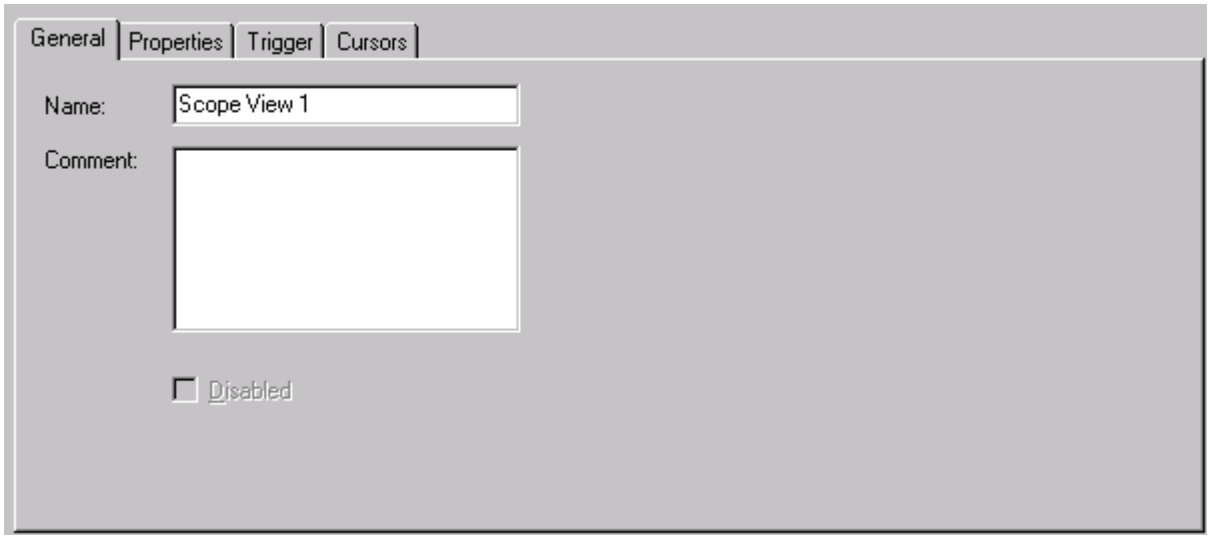


It is possible to choose here whether the plot should be drawn against time, or whether an XY presentation should be generated.

After a Scope View element has been inserted into the tree structure, the right hand side initially shows an empty Scope View, i.e. one that does not yet contain any channels. However, before a channel is added, the properties of the Scope View should be resolved. The individual property pages are described for this purpose below.

If you now quickly want to record channels, you can in fact go straight to the chapter on "Inserting a Channel [▶ 15]", and continue there using the default settings for the properties of the Scope View.

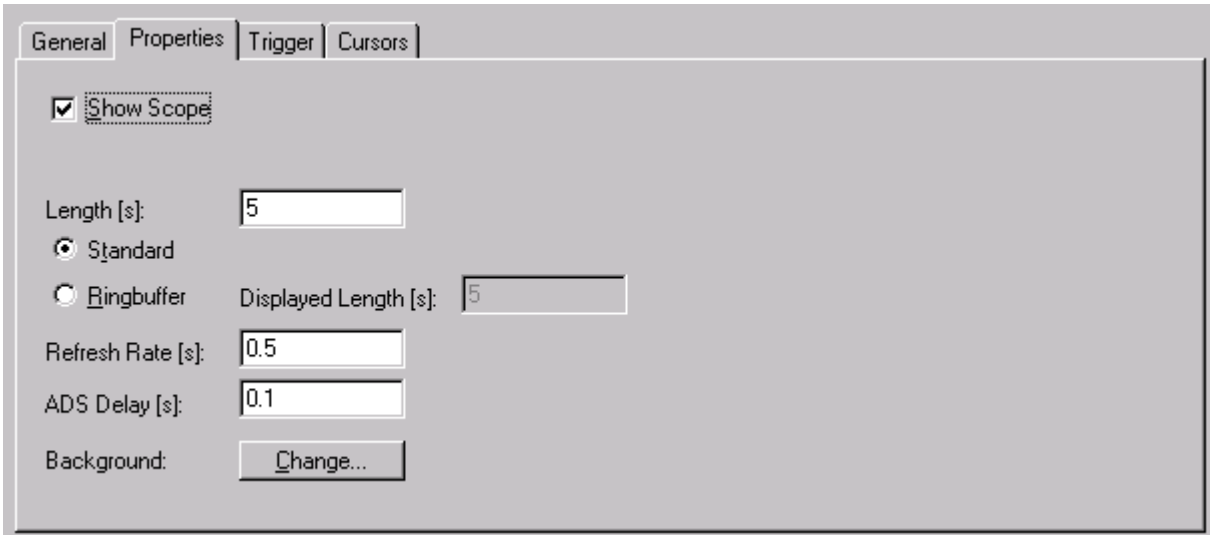
General



The *"General"* property page shows the name of the currently selected Scope View. The name in the tree structure is the same as that shown here, and can also be altered here.

The comment is included when the Scope View is printed.

Properties



Show Scope

TCatScopeView can show a number of Scope Views at the same time. The ”Show Scope” check-box specifies whether the Scope View is displayed in online mode (recording). If this flag is not active, no channels are recorded in online mode, and can therefore not be displayed later either.

Overload prevention

Since TwinCAT V2.8 Build 722
If the amount of unprocessed data exceeds a certain threshold value, then the Scope switches in offline mode automatically

Standard & Ring Buffer

There are basically two different methods to record the plot of a Scope View.

If *"Standard"* is selected (default), the channels of the Scope View are recorded after the trigger signal for the time specified for the duration of the recording. The values are displayed from left to right. Once the recording duration has elapsed, online mode is automatically ended.

Alternatively, the *ring buffer* can be selected. In this mode, recording continues until the online mode is ended explicitly. In that case, the current value is always displayed at the right hand edge of the Scope View, while the old values are correspondingly shifted to the left.

The *"Displayed Length"* refers here to the time period whose values are directly displayed in the Scope View. In offline mode it is also possible for older values to be displayed, where the *"history length"* is given by the recording duration.

Refresh rate

The refresh rate refers to the time within which the Scope View is updated. It should be noted that a fast refresh calls for higher computer performance.

ADS Delay

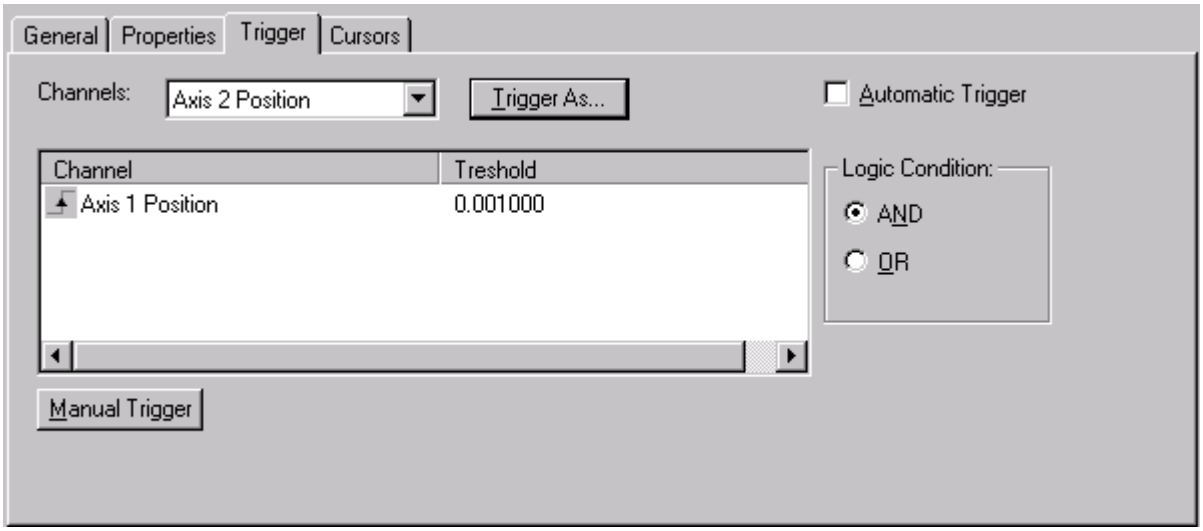
The values of a channel to be displayed are conveyed to the TCatScopeView by ADS. ADS Delay allows the block size or the number of ADS messages to be affected.

This value should not normally be changed.

Background

The *"Change Background"* button allows the background color of the Scope View to be changed.

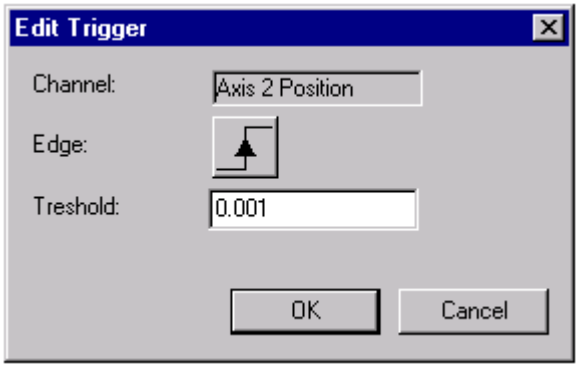
Trigger



As has already been explained, it is possible to trigger on the basis of particular events. At least one channel must be present in Scope View for this.

Inserting a trigger condition

The "Channel" combo box lists all the channels in a Scope View that are not present in the trigger list (see illustration above). In order to insert a channel into the trigger list it must first be selected in the combo box. In the next step, the *"Triggers As..."* button must be selected.



By clicking on the flank symbol it is possible here to select whether to trigger on a rising or falling edge. The threshold value can also be edited.

In order for triggering to occur it is necessary, in the case of a rising edge, for the value to have previously fallen below the threshold value. Precisely the opposite applies to falling edges.

Automatic Trigger

It is also possible to perform" endless recording" with the standard buffer. In that case, *"Automatic Trigger"* is to be activated.

This will check the trigger condition again after the end of the plot has been reached. If the condition is satisfied, the old plot is cleared and a new one is recorded.

Starting on trigger event (default)

The recording starts on the triggered event

Stopping on trigger event

Since TwinCAT V2.9 Build 1031
On the triggered event the Scope switches into offline mode after a configurable interval is passed.
Use the 'Pretrigger' cpntrol to adjust the interval.
This function requires operating the scope in 'ring-buffer-mode' [▶ 12]

Combining trigger conditions

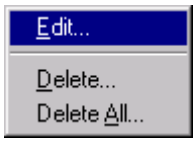
It is possible to set trigger conditions to the right of the trigger list. All the elements in the trigger list can be combined with either a logical ”AND" or with a logical ”OR".

If these conditions are not enough it is possible to program a trigger condition in, for example, the PLC task. The result of this condition can be assigned to a PLC variable. That allows TCatScopeView also to access the variable. It can now be added to the Scope View as the ”trigger channel".

Manual Trigger

It can also happen that the recording is to be started manually. In order to avoid the need to remove all the channels from the trigger list, a manual trigger is provided. If this is activated, recording starts.

Editing the Trigger Channels



If it is necessary to change the triggering properties of a channel at a later time, the appropriate channel must be selected within the trigger list. Using the right mouse button the context menu shown on top here can be opened. By selecting the *'Edit..'* menu item, the "Edit Trigger" dialog is opened.

Cursor

See also "Analysis of a Scope View - Cursors [▶ 19]"

5 Inserting a Channel

In order to be able to record the variables of the software task (e.g. the PLC task) they must be described in TCatScopeView. Each variable to be displayed is assigned to a channel in the Scope View.

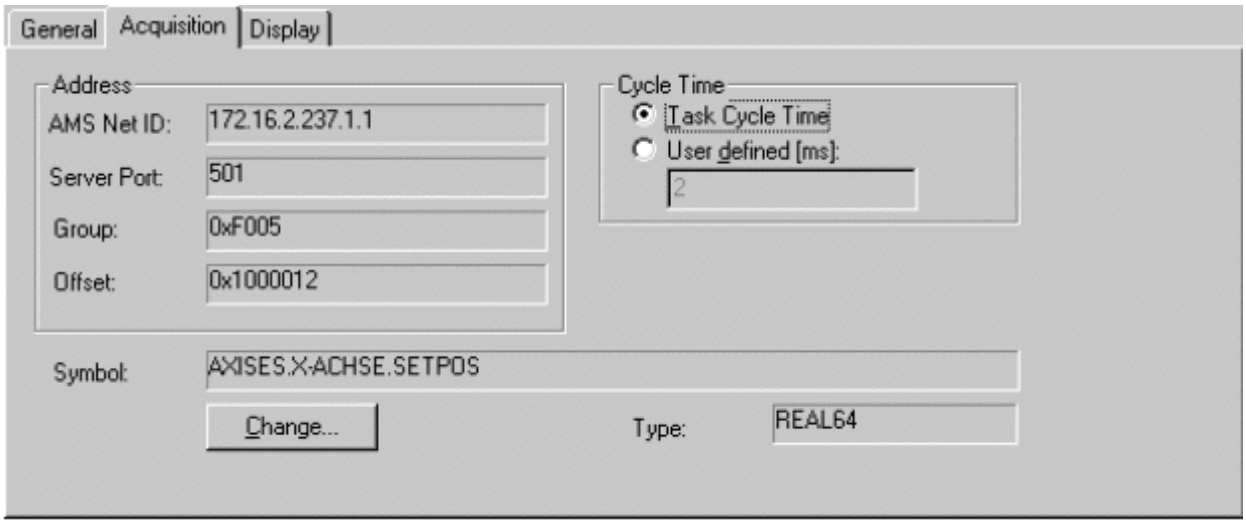
The procedure for inserting a channel is the same as that for inserting a Scope View.

The property pages for the channels are described again in what follows.

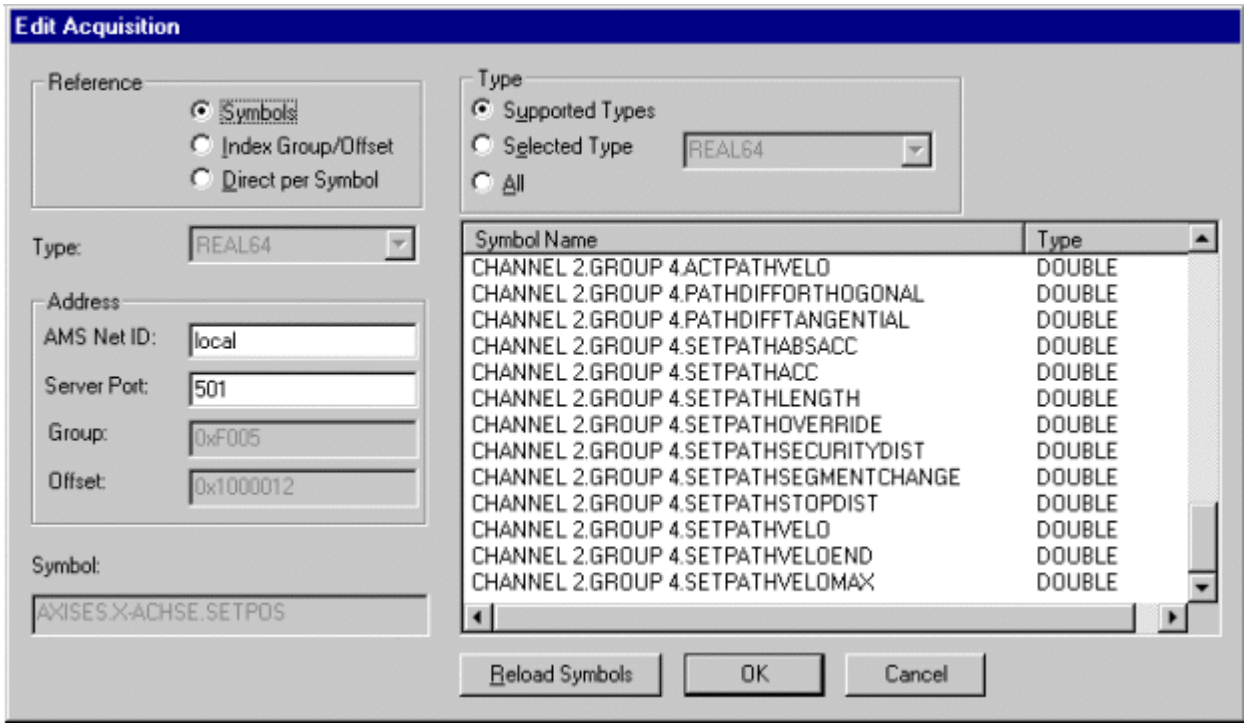
General

See also "Adding a Scope View - General [▶ 11]"

Acquisition



This page is used to describe the variable that is to be recorded. To edit the values, click on *"Change..."*, which will open the following dialog:



There are various methods of accessing a variable. The choice is made by means of the radio buttons displayed under *Reference* (upper left of the dialog).

Reference	Description
Symbol name	The variable can be directly selected from the list. It is, however, important to ensure that the correct server port is chosen.
Index group/offset	In those cases where symbols have not been generated it is also possible to access the variables by index offset and group. The corresponding addresses can be found in the ADS Device documentation.
Directly by symbol	It is not necessary for all the symbols to be read to access variables symbolically. If the name is known, it can be used to access the variable.

AMS Net ID

The AMS Net ID of the target system can be given here. This is normally set to "local", so that the AMS Net ID of the computer on which TCatScopeView is currently running is used.

Server Port

The Server Port must always be given. See also "Appendix - How do I find the correct port? [▶ 24]" for how to determine the port

The port information for the PLC is found in the system manager under PLC configuration and IEC project.

The port for the NC or NC I is to be taken from the SAF configuration.

If symbol names are used, the symbols can be read with *"Reload Symbols"* and selected with a click.

Recording variable from the NC

When recording variables from the NC or from the CNC it is necessary that symbol generation is activated in the System Manager, since otherwise the symbols cannot be read (see also Appendix - Generating the NC Symbols [▶ 25]).

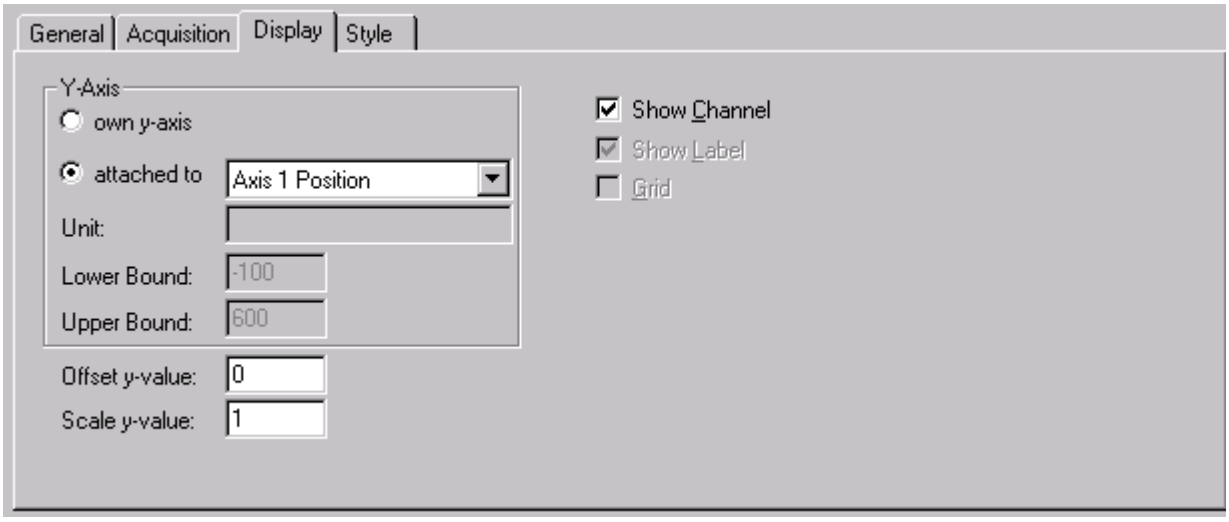
Reading symbols of a PLC task

If the symbols of a PLC task are to be read, they must be selected in the PLC project (cf. instructions for PLC Control - Options).

Cycle time

For the cycle time it is possible to choose between a user-defined cycle time and the task cycle time. It should be noted here that the value entered for a user defined cycle time must always be a multiple of the true cycle time.

Display



This property page is used to specify how the plot is to be displayed in the Scope View.

Y-Axis

There are two possibilities for the selection of the Y-axis. It is possible to create an individual Y-axis. It is necessary in that case to specify the lower and upper bounds. It is also possible for one Y-axis to be linked to another. In that case the display bounds are adopted from the given channel, and no separate Y-axis is displayed.

Show Channel

The *"Show Channel"* switch allows the display of a channel in the Scope View to be activated or deactivated.

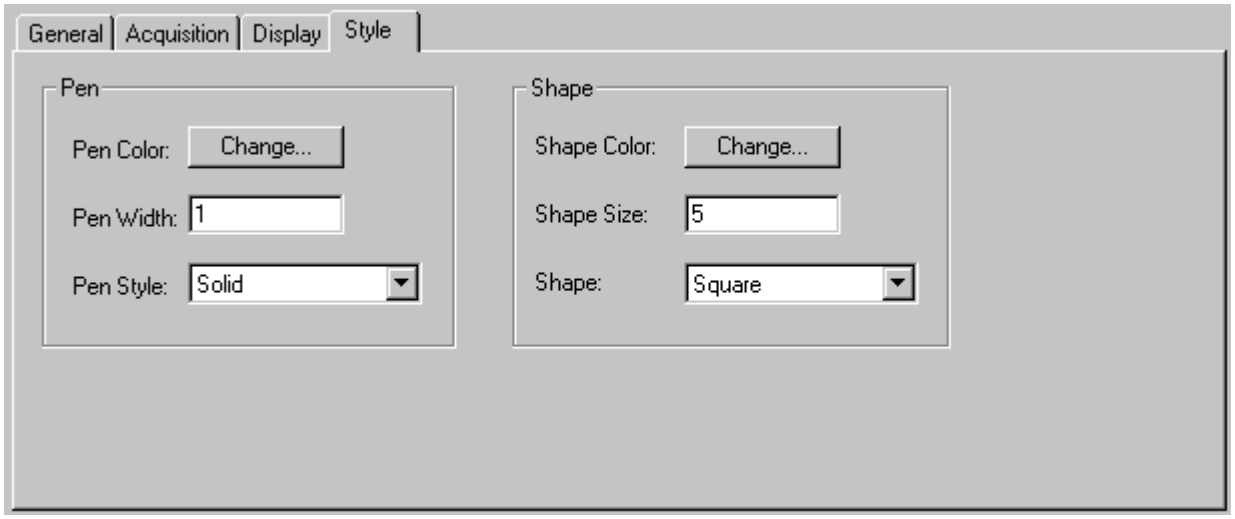
Offset and Scaling

An offset and a scale factor can be given for each channel. The value read in is then first multiplied by the scale factor, after which the offset is added.

-from TwinCAT Version 2.9 Build 1022 (Scope Build 195):

In the xt display, an additional offset can be entered for the time axis (offset X values). This allows you to move any channel on the time axis. When switching to online mode, the X offset is automatically reset to 0.

Style



The way in which the plot is shown in the Scope View is described on the *"Style"* properties page. This includes the color and width of the pen. *"Style"* is also used to define the kind of line, e.g. solid, dashed etc.. It should be noted, however, that the line is always solid if the width of the pen has any value other than 1.

It is often helpful for closer analysis if the individual interpolation points can be seen. This can also be set on this page.

In online mode it is better if at all possible, not to draw the interpolation points, as this demands a significant increase in computing power.

6 Online Mode

Once a configuration has been created or loaded, the online mode can be activated. A necessary precondition is that the TwinCAT System Service is running (the TwinCAT icon in the task bar is green).

Online mode is activated with the <F5> key, or by pressing the illustrated button.

It is not possible to add or remove channels while TCatScopeView is in online mode. It is also not possible to edit them at this stage.

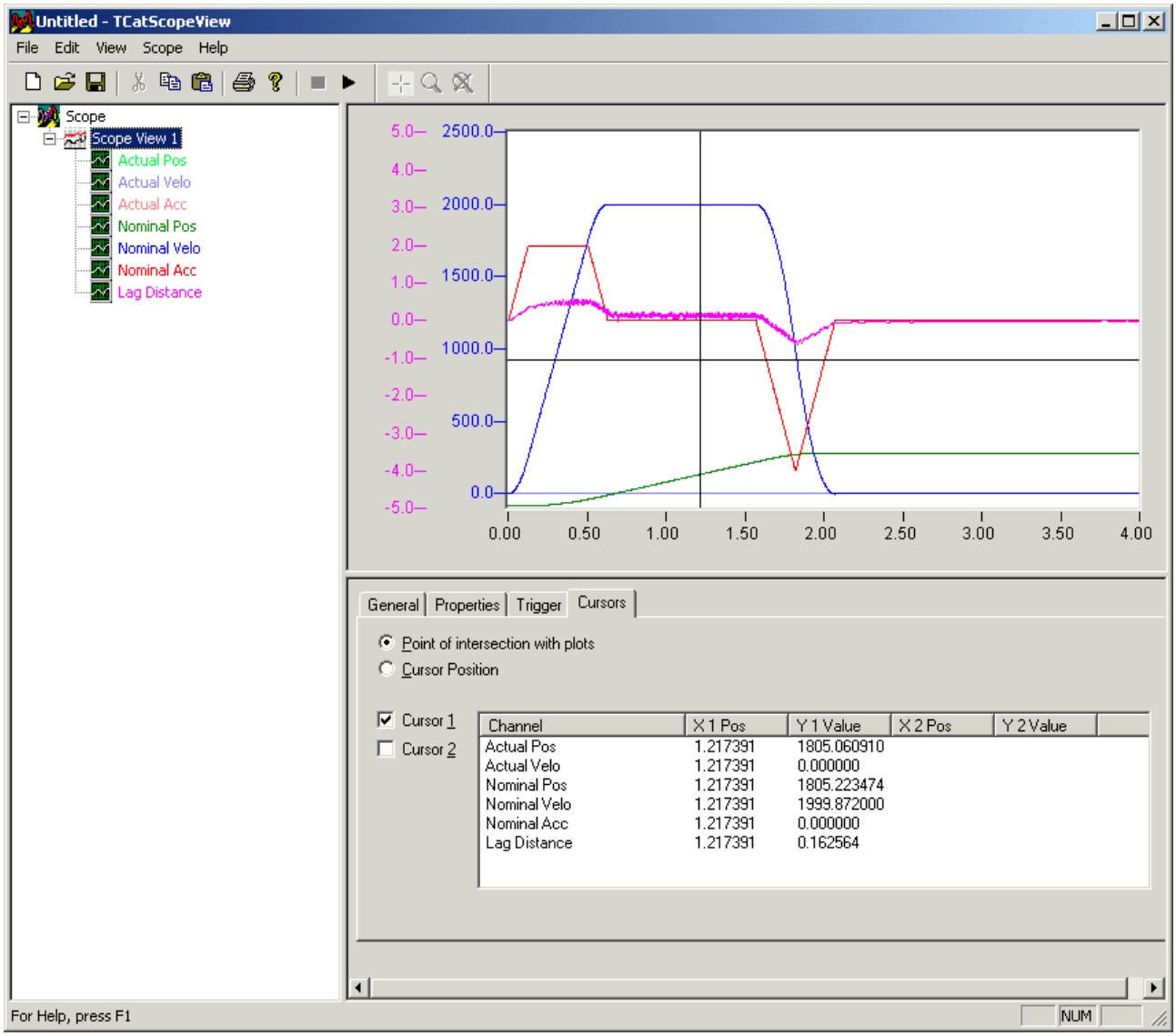
Recording begins as soon as the trigger [▶ 13] condition is satisfied. According to the Scope View setting, online mode will either end automatically or it will have to be stopped manually.

If there are no trigger conditions, recording starts immediately.

Online mode can be ended with the **<F5>** key, or by pressing the illustrated button in the toolbar.

7 Analysis of a Scope View

Cursor



Two cursors are available to TCatScopeView. The selection is made by way of the 'Cursor' properties page that is associated with the Scope View.

There are a number of ways of moving the cursor in Scope View.

If the cursor is to be moved by the mouse, the Scope View in which the cursor is located must first be selected. Next, the cursor button in the toolbar must be activated. The cursor can now be moved by pressing the left mouse button on the cursor and holding it down.

If the cursor is to be moved with the arrow keys, the cursor that is to be moved must first be selected in the properties page (click with the right mouse button). If that is done, the cursor can be moved with the arrow keys. If the cursor is moved in a vertical direction, the next interpolation point is always shown. In horizontal direction the cursor is always moved by one point.
With <Alt> and arrow the cursor is moved by 10 interpolation points.

The Y-values displayed in the cursor list describe either the intersection with the curve or the intersection with the horizontal cursor. The selection is made by means of the two buttons that are located at the top of the properties page.

In the X against Y display, only the cursor position is returned.

Zoom

Zooming with the Mouse

As well as the cursor, TCatScopeView offers the option of zooming in to a part of the Scope View. First, the Scope View that is to be magnified must be selected. Then the zoom button must be activated in the toolbar. The mouse can then be used to mark the area that is to be magnified. The left mouse button must be held down for this purpose.

If the wrong area is accidentally marked, the right mouse button can also be pressed. This removes the selection.

To undo the zoom, it is possible either to press the zoom-out button in the toolbar, or to press the **<O>** key. It is necessary for the *'Cursor'* properties page to be active for keyboard operation.

Zooming with the Cursor

In is not absolutely necessary to use the mouse to magnify a Scope View. The area that is to be magnified can be marked with the aid of the cursor. It is, however, necessary for this purpose that both cursors are displayed. Once the cursors have been brought to the desired position the **<Z>** key can be used to magnify the area framed by the cursors.

It is again, however, necessary for the *'Cursor'* properties page to be active for this purpose.

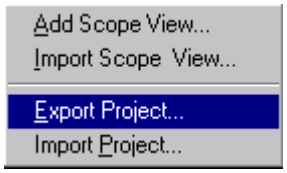
8 Data backup

Saving the configuration

There are various ways of saving the entire TCatScopeView configuration. It can be done either directly by pressing the *'Save'* button, or by way of the menu.

It must be noted here, that these methods only save the configuration, and not any plots that may have been recorded. The way in which they can be saved is described in more detail below.

Exporting / Importing a Project

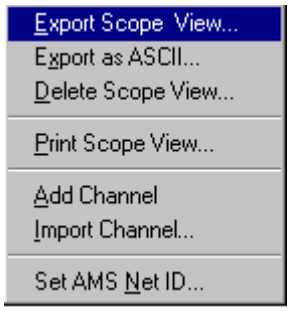


A project is exported by again using the context menu in the tree structure.

When a project is exported in this way, all the Scope Views (plots) are saved as, well as the configuration.

The project can then be loaded again by means of the menu item *'Import Project...'*.

Exporting / Importing a Scope View



If it is not the whole project, but just some individual Scope Views that are to be exported, the menu item *'Export Scope View...'* can be used. As in the case of exporting a project, the configuration data are also saved in this case.

Importing a Scope View is done via the base element in the tree structure. Its context menu contains the menu item *'Import Scope View...'*, by means of which a Scope View can be loaded.

Exporting / Importing a Channel

It is possible to export single channels. In this case the plot itself is saved along with the channel-specific configuration.

A channel is imported through the Scope View's context menu. The channel to be imported is appended to the channels that already exist.

Exporting as an ASCII Table

The Scope View context menu can also be used to export the recorded values as an ASCII file. This makes it possible, for instance, to import the data into Origin or Excel.

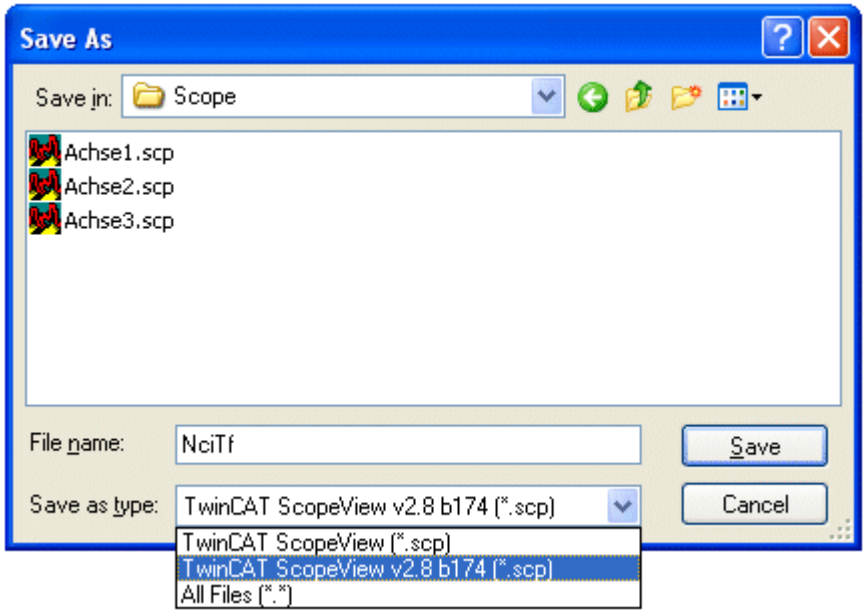
Summary of data formats

Suffix	Description
.scp	Saving the Configuration
.spr	Exporting / Importing a Project
.svw	Exporting / Importing a Scope View
.cha	Exporting / Importing a Channel
.dat	Export an ASCII table

Save with older file format

since Scope Build 193

The file format has changed with Scope Build 193. To save a file with an older format, select it in the save-dialog.



9 Miscellaneous

Print

In order to print a Scope View it must first be selected. Only that region of the Scope View that is currently displayed is sent to the printer.

Changing the AMS Net ID in a Scope View

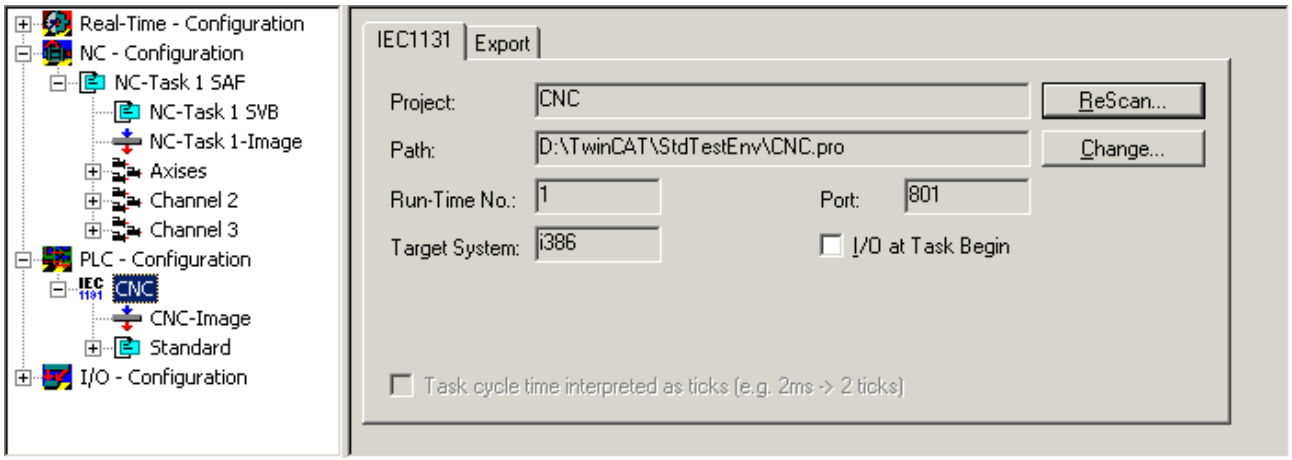
The Scope View context menu can be used to change the AMS Net ID for all a Scope View's channels. The present AMS Net ID is suggested as standard.

10 Appendix

10.1 How do I find the correct port?

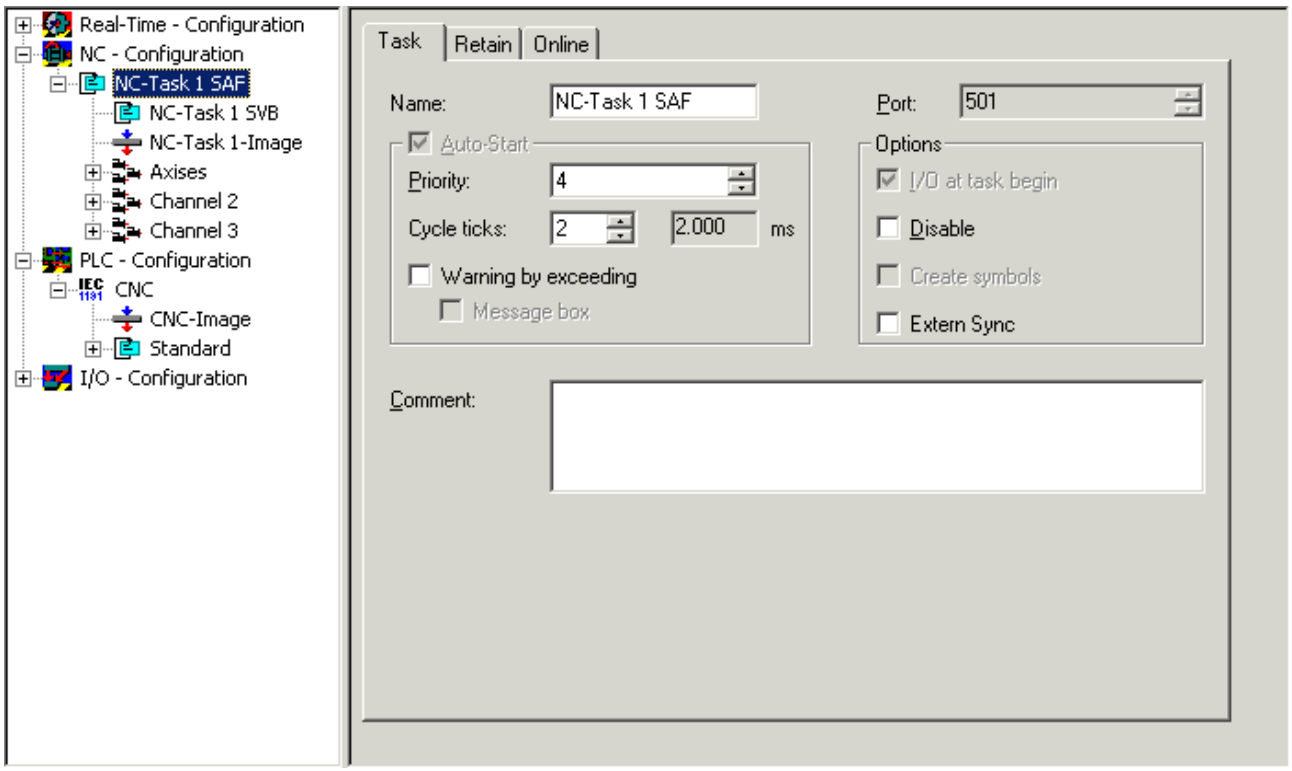
In order to be able to acquire data with the Scope View it is essential that the port is given in the course of describing the variables (see also Adding a Channel - Acquisition [▶ 15]). This can be found through the System Manager.

PLC port



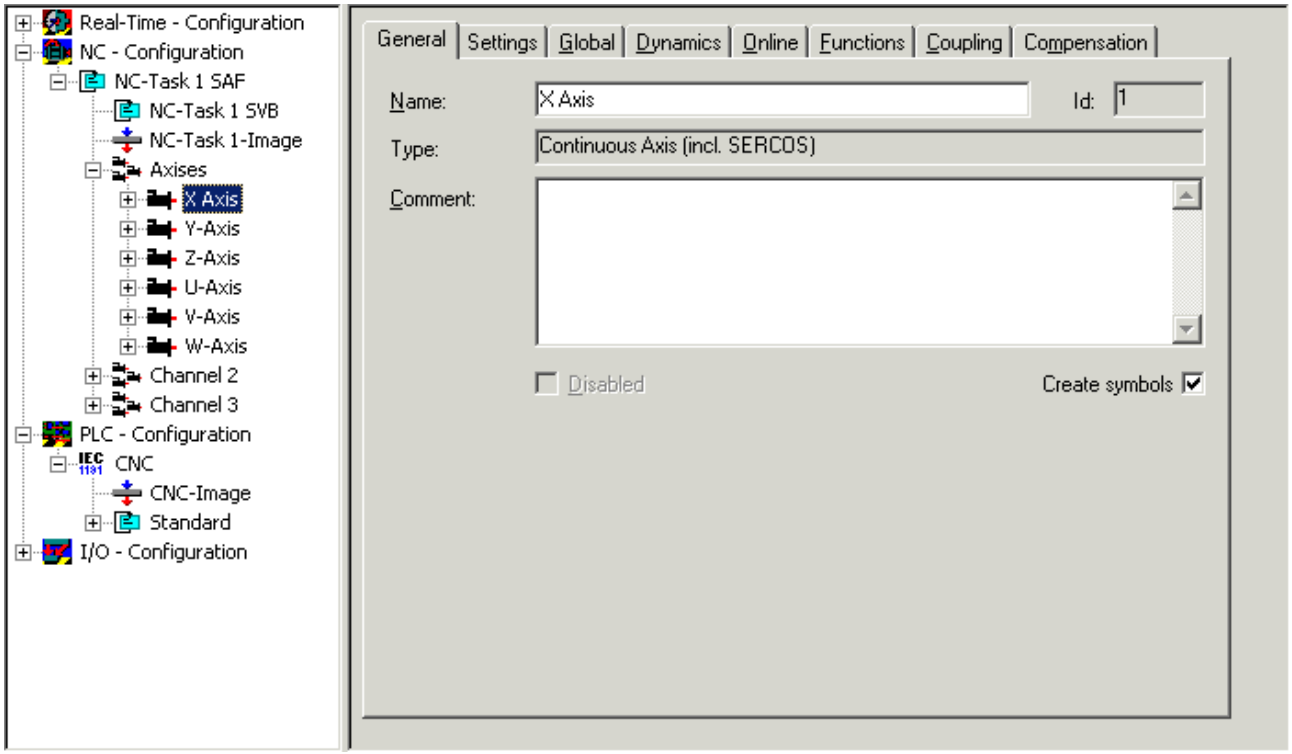
The port for the PLC is to be found on the *"IEC1131"* properties page. To see this page, click on the PLC project under the PLC configuration.

NC port



To find the NC port, click in the System Manager under NC configuration on the corresponding NC task. The port can then be found on the *"Task"* properties page.

10.2 Generating the symbols for the NC



It is necessary for these to be created in order to be able to access the NC variables symbolically. This is done by activating the *"Create symbols"* checkbox in the System Manager. It is possible here to generate symbols for every axis. It is also possible to generate symbols for the encoder, the drive and the controller. These are not, however, generally of great importance, and should only be generated when needed.

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