ActWin Tutorial

This tutorial will show how to use the most important parts of ActWin through ”walking around” in the menus and creating a small project. (It will therefore not show the shortest way of building a project)

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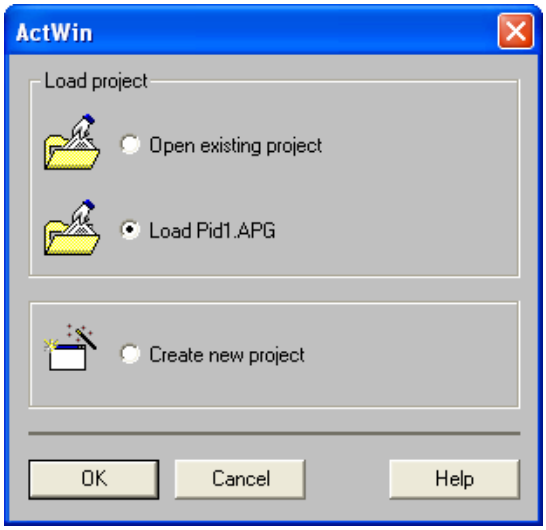
Start ActWin

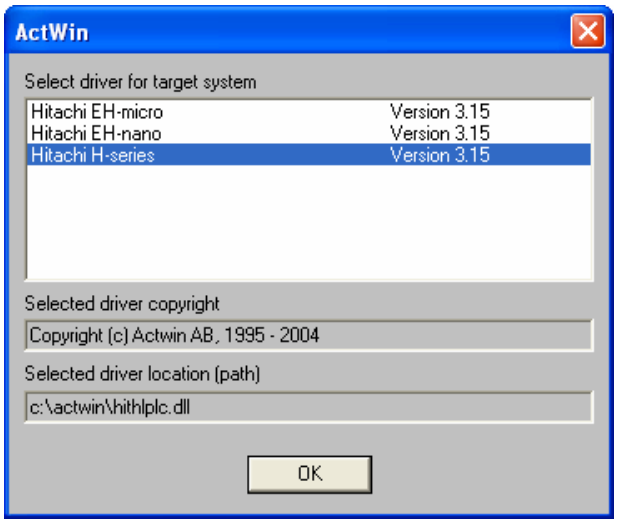


Open ActWin:

You will get the following Window:

Open an existing project, the latest project (in this case "Maxi_306.apg" or a new project.

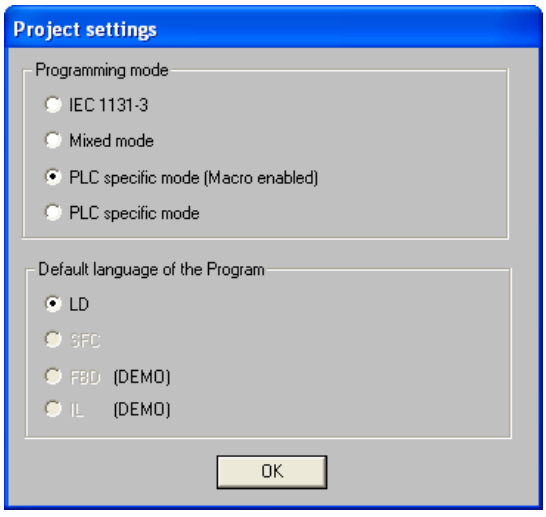
- Select "Create new project" with the mouse.
- Click on "OK"



If a dialog appears prompting you to select target system:

- Select Hitachi H-series from the list of selectable target systems
- Click OK

If it's stand "DEMO" after the driver, the driver is in DEMO mode.



A new window appears where you can select what PLC language you want to use:

- LD (Ladder)
- SFC (Sequential Flow Chart)
- FBD (Functional Block diagram)
- IL (Instruction List)

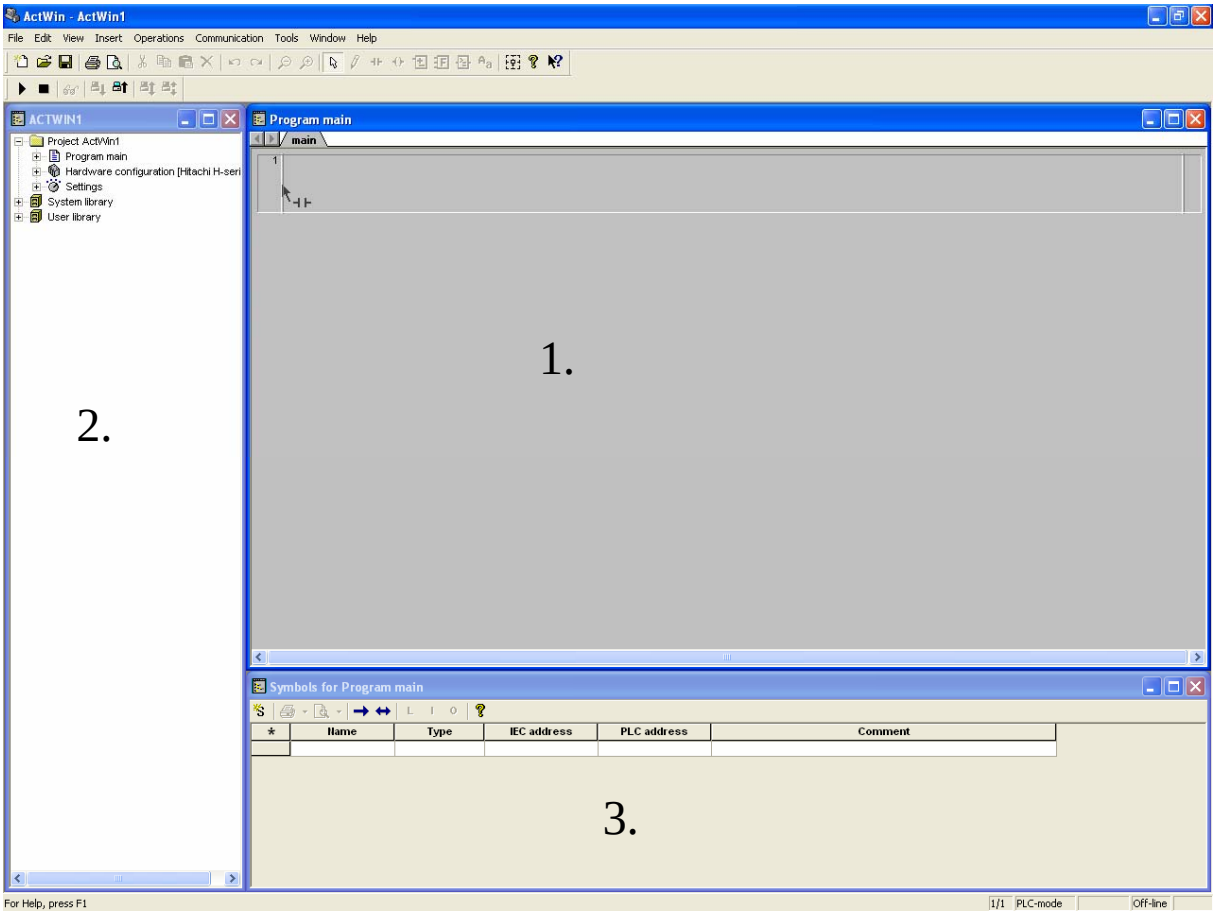
In PLC specific mode only LD is available.
In Mixed mode LD and SFC are available.
All are available in IEC1131-3 mode.

Select PLC Specific Mode and LD, press OK

Design of Window:

You will now get the following screen with three main Windows:

1. Programming Window (Where you write the program, function blocks etc.)
2. Project Window (Complete hardware and software configuration of the project)
3. Symbol window (Where all symbols like Inputs, Outputs etc. can be edited)



The toolbar include this functions

1 2 3 4 5 6

It is divided into following groups:

1. File handling and printout.
2. Cut, paste, undo etc.
3. Zoom tools.
4. Ladder editing (Not available in “Ladder editor grid mode”)
5. Help buttons (Do not forget to use the help system)
6. On-Line and communication

Hardware configuration:

Open the Hardware configuration to select the hardware to run the PLC program by clicking in the tree on ”HW Configuration”

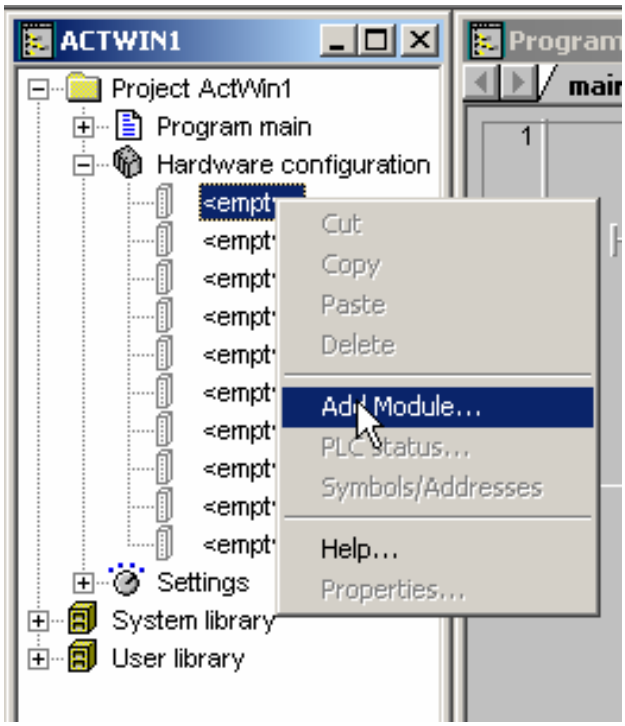
This will open ten new items.
They all symbolise the racks in the configuration.
The first is the one containing the CPU.
The other ones are the expansion racks.

Start to click with the right mouse button

on the first rack. (Instead of right click you can double click)

Select the ”Add Module” alternative.

You will now get a list of all Groups and modules available.
Select a suitable base from the list, e.g. EH-BS8A from the EH-150 Base group .

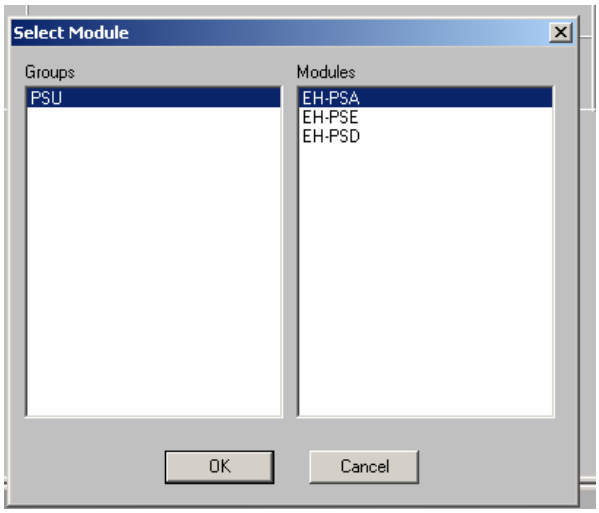


The item will change name to ”EH-BS8A” and a + will appear to show that we can fill this rack with modules.

Click on the rack item and open it. In this case 10 new folders will appear. They are representing the modules in the base.

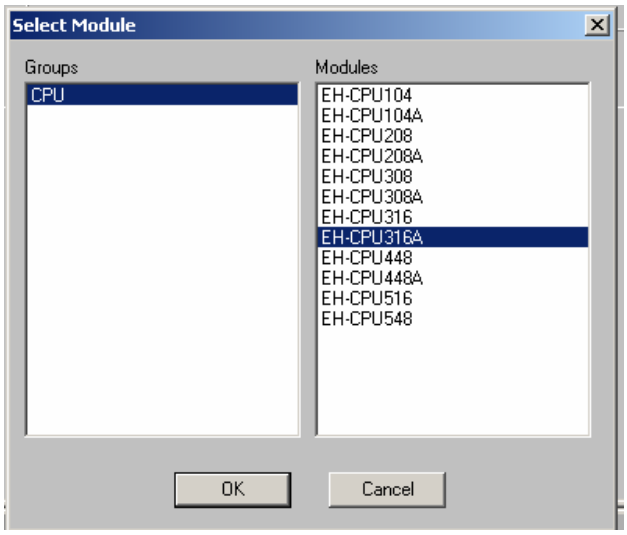
Double click with the left mouse button on the first module.

Select the power supply module. E.g. EH-PSA and press OK.

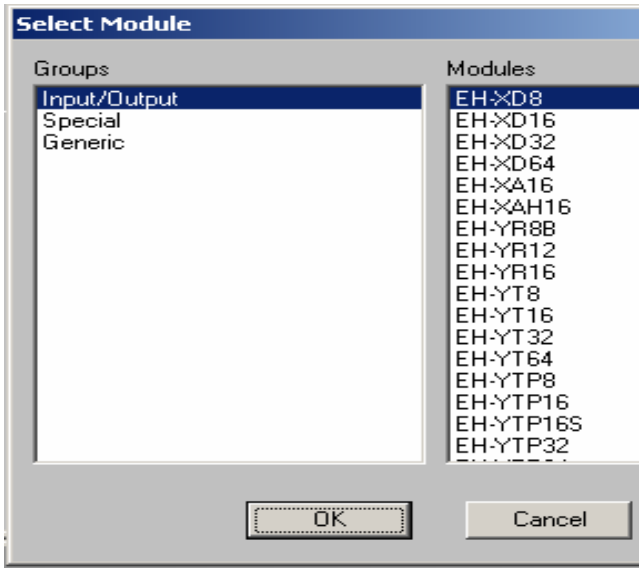


Double click on second module.
A list of all availeble CPU :s will show up.

Select e.g. Eh-CPU316A and press OK. (You can also double click on the module to select the module.

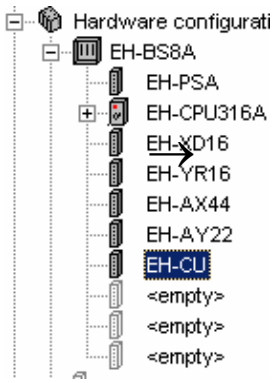


The list for the rest of the positions will contain all Input/Output modules special and all Generic modules.



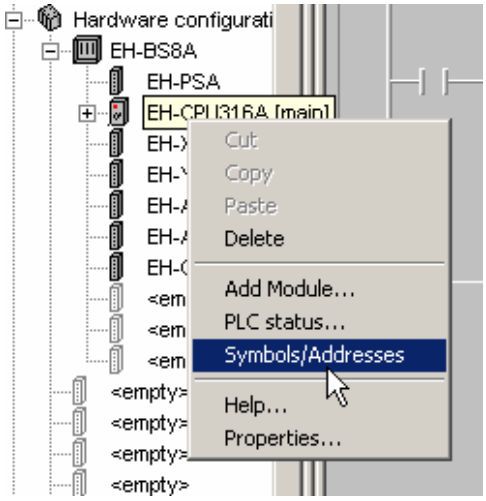
When the rack configuration is ready the configuration is shown like this.

You can now minimise the HW Config. tree by clicking on ⊟



Allocate Known symbols (e.g. Inputs and Outputs)

Right click on the CPU and select "Symbols/Addresses".

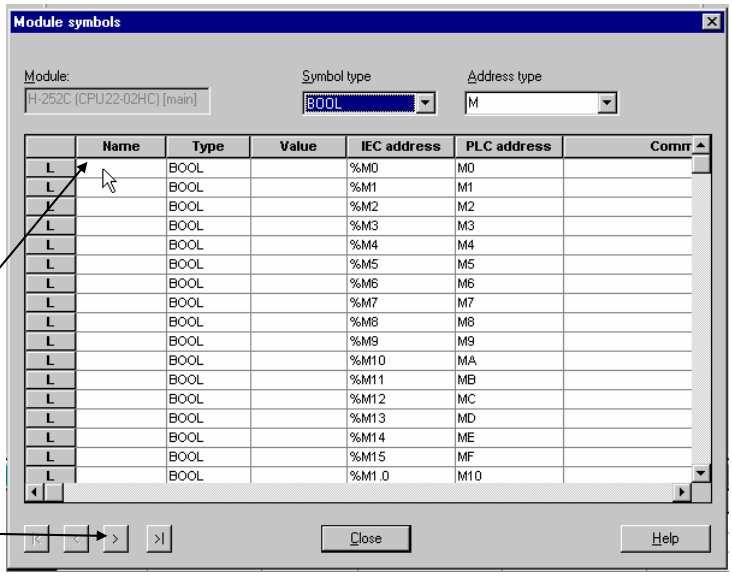


You can type the symbol names on each address type in the CPU.

(Some characters, e.g. Space are not allowed due the compatibility to the IEC standard, see help system)

To enter the symbols in the I/O modules.
You can import symbols from a CAD system or e.g. Word or Excel with Copy/Paste to the Name Column.

Mark the first cell and press <Ctrl + V>
use these buttons to go from one module to the next.

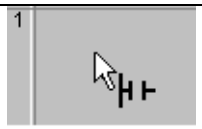
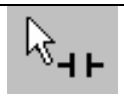
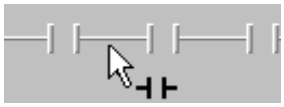
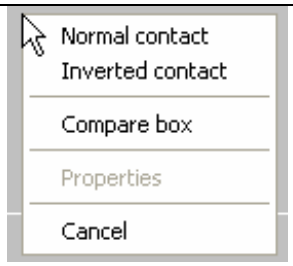
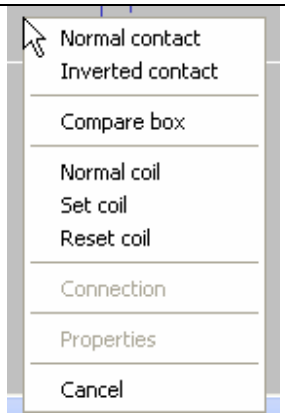
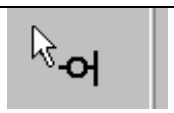
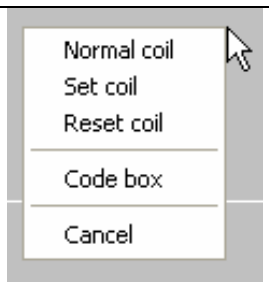


Ladder editing grid mode:

(For programming not in grid mode see section “Ladder editing old mode”

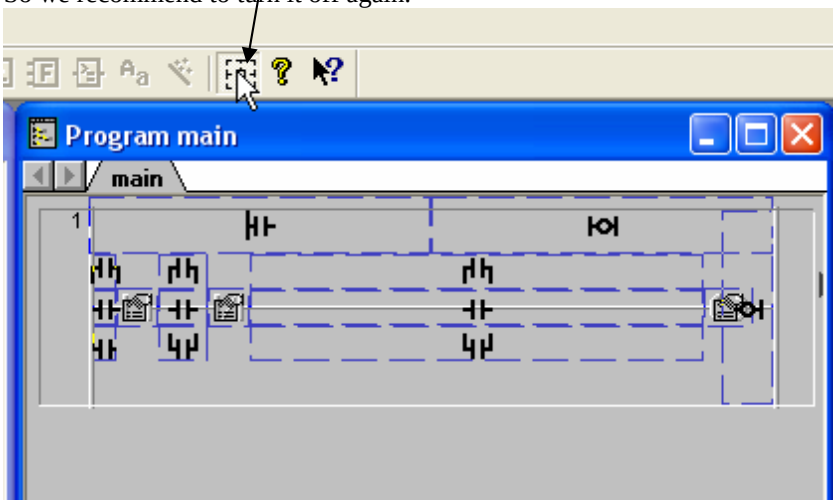
There is a new and even much more effective way of Ladder editing in ActWin.
It is a unique method based on a World patent owned by Actron.

The basic idea in the patent is that object where you currently are working decides what you can do. It will present you all options and nothing else.
You do not have to go and fetch any tools etc.
You will save time and the risk of errors decreases
Following main symbols occurs depending on where the cursor is:

Description	Main interactive symbol	Detailed selection
		If you hold down the Left button a menu will show the options. Select and release the button. The menu will also appear if you Right click
New rung or comment.	 A left click will create a start contact. 	
New input object. Serial connection	 	
New input object. Parallel connection above or beneath.	 	
New Output object.		

Grid area

If you press the Grid button you will see where the areas are and what symbol will occur in each area.
It is not practical to work with the grid pattern on.
So we recommend to turn it off again.



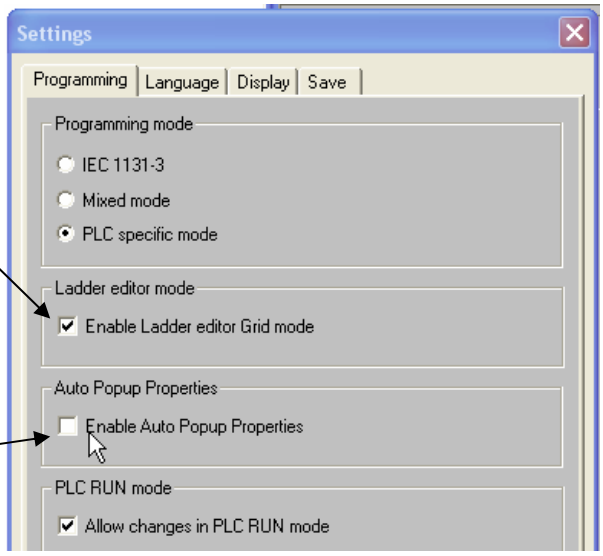
Enable/disable Ladder editor grid mode.

Select
"Tools-Act Win Settings"
from the top menu.

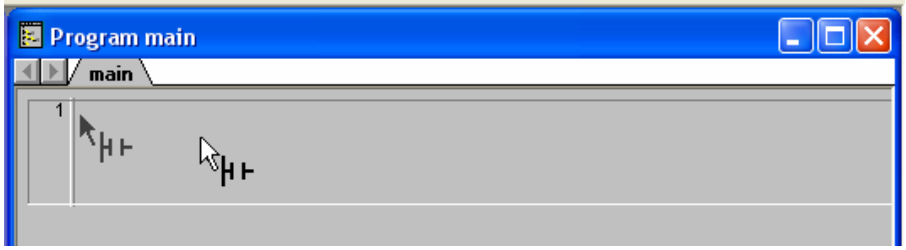
You can select to use the traditional Act Win ladder editor or the new one.

When you test the method we recommend you to Disable Auto Popup Properties.
(work without symbols)

When you do real programming it is better to Enable this option.



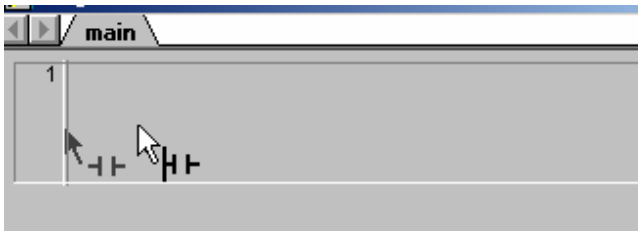
When you start you will see two different cursors on the screen.
The black one is for keyboard editing and the white one is for mouse editing.



Create a contact:

Move the mouse approximately to the place where you want the contact. Click with left button.

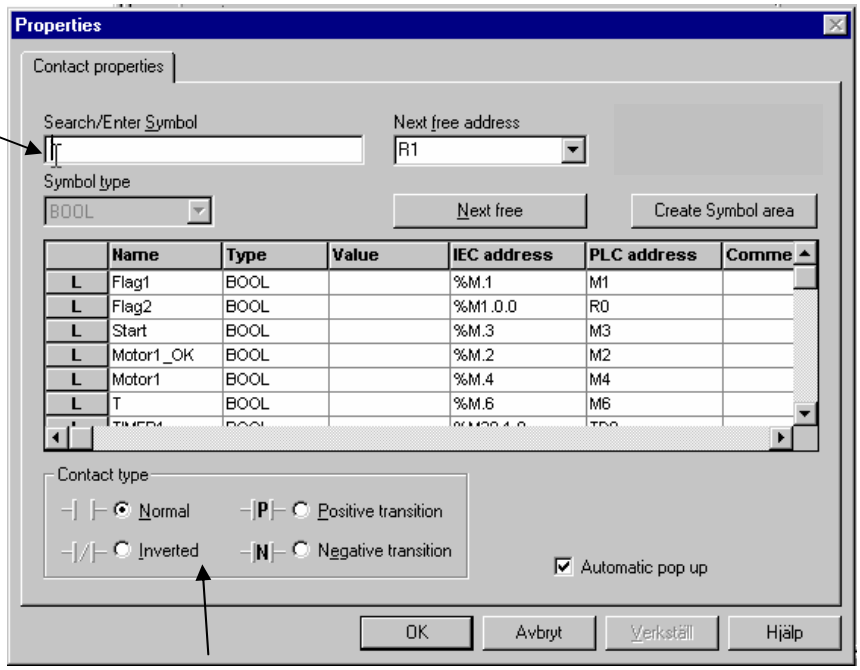
→



Symbol /address handling:

The symbol /address handling is probably the most important part in a PLC programming software. The reason for this is that a significant part of the programming time is spent here. Most programming errors are connected to usage of wrong addresses or double usage of addresses. ActWin gives a maximum comfort, guideline and control in the address allocation.

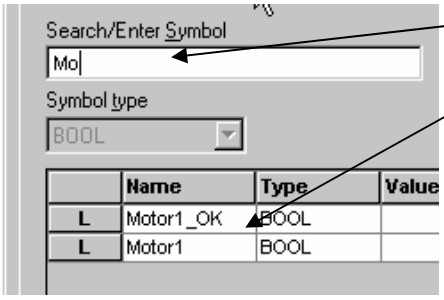
In order to give an easy way to define or search for an address and the symbol name the following window will pop up automatically:



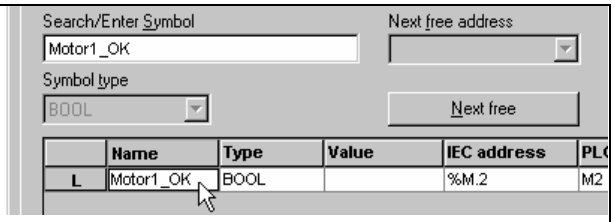
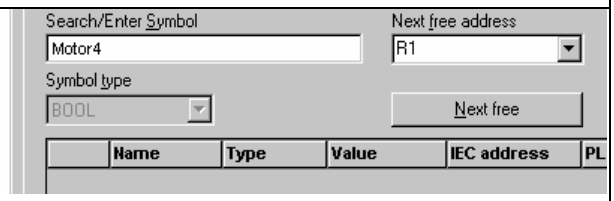
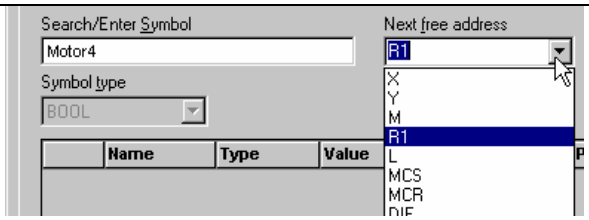
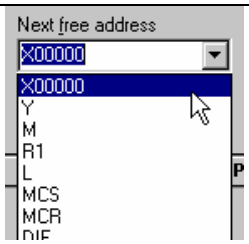
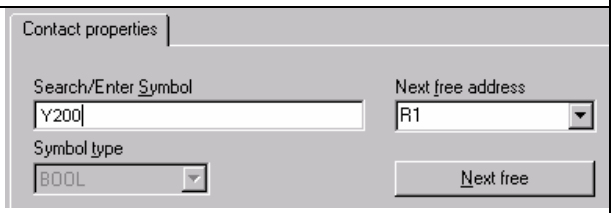
Type the name of the symbol.

When the symbol name does not exist you will always get a suggestion of the first free address. This makes allocation of new symbols very fast and you will avoid double use of addresses.

Here you can change to an inverted contact or an edge detection.



When you type the symbol, all matching symbols will be shown.

Select an existing symbol: Instead of typing the entire symbol name, you can click in the list and select the symbol you want.	
Create a new symbol: A new symbol does not have any match. If the suggested address is OK you can press Enter to create the symbol.	
Select an address type for the symbol: If you want a special address, then click on the Memory address and select the type you want. You can also type the address with the number directly in the Memory address window.	
Select the address number: The first available address of the type you suggested will be suggested. Accept or type the number you want and press Enter for OK. You can also press the Next free button to get the next available address.	
Using addresses directly: Even though it is not recommended it can in some cases be comfortable to use the address directly. Just type the address. The symbol on that address will be used or if there is no symbol a new temporary symbol "__Y200" will be created. (All addresses have to have a symbol)	

Play a little with the symbol handling and get used to this method and you will realise the comfort.

The button Create Symbol area allows you to define any number of symbols in a one operation. (see "arithmetic box" description for more details.)

Make a serial connection:

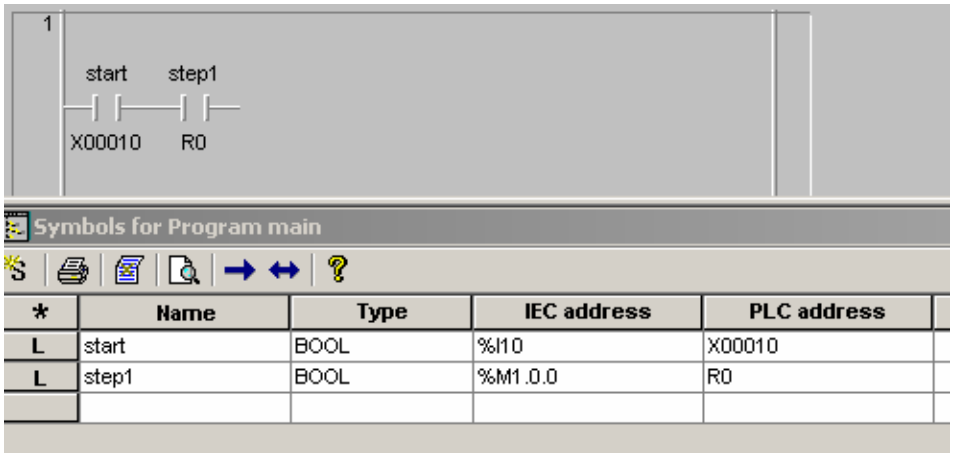
Repeat the procedure with the contact and insert the new contact on to the right side of the first one.

As you can see, the editing field of the rung is marked (shown as deeper). This means that the rung is not ready and approved by ActWin.
When it is completed the marking will disappear.

Give the new contact a symbol name and an address:

The new symbols will appear in the symbol window.

This window will also inform about type, PLC address
and the corresponding IEC1131 address

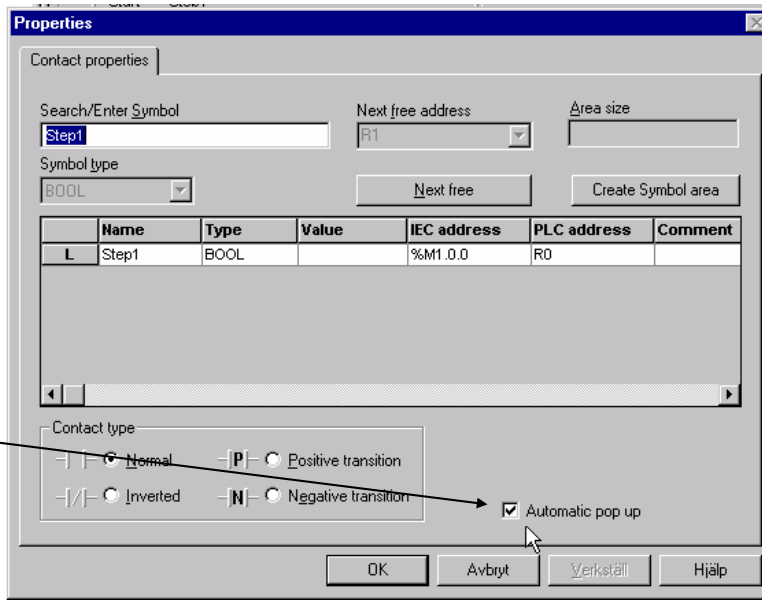


Ladder editing without symbols:

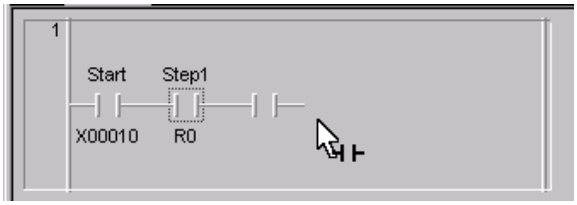
In order to make some different ladder editing without the symbol procedure for each contact, we can turn the symbol editing off.

Make a new contact in series. But instead of giving a symbol name, disable ”Automatic pop up” and press OK.

(You can also fetch this window, the Contact Properties, by right-clicking  on a contact)

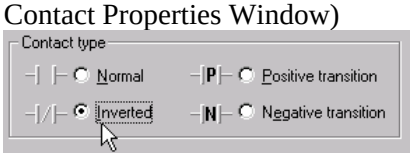


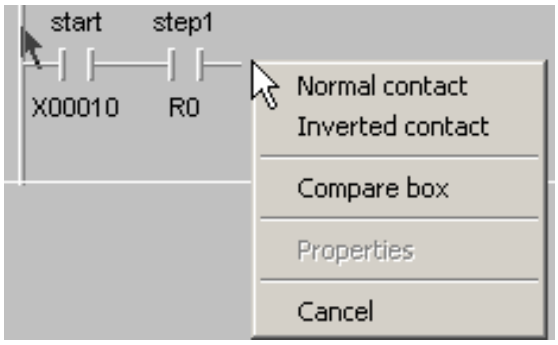
The contact will be drawn without symbol and address



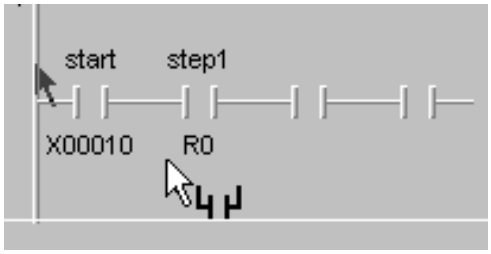
Inverted contact

To make an inverted contact click and hold down mouse button, a menu will show the options. Select "Inverted contact".(This can also be changed in the Contact Properties Window)





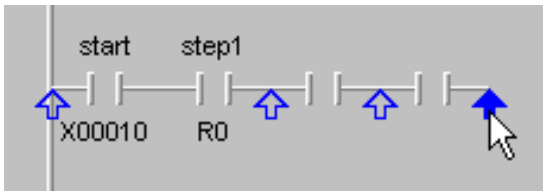
Note that the width of the ladder diagram is flexible. (the right power line moves rightwards)



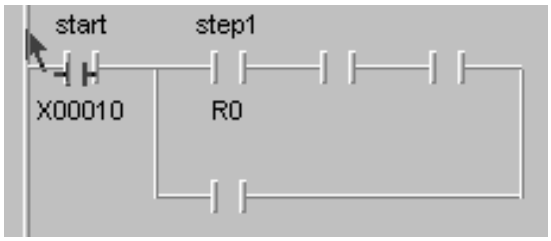
To make a parallel connection:

Move the cursor down from the ladder line to indicate a parallel connection.
A symbol for parallel connection appears.

Left click and all possible connection points for the parallel connect are marked with arrows.

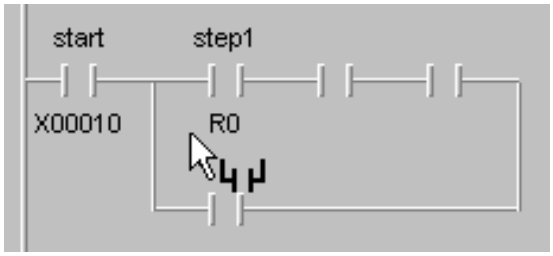


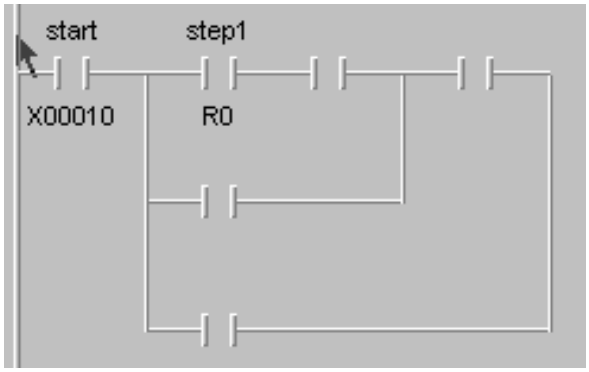
Point and click at the correct connection point.



To insert a parallel connection:

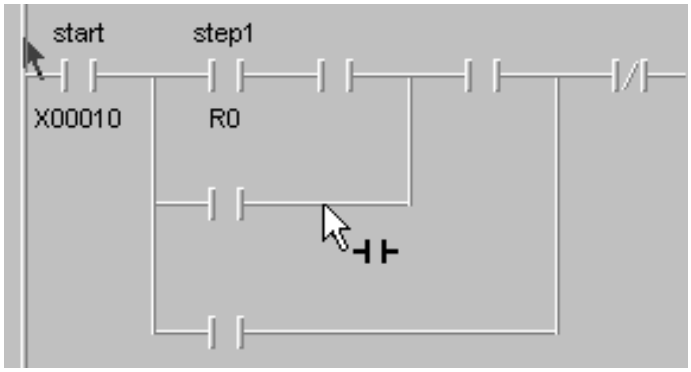
Make the same procedure as above inside the other connection.





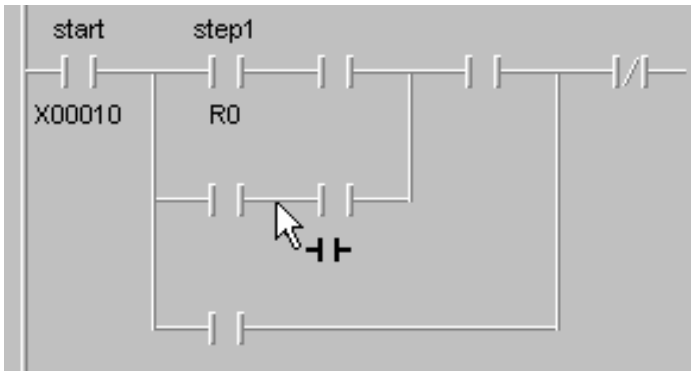
To connect a contact in series:

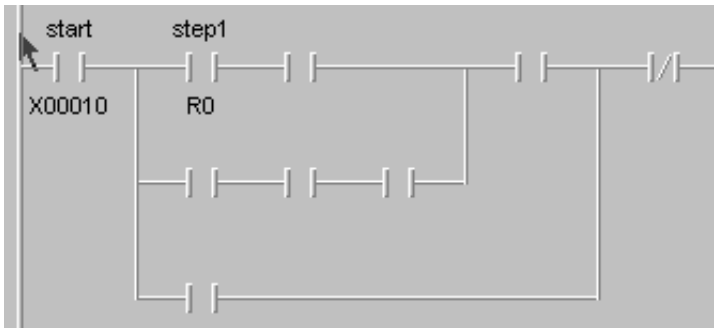
Place the mouse arrow on the line where you want the contact. Click on the left mouse button.



To insert a contact in series:

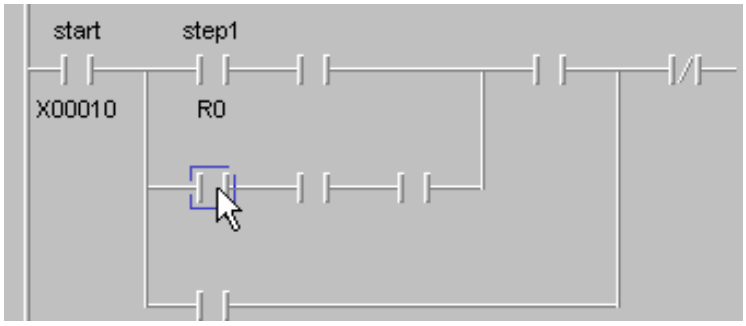
Place the mouse arrow on the line between the contacts where you want the contact. Click on the left mouse button.





To Delete contact:

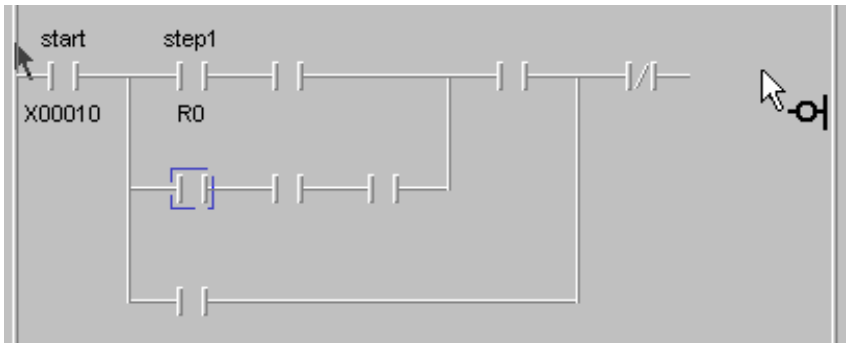
Click on the contact that should be deleted. The contact will be marked. Press Delete and the rung will be redrawn without the deleted contact.

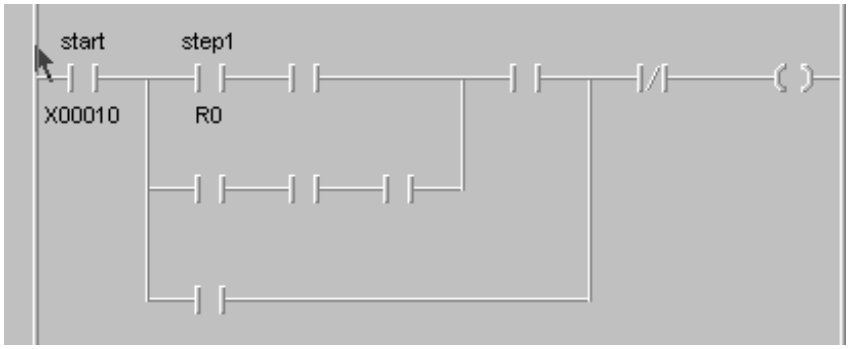


Create a coil:

Place the curser at the right side of the ladder diagram. The cursor will change to a Coil symbol.

Left click and the coil will be inserted.

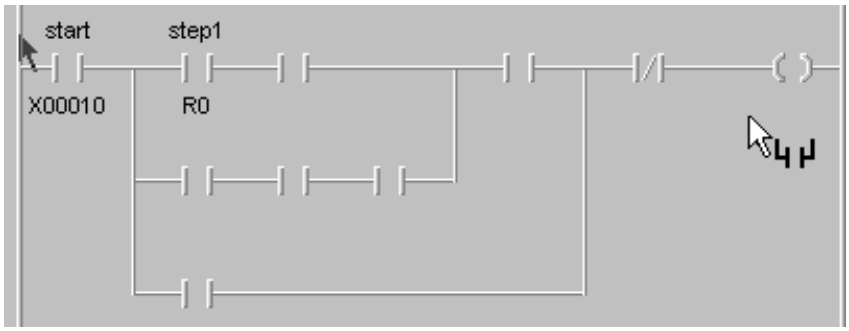




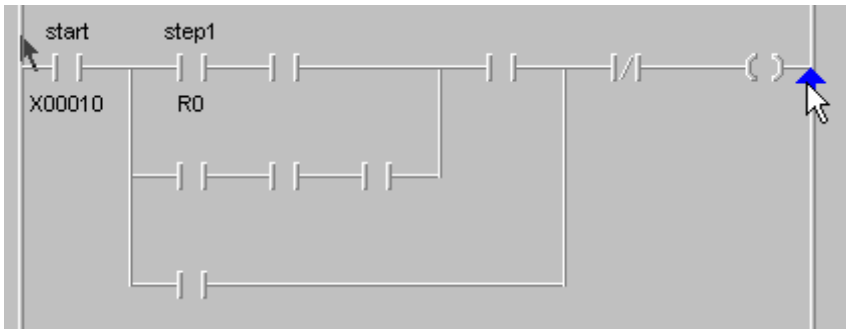
Create a parallel coil:

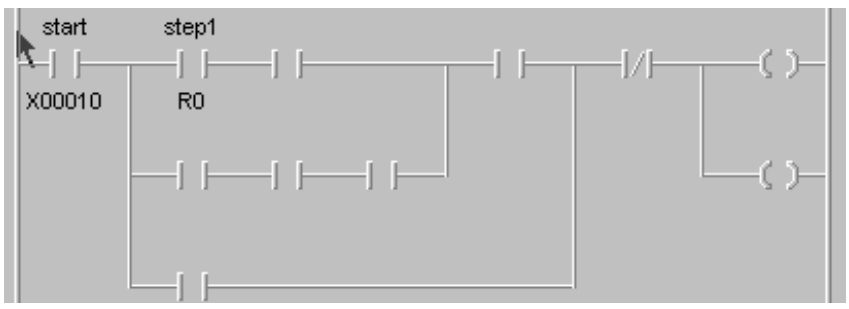
Place the cursor below the coil. The cursor will change to a parallel contact symbol.

Right click and select Normal Coil or Set/Reset coil



Click on the arrow and the parallel coil will be completed.



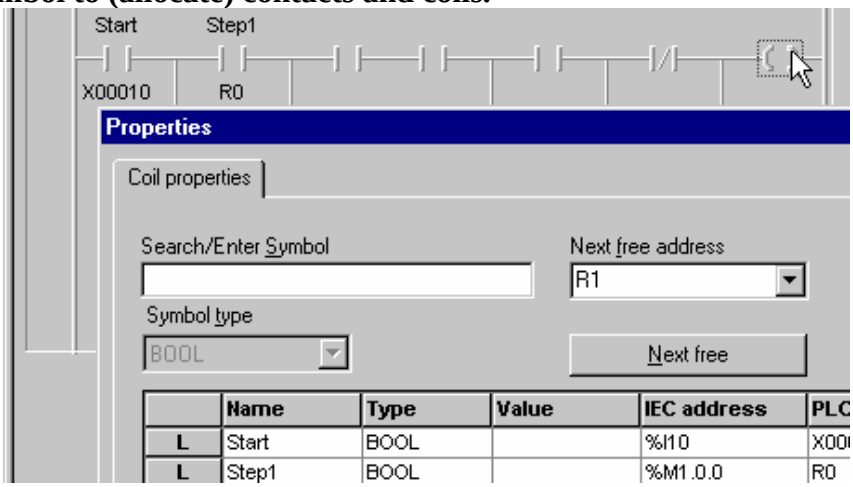


Give or change a symbol to (allocate) contacts and coils.

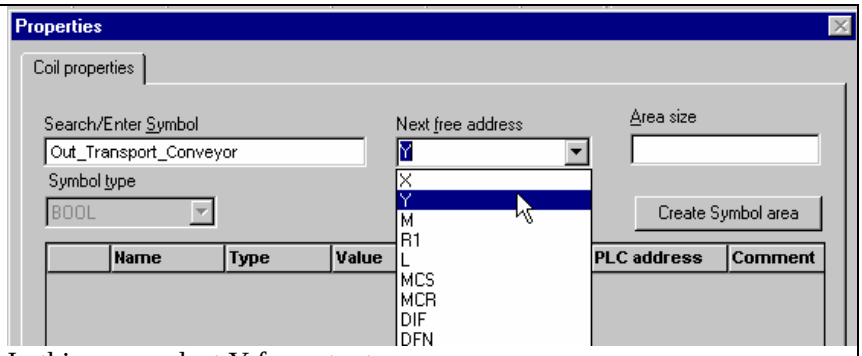
Go to the contact or coil you want to allocate.

Double Click (or click with the right mouse button

and select ”Properties”)

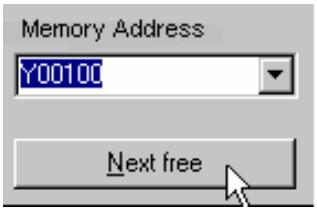


The Symbol selection and search window will appear. Type the new symbol name. *(You are not limited to any length of the symbol. Just use a significant, but not too long symbol names out of practical reason. Note that blanks are not allowed.)*



In this case, select Y for output.

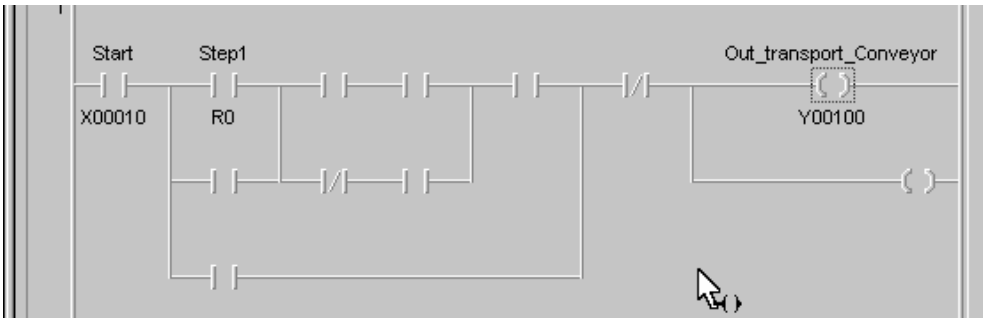
If you have not decided the address number from the beginning, press ”Next free” and the software will suggest the first free unused output address.



Press OK and the coil is allocated.

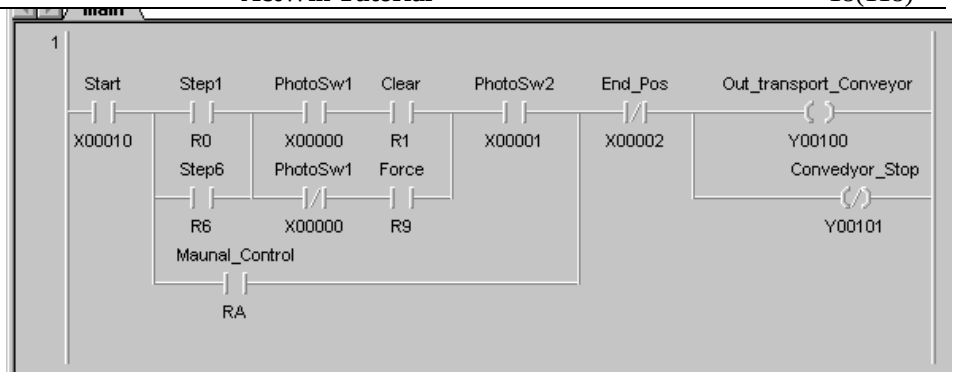
Continue with the same procedure

or select already existing symbols from the list.



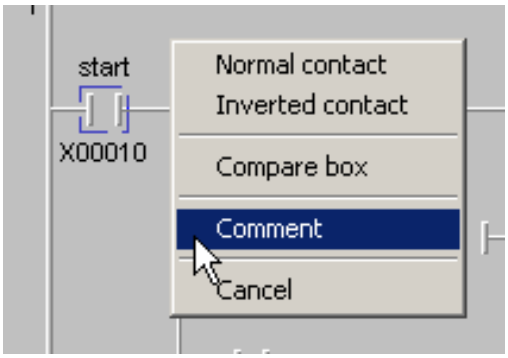
Note that before the rung was completed it was shown on a "lower level"

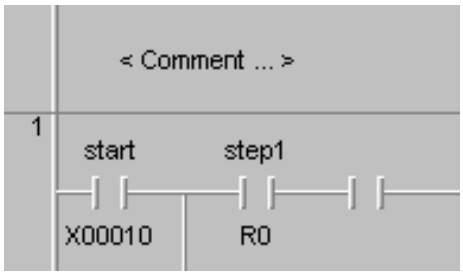
When the rung is completed and approved by ActWin the marking disappears.



To write a rung comment:

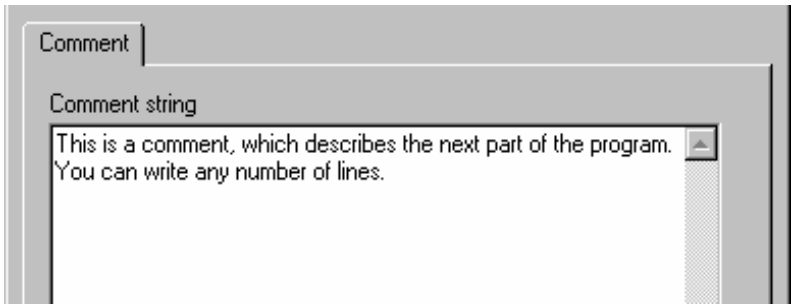
Place the cursor above or beneath an existing rung. A symbol for contact in a new rung appears. Right click and select "Comment" from the menu.



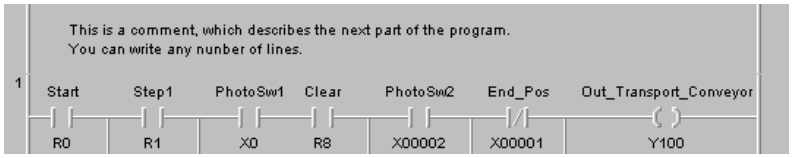


Click on the <Comment...> symbol.

A window will open, where you can write the comment.



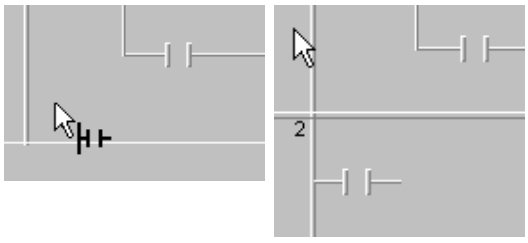
Press OK and the comment will be inserted in the ladder diagram.



To start a second rung:

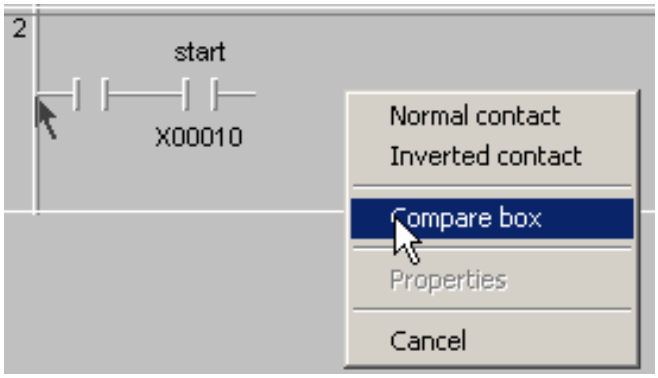
Place the cursor above or beneath an existing rung. A symbol for contact in a new rung appears.

Click with the left mouse button and a contact in a new rung will be created.

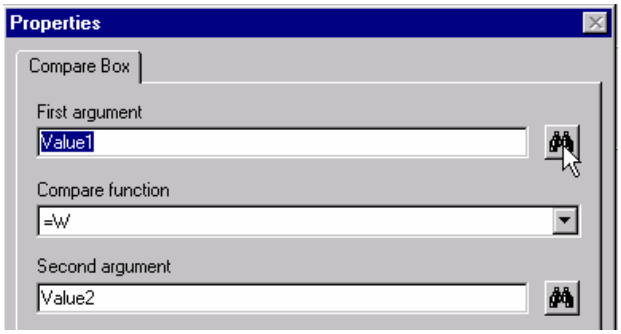


Make an H PLC specific Compare box:

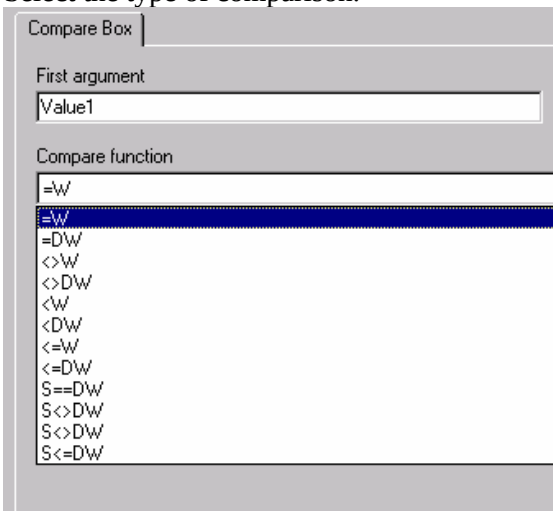
Treat the Compare box just like a contact but right click or press and hold down left button. Select Compare box from the menu.



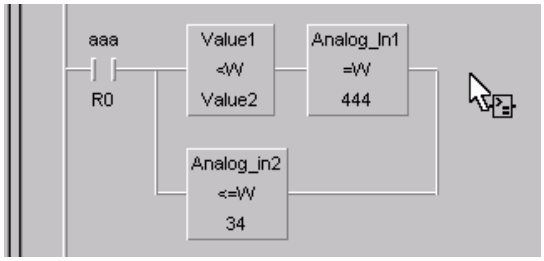
Use the Monoculars to allocate the symbols or type a constant value.



Select the type of comparison.

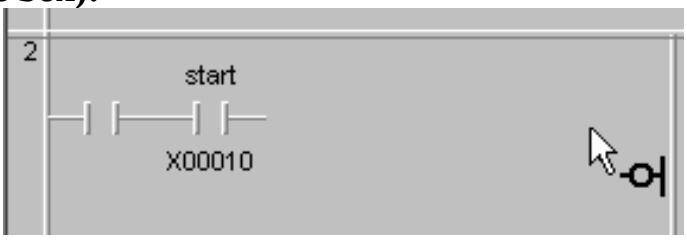


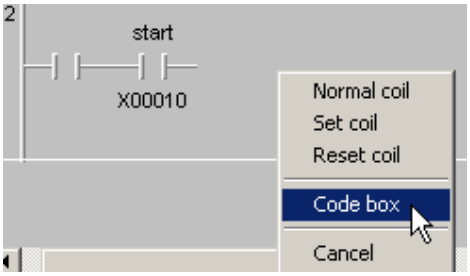
Continue to build the network

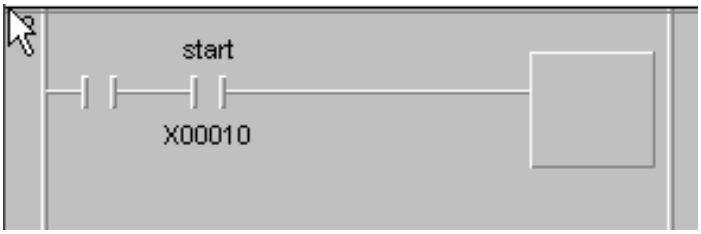


Make an arithmetic box (Code box):

Treat the Arithmetic box (Code box) just like a coil but right click or press and hold down left button. Select Code box from the menu.





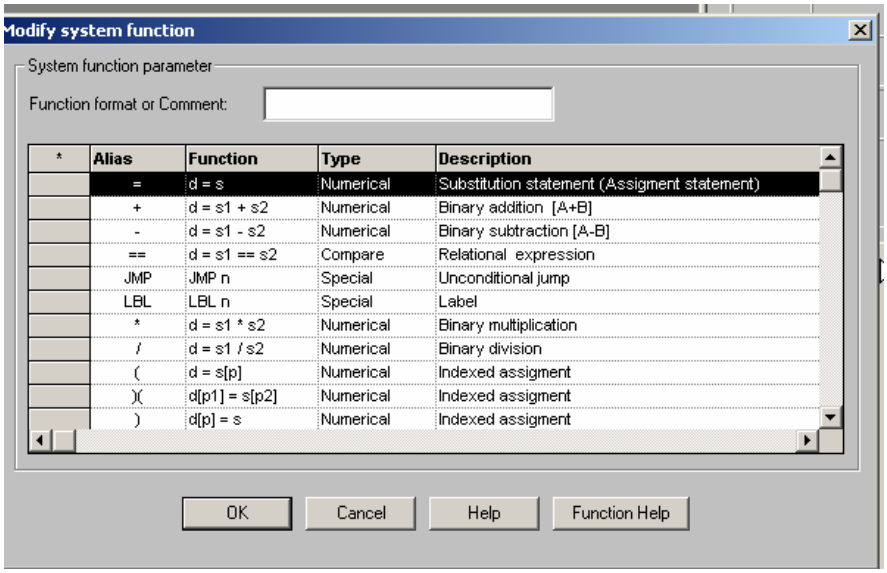


There is now a very quick way of selecting the instructions.

You will get a list of available instructions.

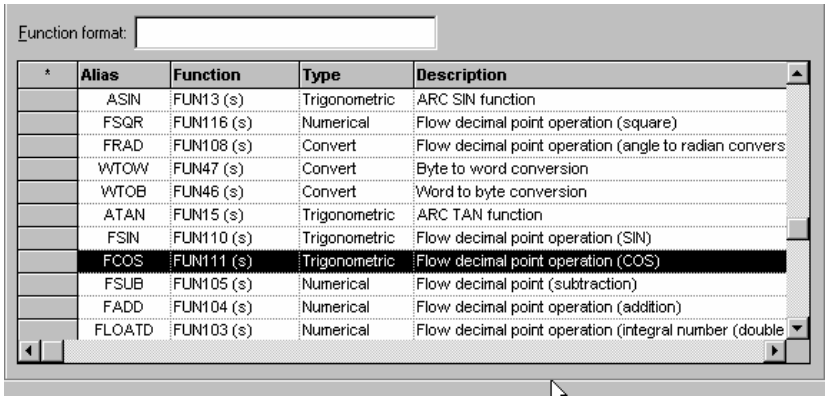
Every instruction has an "alias", which means a short logical name.

They are sorted in a priority order, which means that the most common instruction "d = s" is on the top. (for d = s, just press Enter)



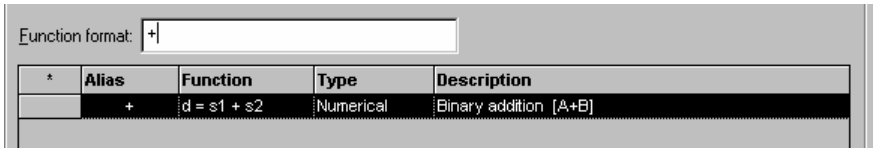
*	Alias	Function	Type	Description
	=	d = s	Numerical	Substitution statement (Assigment statement)
	+	d = s1 + s2	Numerical	Binary addition [A+B]
	-	d = s1 - s2	Numerical	Binary subtraction [A-B]
	==	d = s1 == s2	Compare	Relational expression
	JMP	JMP n	Special	Unconditional jump
	LBL	LBL n	Special	Label
	*	d = s1 * s2	Numerical	Binary multiplication
	/	d = s1 / s2	Numerical	Binary division
	(	d = s[p]	Numerical	Indexed assigment
	)(	d[p1] = s[p2]	Numerical	Indexed assigment
	)	d[p] = s	Numerical	Indexed assigment

You can scroll down and select the right function with Enter or click with the mouse..



*	Alias	Function	Type	Description
	ASIN	FUN13 (s)	Trigonometric	ARC SIN function
	FSQR	FUN116 (s)	Numerical	Flow decimal point operation (square)
	FRAD	FUN108 (s)	Convert	Flow decimal point operation (angle to radian convers
	WTOW	FUN47 (s)	Convert	Byte to word conversion
	WTOB	FUN46 (s)	Convert	Word to byte conversion
	ATAN	FUN15 (s)	Trigonometric	ARC TAN function
	FSIN	FUN110 (s)	Trigonometric	Flow decimal point operation (SIN)
	FCOS	FUN111 (s)	Trigonometric	Flow decimal point operation (COS)
	FSUB	FUN105 (s)	Numerical	Flow decimal point (subtraction)
	FADD	FUN104 (s)	Numerical	Flow decimal point operation (addition)
	FLOATD	FUN103 (s)	Numerical	Flow decimal point operation (integral number (double

Select e.g. "d = s1 + s2" (binary plus) by typing the alias "+" Press Enter

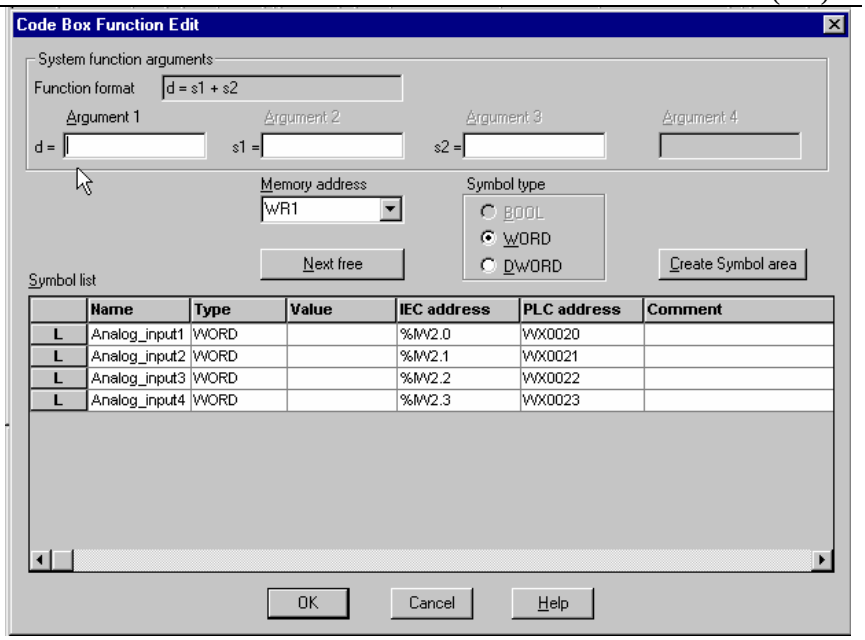


*	Alias	Function	Type	Description
	+	d = s1 + s2	Numerical	Binary addition [A+B]

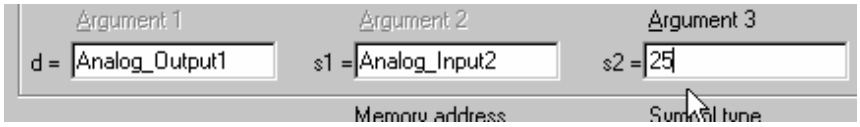
Here you can define the symbols that are used in the instruction.

The symbol type selectable. WORD is default here.

Search or define the symbol like in the contact/coil dialog.
Press <Tab> to enter the symbol and move to the next argument.

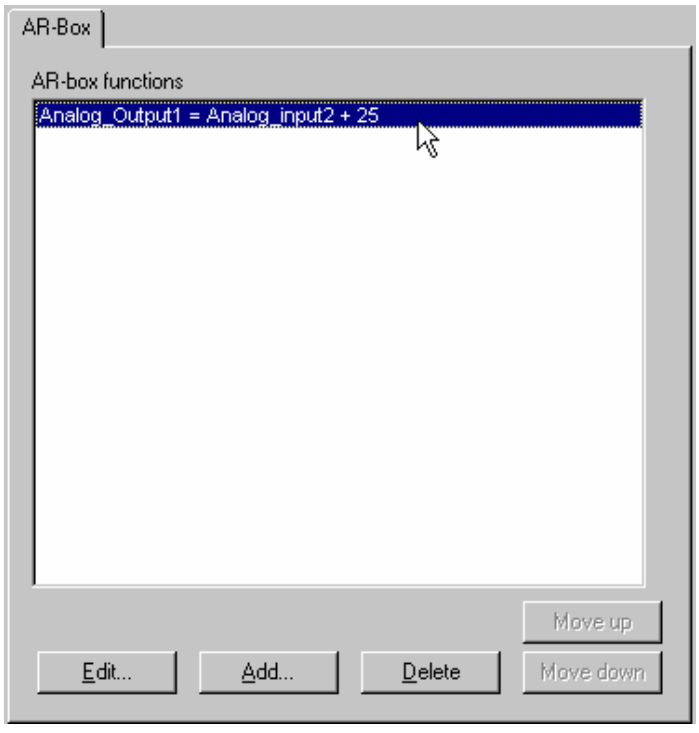


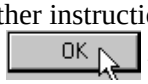
When the symbols and constants are defined, press OK



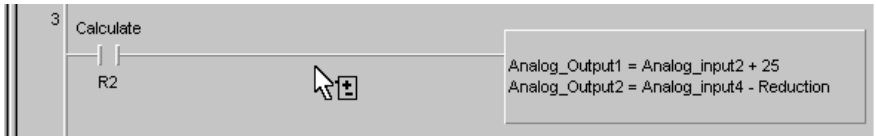
A window will pop up where all editing can be done.

- **Delete button** will delete a line.
- **Add Button** will insert a new line.
  You will get a list of all functions.
- **Move buttons** will move a line up or down
- **Edit button** will allow you to change an existing line.



Add another instruction and press the 

button and the box is completed.

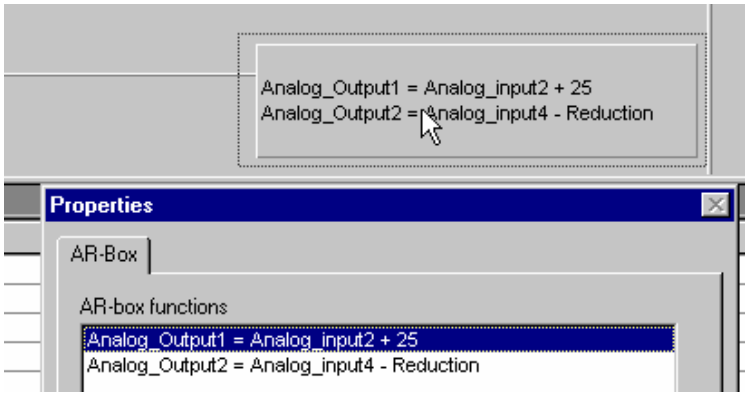


Edit the content of an arithmetic box:

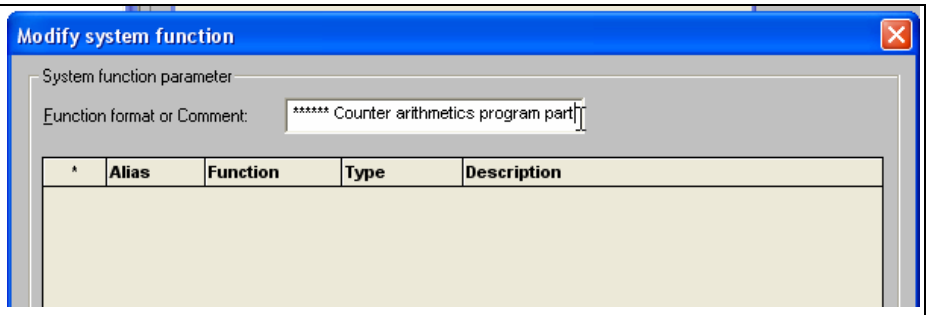
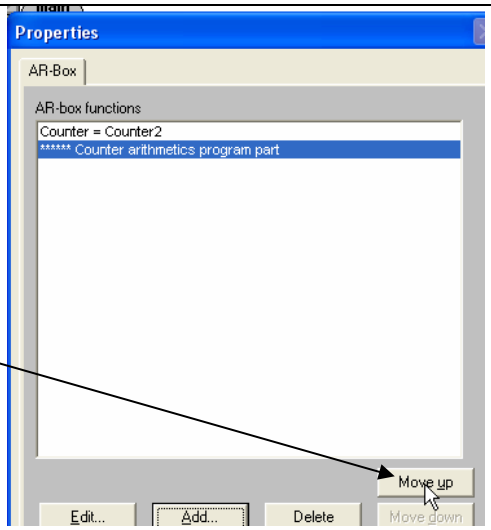
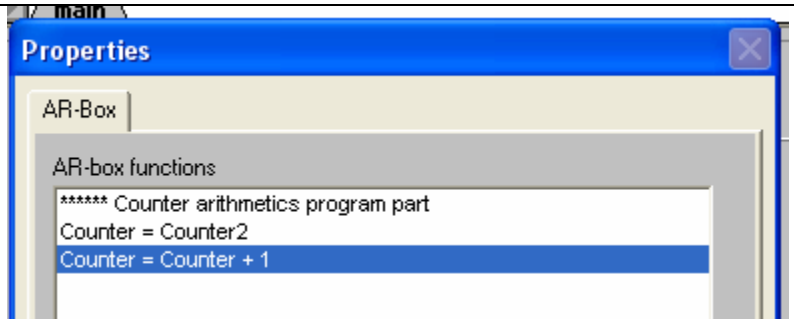
Double click on the box

(or Right click  and select ”Properties”).

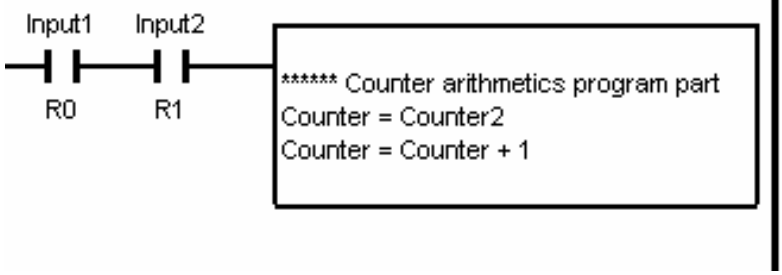
The edit box will open and allow you to continue editing.



Write a Comment in a Code box.

The “Function format or Comment” window allows you to write any text.	
This text will become a line comment in a Code box. Use the Move Up button to Move the Comment to the top.	
Continue the coding through pressing the Add button (or press Insert)	

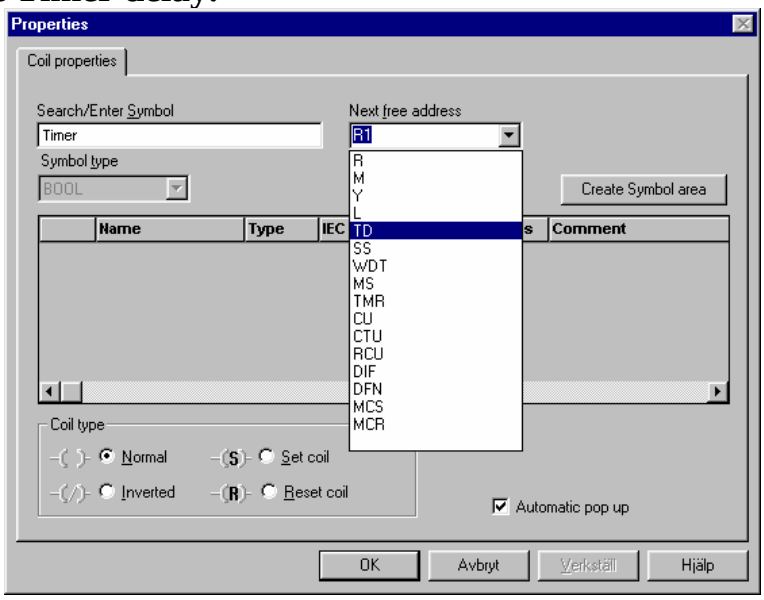
When you are ready, press the Close button.



Make an H PLC specific Timer delay.

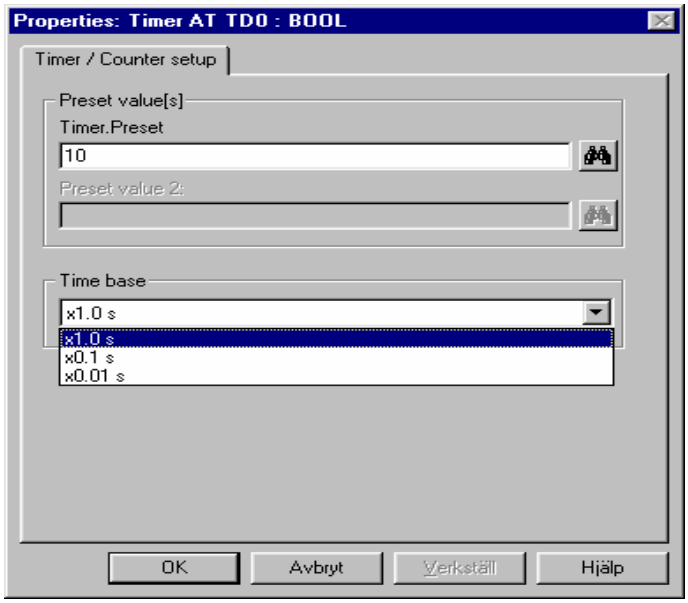
Create a coil.
Give the new symbol a name and select address type TD from the address list.

Press OK button.



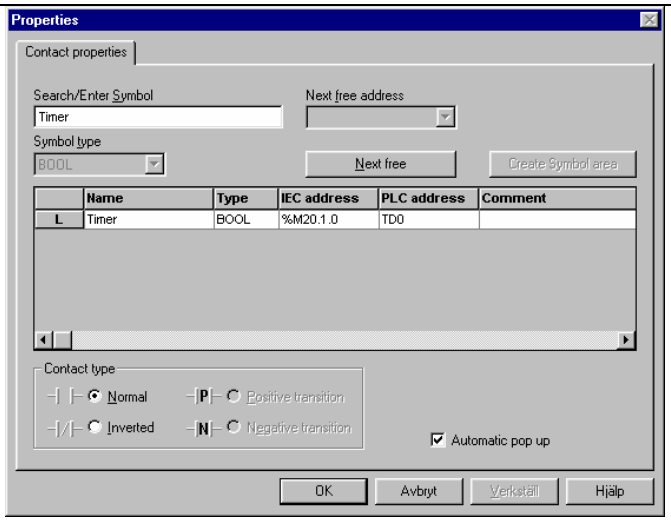
In the Timer properties window enter Timer Preset time and select Time base.

Press OK button



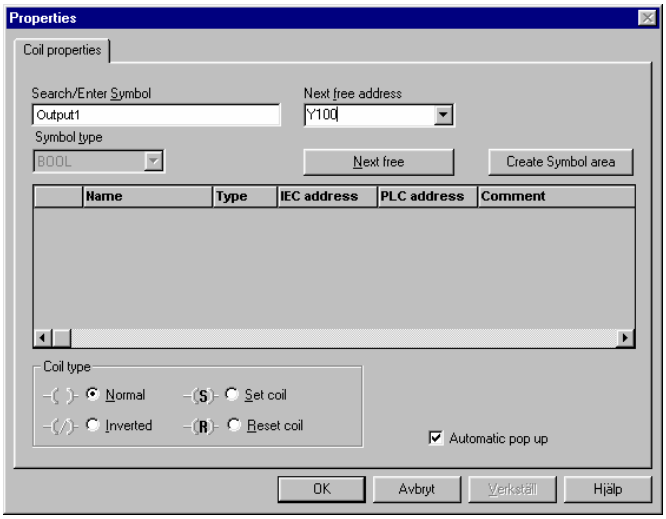
Create a contact in a new block.
Select the “Timer” symbol in the contact properties window.

Press OK button.

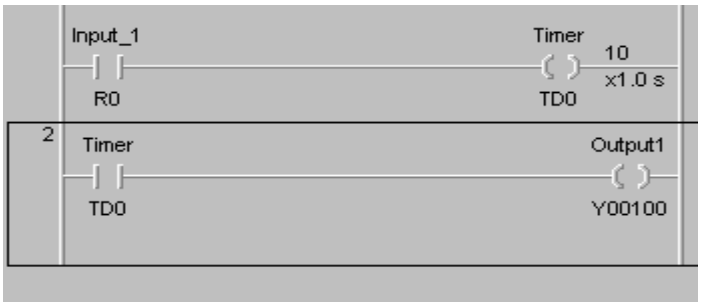


Create a coil with for example address Y100.

Press OK button.

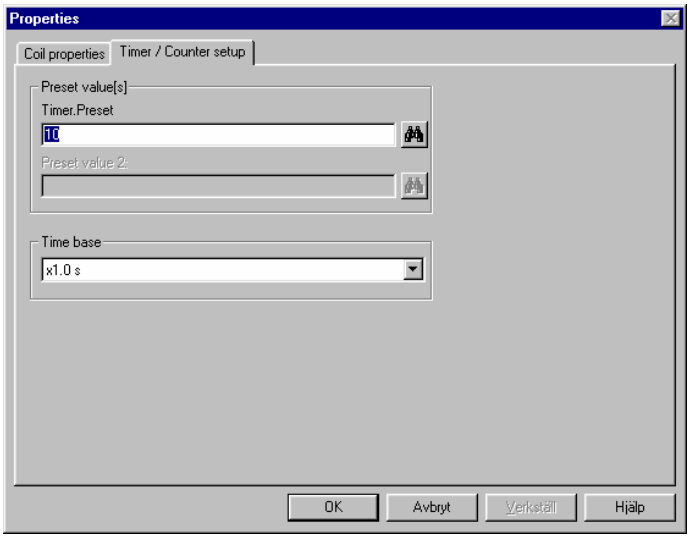


If “Input_1” is true, “Output1” will be true after 10 seconds.



To change the Timer Preset value.

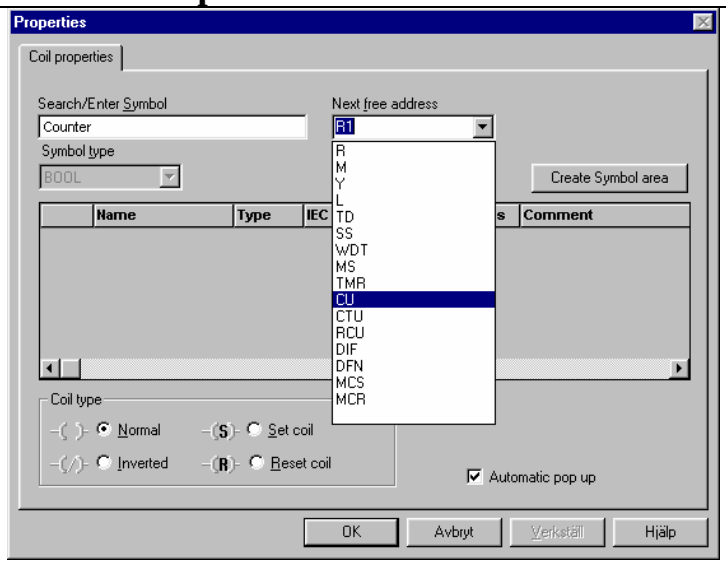
Right click on the Timer coil and Select “Properties”.
Click on the Timer/counter folder.
Change the preset value or time base and press button OK.



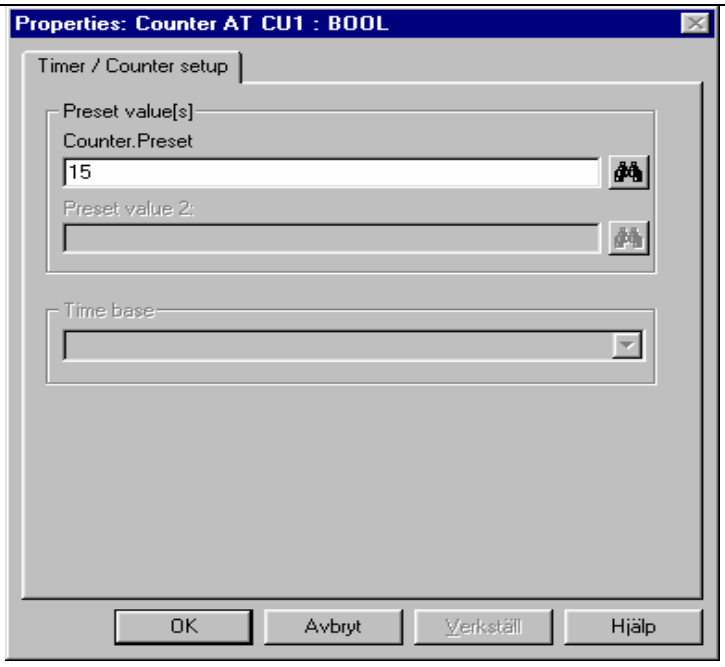
Create an H PLC specific Counter up.

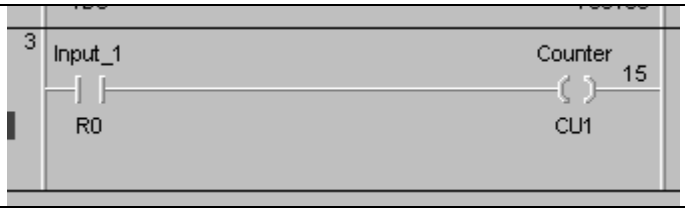
Create a coil.
Give the new symbol a name and select address type CU from the address list.

Press OK button.



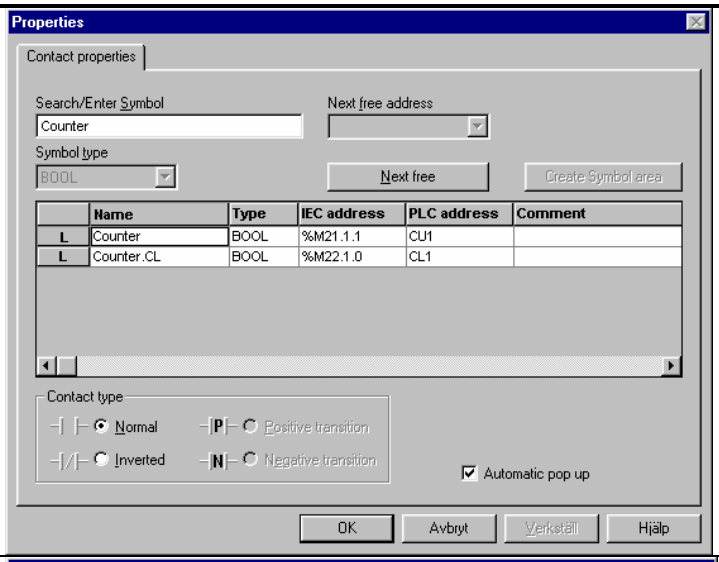
In the Counter properties window enter Counter Preset value.
Press OK button





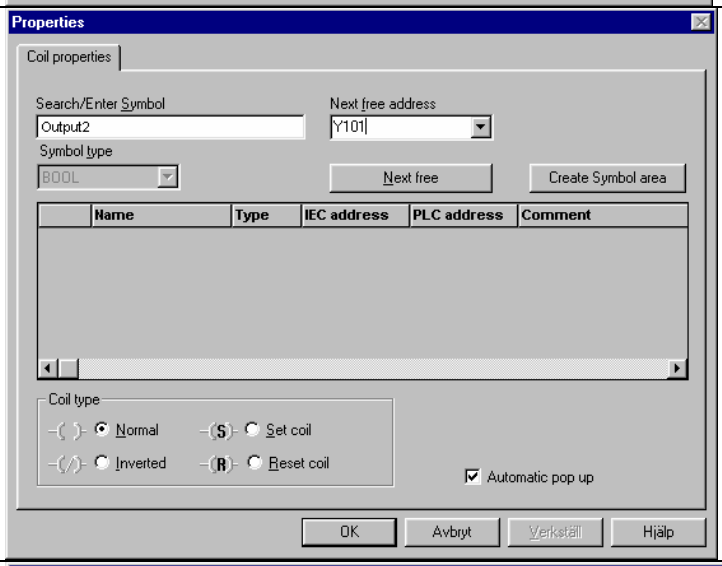
Create a contact in a new block. Select the “Counter” symbol in the contact properties window.

Press OK button.



Create a coil with for example address Y101.

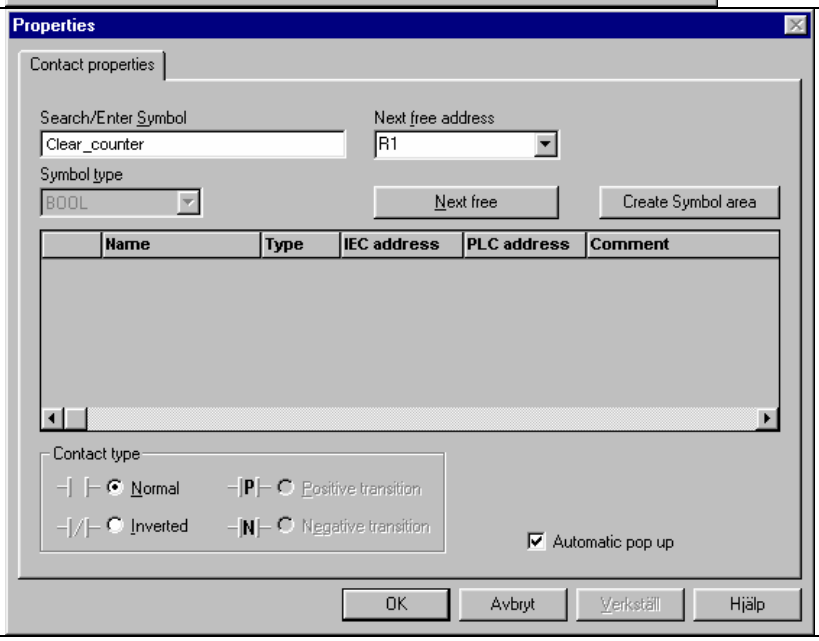
Press OK button.



Clear current value in a Counter.

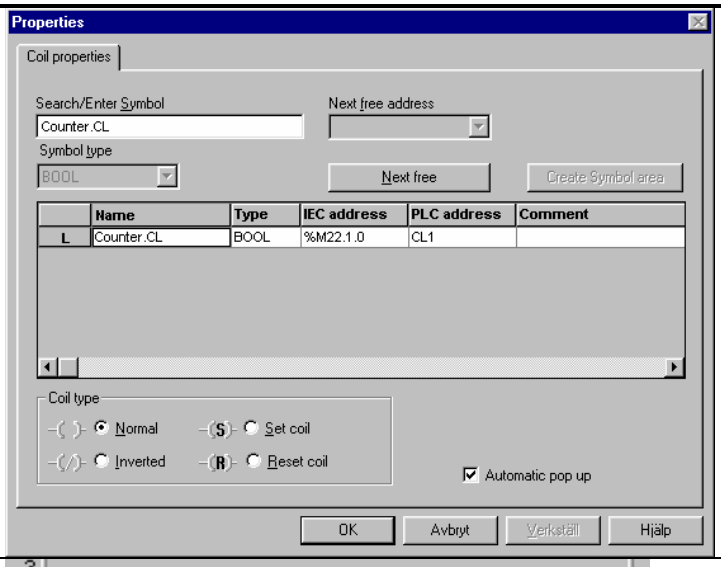
Create a contact in a new block. Give the symbol a name and an address..

Press OK button.



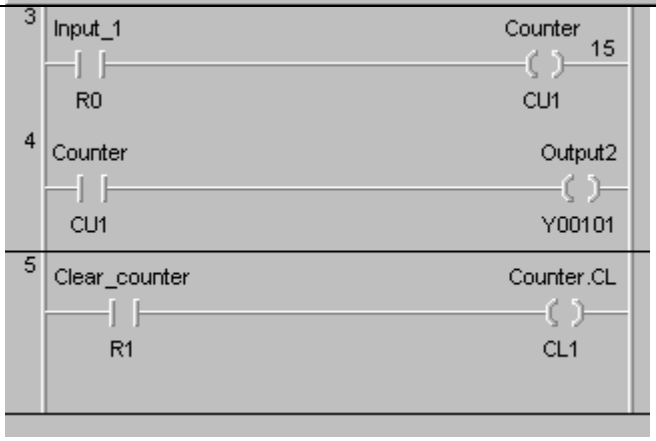
Create a coil and select the "Counter.CL" symbol in the coil properties window.

Press OK button.



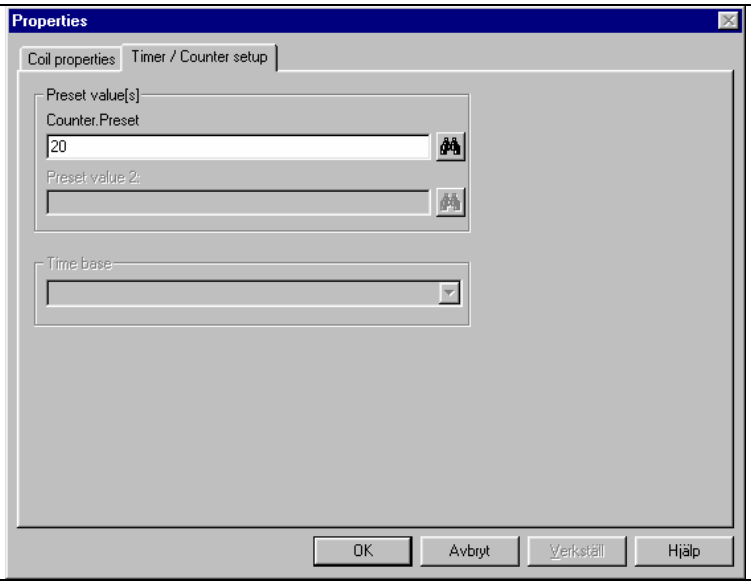
Every time "Input_1" goes high, the counter current value will increase with one.

When "Clear counter" is high the Counter current value will be set to zero.



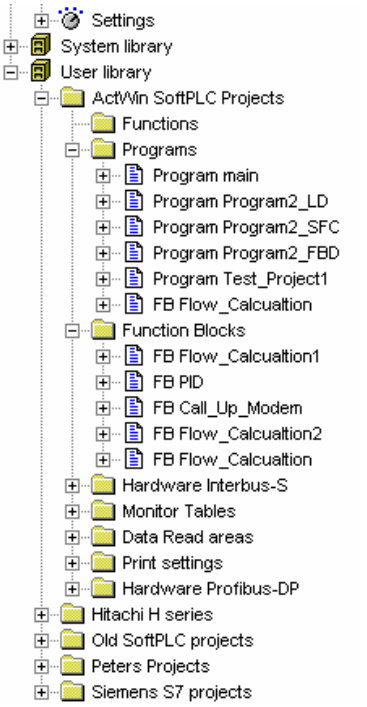
To change the Counter preset value.

Right click on the Counter coil and Select "Properties".
Click on the Timer/counter folder.
Change the preset value and press button OK.

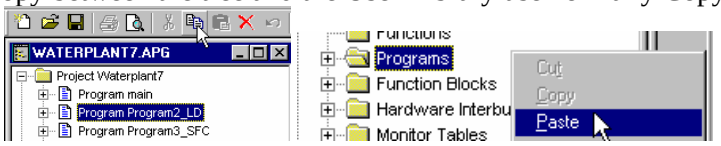


User Library

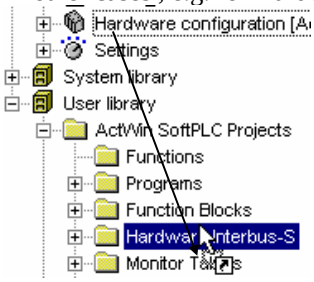
In the User Library you can store Programs, Functions, Function Blocks, Hardware configurations, Monitor tables, Data memory areas, printer settings etc. that you can reuse.



To copy between the tree and the User Library use normally Copy-Past



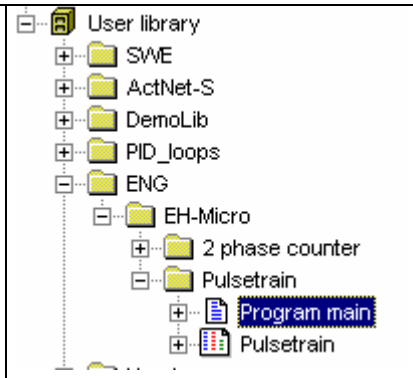
In other cases , e.g. for Hardware Configurations, use Drag and Drop.



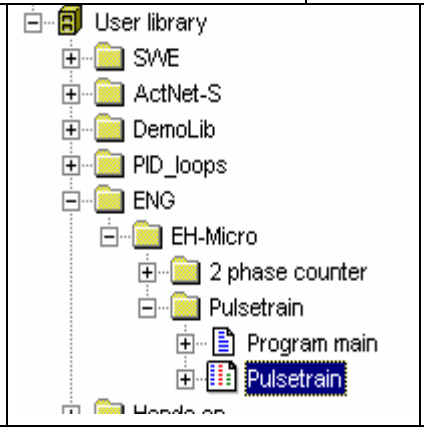
Included User Library files.

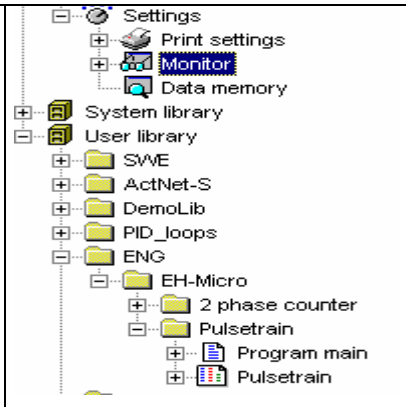
In ActWin some User library files are included. In the **ENG** library some example projects are included. For example the "**Pulsetrain**" for Micro-EH series.
To use this example project do following:

Right click on the "Program main" under "Pulsetrain".
Mark the program window and select menu "Edit/Paste"

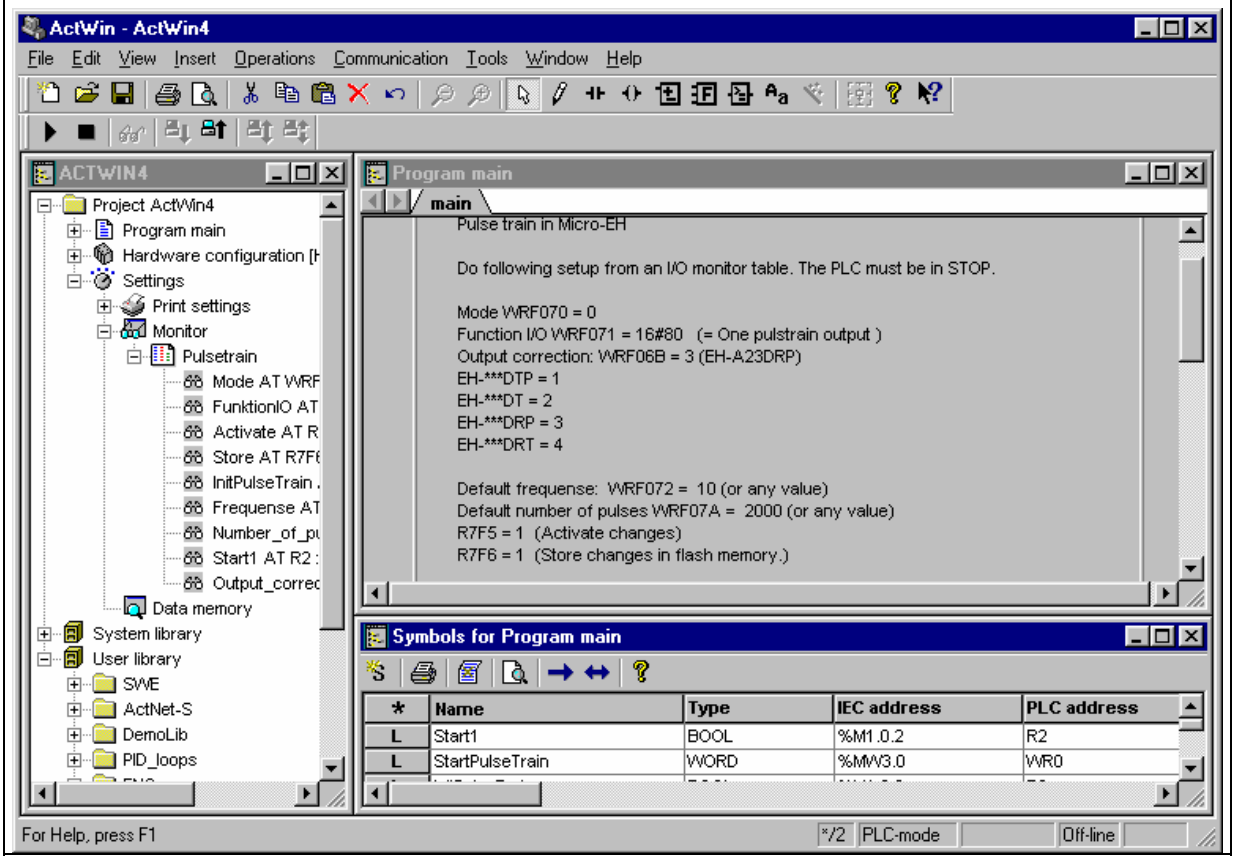


Drag and drop the "Pulsetrain" monitor table to "Monitor"





The ActWin window will look as follows.



Structure your program by using Section Comments

When the program gets bigger there is a useful function to structure the program. It gives you the possibility to go from one place to another very quickly and to display different parts of the program simultaneously.

Insert a rung comment. E.g. “ActNet-S Macro” Select Section comment in the box.	The Comment will look like this: ActNet-S Macro

When the comment shows This comment will now hide the program until there is a new Section comment.

Click on the and it turns into a and shows the program section belonging to the comment.

Example of a program using Section comments:

Complete program	Two sections opened.
ActNet-S Macro Set ActNet-S in Receive Convert from real ASCII Compare to slave no. Set "SlaveNo" to the number of the slave Check if the Function is supported (01, 04, 15, 16 are supported) Calculated LRC and compare if it is correct Send response to Function 01 Send response to Function 04 Send response to Function 15 Send response to Function 16 Calculate LRC and write end of message Convert to real ASCII	ActNet-S Macro Set ActNet-S in Receive 5 RecieveReady M2F — Receive M30 6 Receive M30 — ReceiveWord = 16#120D Convert from real ASCII Compare to slave no. Set "SlaveNo" to the number of the slave Check if the Function is supported (01, 04, 15, 16 are supported) Calculated LRC and compare if it is correct Send response to Function 01 20 Fun01OK M80 — OK M1C1 — Point2 = Bytecount FOR 2 (Point2) Point3 = Bytecount - Point2

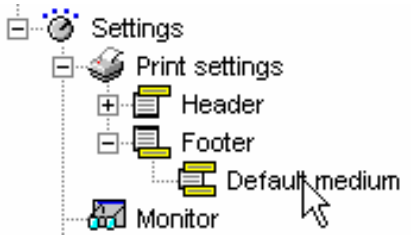
You can use the Zoom tools to get the right overview of the program.

Compressed, (Content view)	Normal view	Complete view
Start of program, Set up of parameters. Start condition for Conveyor Comparing analog values to constant levels Comparing other parameters in the system Separation control Alarm handling Call up master station for emergency Regualtion of pumps	Start of program, Set up of parameters. 1 MOVE_INT EN ENO — 1232 — Maxlevel1 Start condition for Conveyor Comparing analog values to constant levels Comparing other parameters in the system 5 EQ_INT EN ENO	Start of program, Set up of parameters. 1 MOVE_INT EN ENO — 1232 — Maxlevel1 Start condition for Conveyor 2 Start %I1.1 — Step1 — Flag2 Step2 — PE1 — Flag1

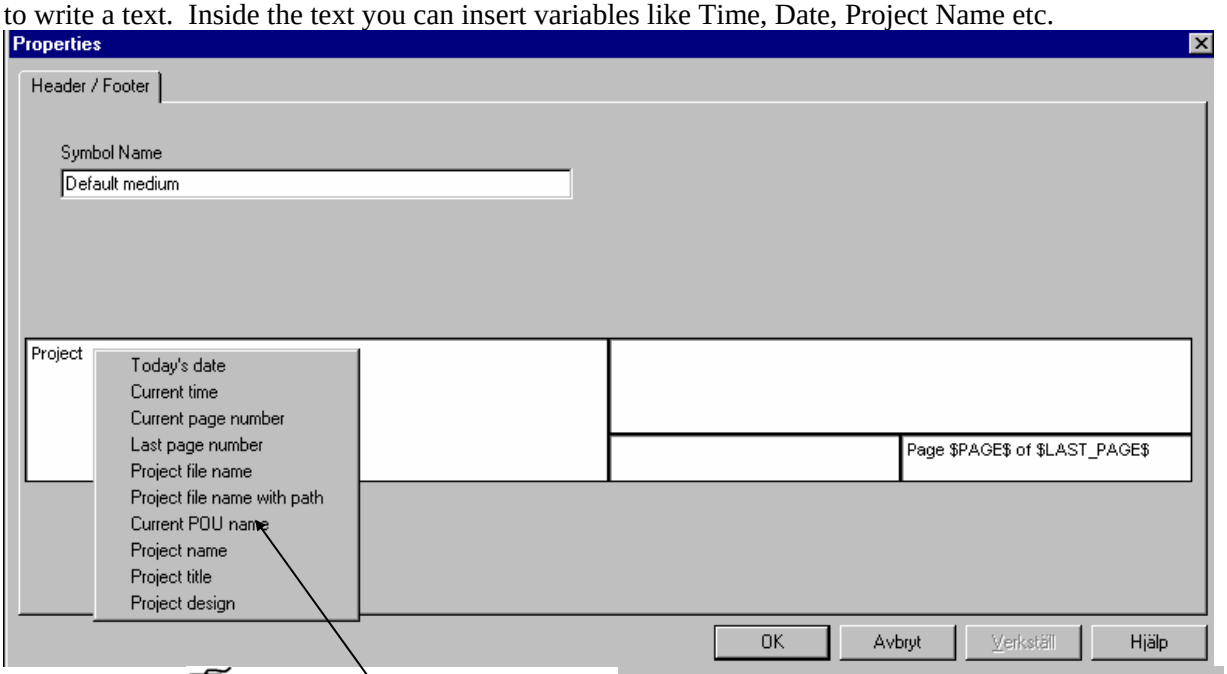
Print the project

To make a proper printout, start to make a footer and/or a header.
(to be printed out on every page)

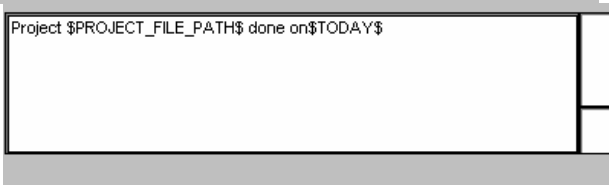
Open ”Settings- Print Settings- Footer” in the tree.



There is already default footer.
To edit this, double click on the footer symbol
A Window will open, where you can design your own footer. Give the footer a unique name and start to write a text. Inside the text you can insert variables like Time, Date, Project Name etc.



Just right-click  and select from the list. A text starting with a $ sign will be inserted. This will be replaced in the final printout by the variable. Continue text editing after the variable.



Export the content of the symbol window

"Mark the symbols (Click on the left column).

Press Copy 

Go to another application, e.g. Excel or Word or CAD system.

Paste 

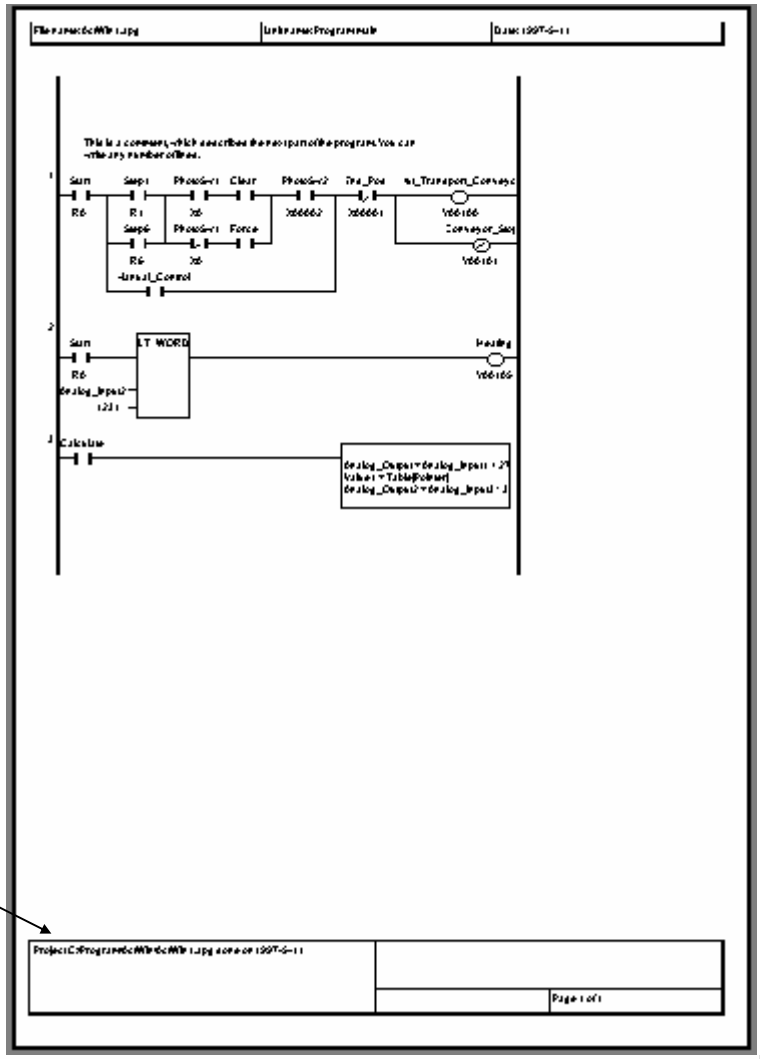
L	Out_Transport	BOOL	%Q1.5
L	Step7	BOOL	
L	Start1	BOOL	%I1.5
L	Analog_Input1	INT	%IW3.0
L	Analog_Input2	INT	%IW4.0
L	Analog_Input3	INT	%IW5.0
L	Analog_Input4	INT	%IW6.0
L	Heating	BOOL	%Q1.0

	Name	Type	IEC address	PLC address	Co
L	Step7	BOOL			
L	Start1	BOOL	%I1.5	%I1.5	
L	Analog_Input1	INT	%IW3.0	%IW3.0	
L	Analog_Input2	INT	%IW4.0	%IW4.0	
L	Analog_Input3	INT	%IW5.0	%IW5.0	

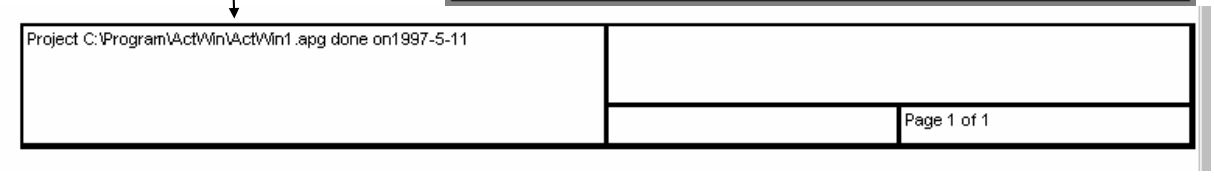
Test the printout with a preview:

Click on the symbol for Preview.

A page looking like the final paper print out will be shown on the screen.

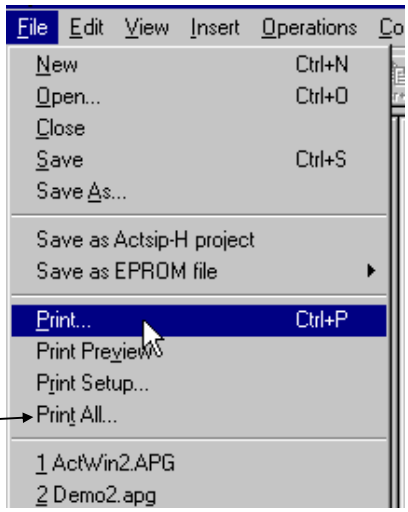


(Here the $ symbols are exchanged to the actual values.)



Paper Printout

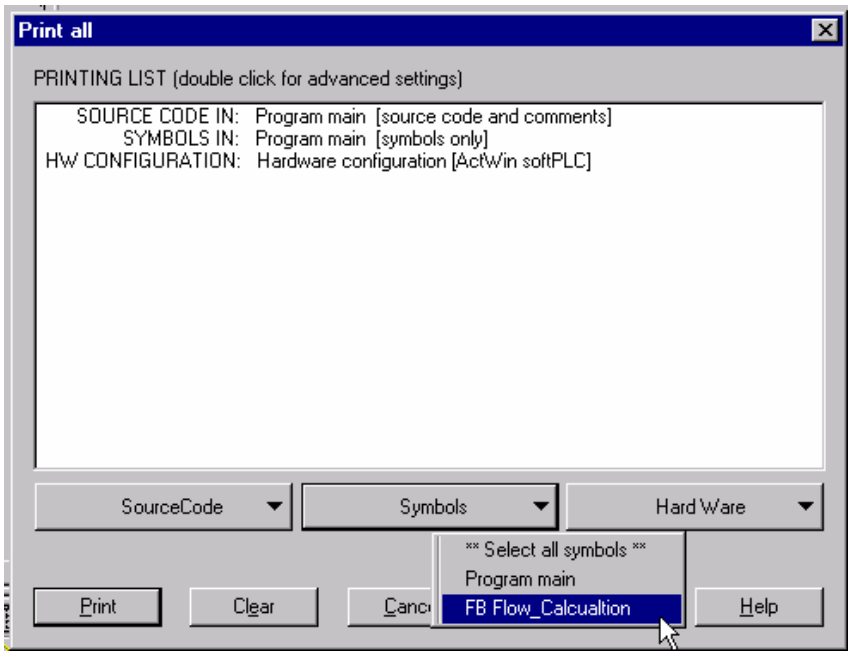
You can click on the  symbol.
Then you will get the complete printout.
You can also select ”Print” in the File menu to get a more detailed printout command.



If you select “Print all” you will get a selection list:

Select what printout you want and press Print.

You can select to print out a part of a program.
Mark it and then select the program in “Print all”

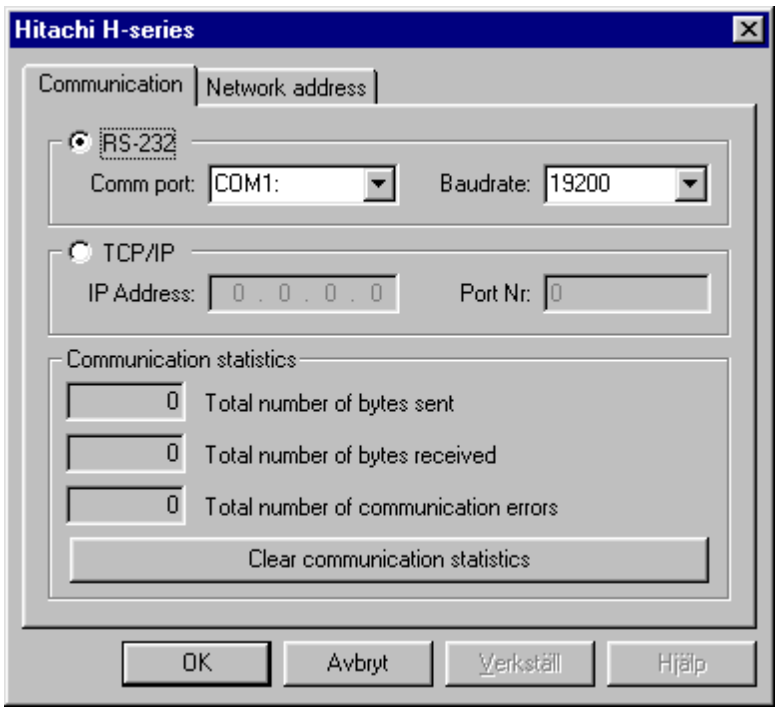


Communication settings

Go to menu “Tools-Driver settings”

For RS232 communication you can select Comm. port and baud rate.

For TCP/IP programming you can enter IP Address and port number. For more information see manual for the Ethernet card (For example EH-ETH)



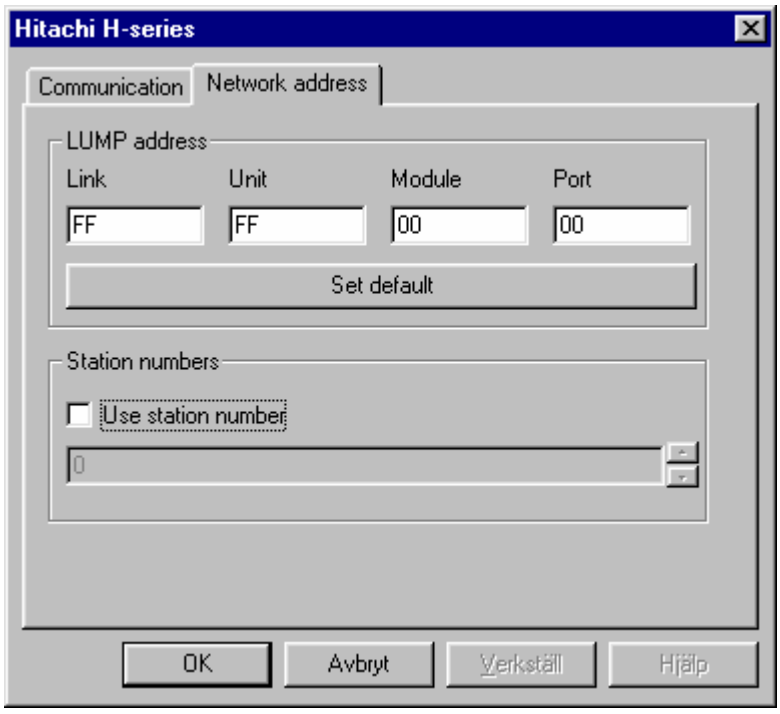
Network address.

From menu “Tools/Driver settings” Select the “Network address” folder.

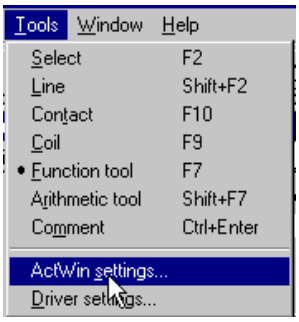
LUMP address:
With this you can program/monitor different CPU´s in a LINK system. If you not using LINK connection, the value should be: FF, FF, 00, 00.

Link: Link module number.
Unit: Sub station number.

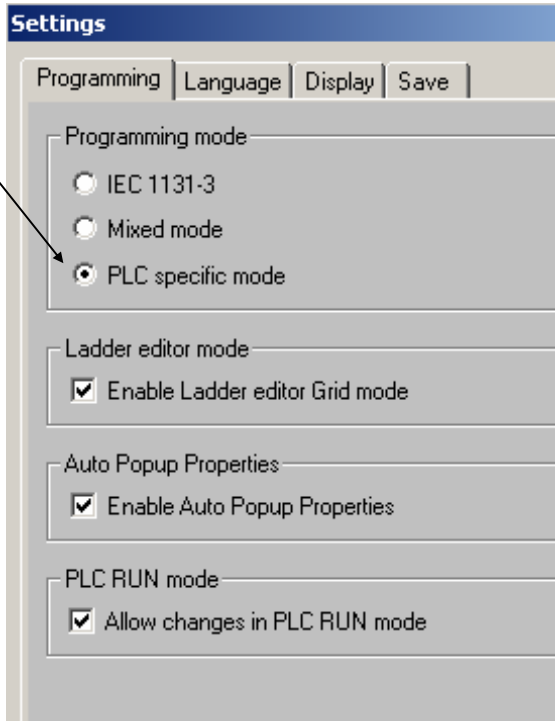
Station numbers:
For multidrop use. Enter station number on unit you should access.



To change settings
Go to ”Tools-ActWin Settings”



Programming mode.
We have started in the ”PLC specific” mode, which only allowed us to write programs compatible to traditional programming.
If you want to continue in the IEC1131-3 programming, select ”IEC1131-3” or ”Mixed mode”



Ladder editor grid mode
To select “Ladder editor grid mode” select the “Enable Ladder editor grid mode”

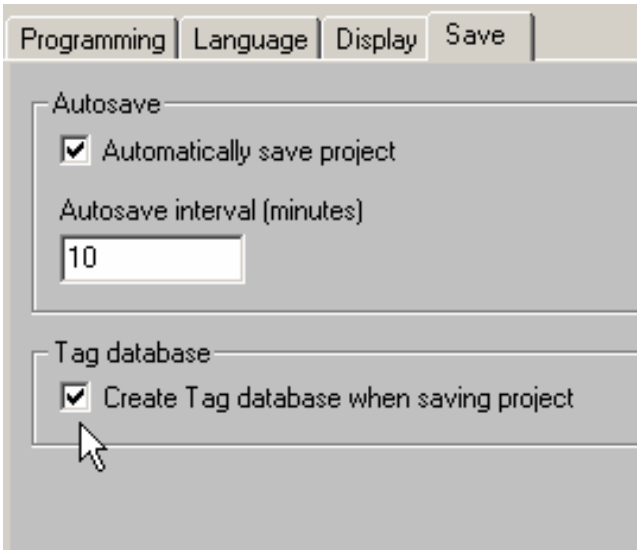
Auto Popup Properties
Select “Enable Auto Popup Properties” for automatic popup of properties dialog .

You can also find folders for **Language**, **Display** and **Save**.

Save folder.

Autosave.
For auto saving select the “Automatically save project” and set the interval

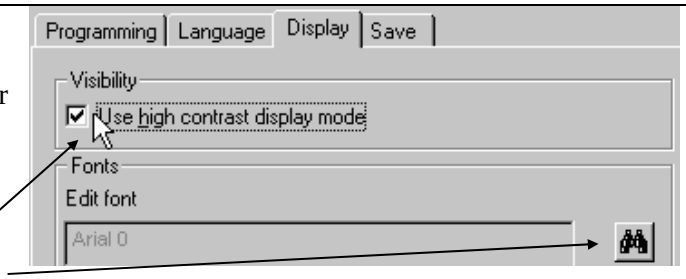
Automatic generation av Tag data base for import to Exor Designer.
For automatic generation of Tag data base file for import to Designer select the “Create Tag database when saving project”. The name of the file will be “projectname”.mdb



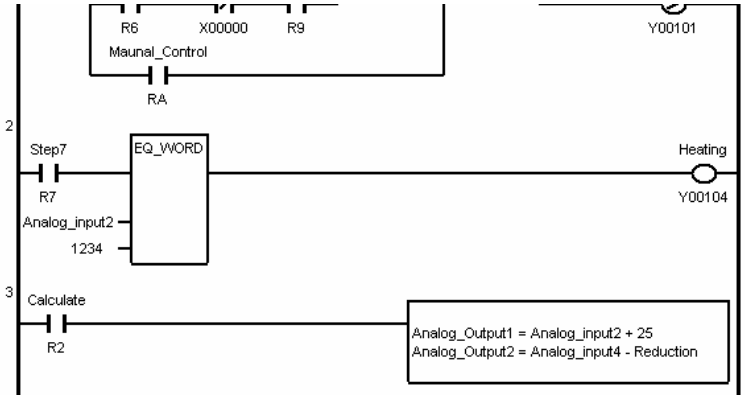
High contrast mode.

Under Display you can select a higher contrast display of the ladder diagram in stead of the modern relief type.

This is practical on some computer screens.
You can also edit the fonts sizes etc. in all screens.

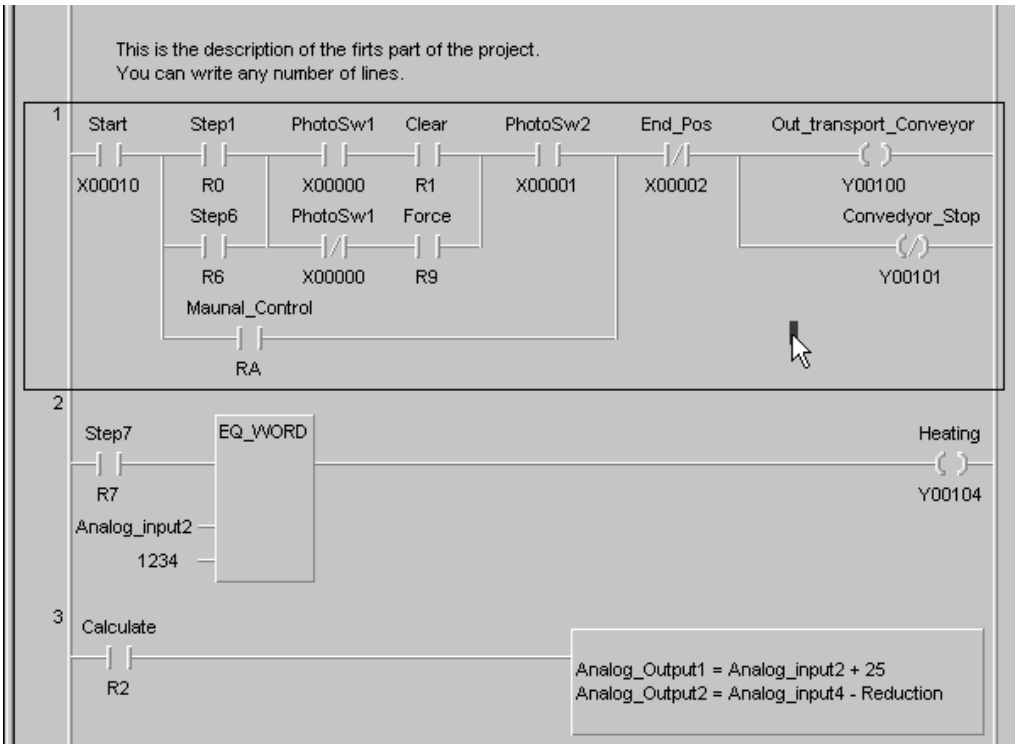


If you select High contrast the screen will look like this:

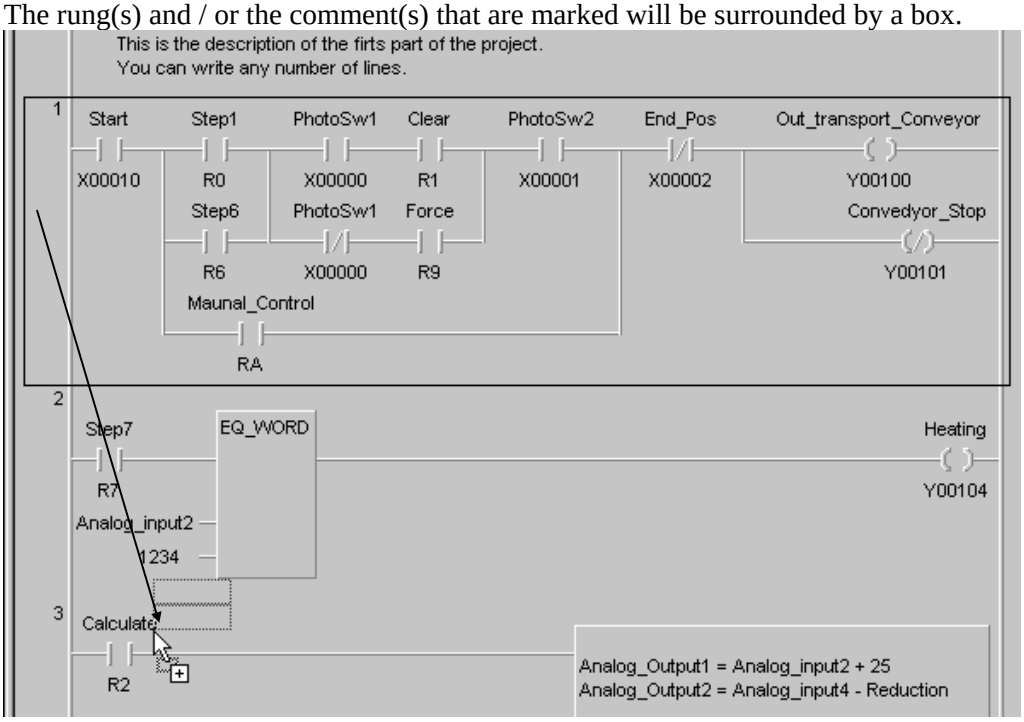


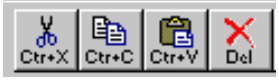
Cut and Past /Move rungs and comments

Left click with the symbol on the rung or the rung comment in order to mark one or more rungs and comments. (To mark more rungs keep the <Ctrl> button down.)



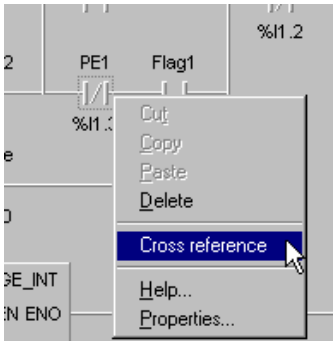
The rung(s) and / or the comment(s) that are marked will be surrounded by a box.



Now you can **drag the rung or comment** with the mouse to another place in the ladder diagram and drop it. Start from the left of the left power line.
You can delete the rung by pressing <Delete>or you can Cut/Copy/Paste with the commands in the Edit menu rungs and comments or the buttons 

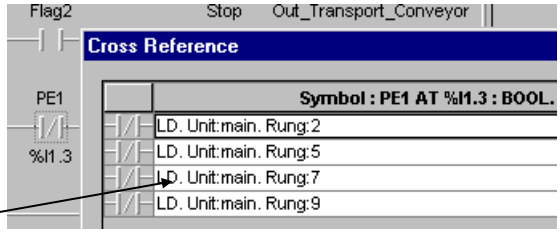
Search for addresses:

Try the Find <Ctrl+F3> and Replace <Shift+Ctrl+F3> to find and replace symbols in the program.



A nice way to get a quick overview of the existence of addresses in the program and to go to the relevant place is to Right click on a symbol.

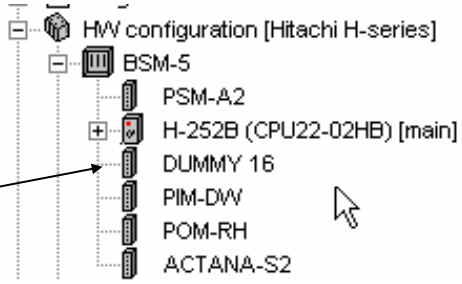
A list will appear informing about the rung numbers and e.g. if it is present as a contact or coil, if it is open or closed etc.



Click on the rung number you want to go to and you will move to that place in the program.

Let us change the rack configuration.

We therefore have to change the addresses in the program.

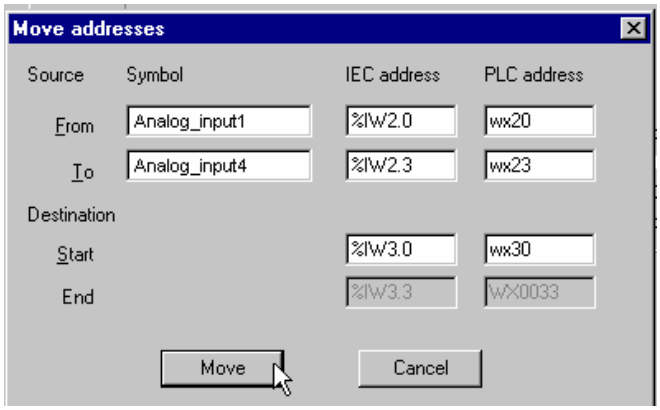


Inserted module

Move addresses

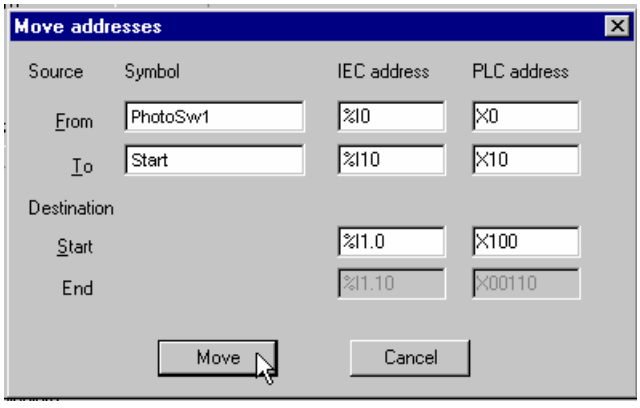
Click on the Move symbol in the symbol Window.

A “Move address” window will pop up. Define first and last address in every group to be moved and the first destination address.

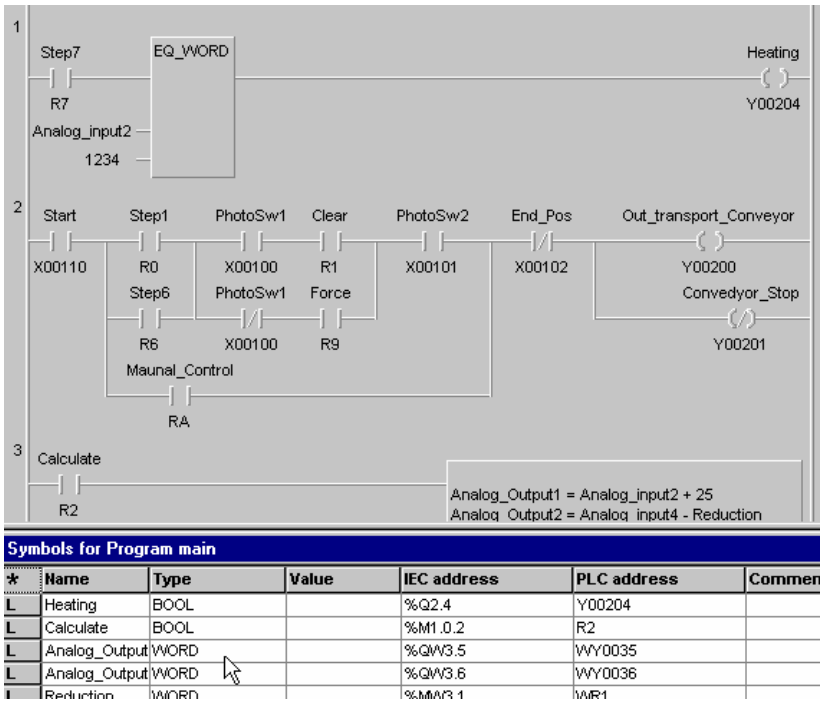


Press the Move button and symbols will change.

Continue until all address are moved.



All I/O addresses in the list and in the ladder program will change.



Symbols for Program main

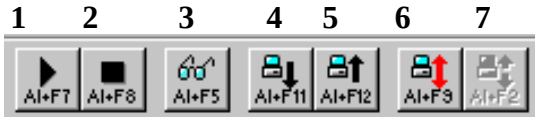
*	Name	Type	Value	IEC address	PLC address	Commen
L	Heating	BOOL		%Q2.4	Y00204	
L	Calculate	BOOL		%M1.0.2	R2	
L	Analog_Output	WORD		%QW3.5	WY0035	
L	Analog_Output	WORD		%QW3.6	WY0036	
L	Reduction	WORD		%MW3.1	MR1	

On-Line Programming

Communication / Transfer:

Following buttons are available:

1. RUN (Start the PLC)
2. Stop
3. Monitor.
4. Transfer the program to the PLC
5. Upload the program from the PLC
6. Go On-Line (First Compares PLC-PC)
7. Update program.
   Active when program is edited On-Line



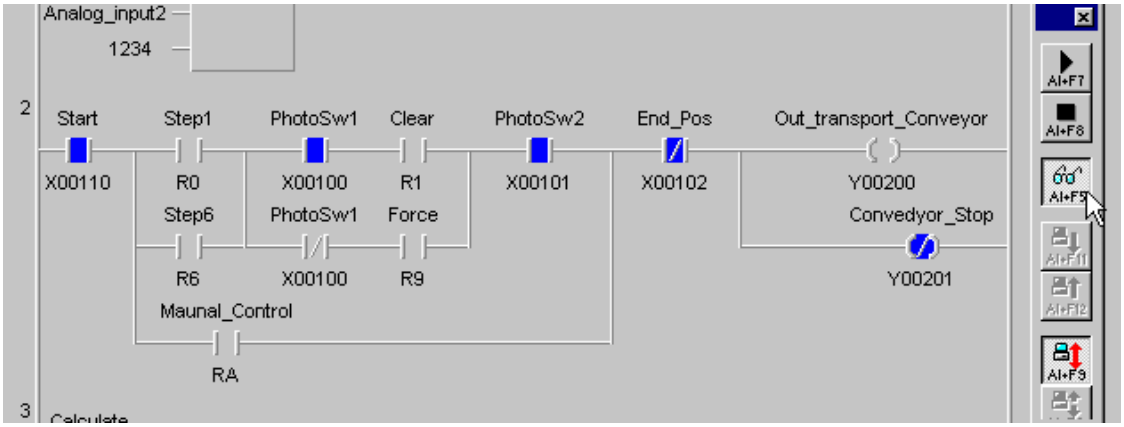
You can also use the Communication-menu commands

Transfer the project to the PLC: 

Press the On-Line button  .

When On-Line is OK the button will change to  and the transfer buttons  will be inactive

Click on the Monitor button. 
Now you can see the monitor status in the ladder diagram.

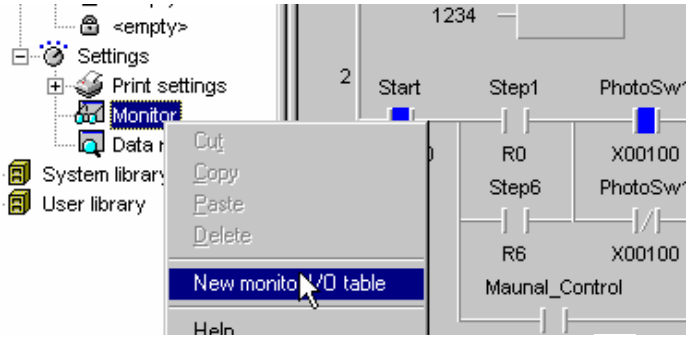


You can move the On-Line tool bar to any place on the screen (Vertical or Horizontal)

Monitor Windows

Many times you need to see monitor information from different parts of the program, which can not be shown just by a the rungs on the screen.
Then you can create one or more I/O Monitor tables:

Right click on the ”Monitor” folder under Settings in the tree.

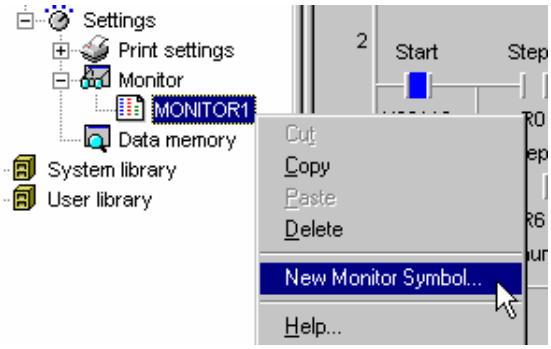


Click on ”New monitor I/O table”.
A window will pop up where you can give the Monitor box a unique name.
Write e.g. ”MONITOR1”

(Note that the hardware configuration is shown as .
That means that it can not be changed during On-Line.)

A symbol in the tree under Monitor will show the new Monitor box.
We have to define the content.

Right click on the symbol and select ”New Monitor Symbol”.

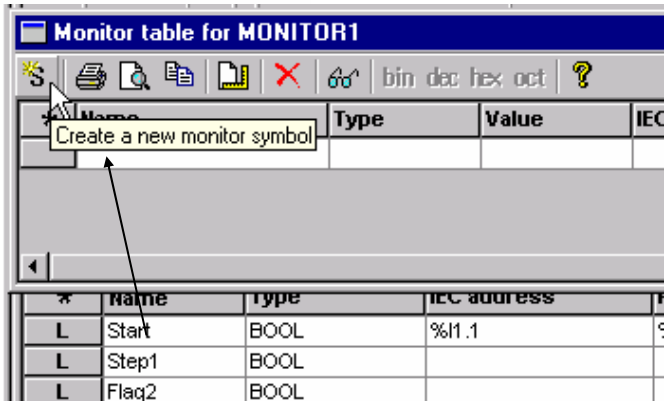


The Symbol selection and search window will pop up. Select the symbols in the box one after the other.

You can now see the symbols in the tree and if monitor is On then you can see the status.

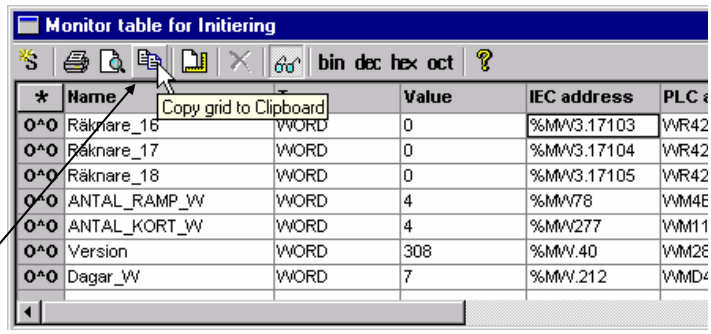
You can select the symbols in the monitor table in two ways:
Click on the S button. The Symbol selection and search window will pop up.

or just drag the symbols from the Symbol window.



You can place the monitor window anywhere on the screen and decide the size.
You can define several Monitor Windows for different purposes and display them together on the screen.

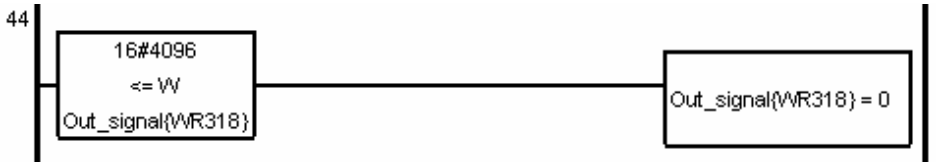
You can catch the Monitor table and the current values if you press the Copy button. This can e.g. be copied in to Excel.



You can show **value monitor information** also in the programming window.
Example:
Symbol + address

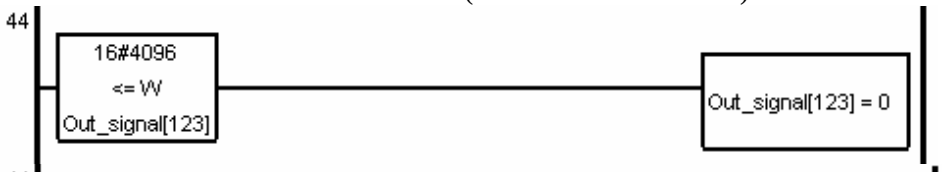
Show Symbol, Address and Symbol/address:

Toggling between these display alternatives is done with Shift+F5
There are three alternatives: Show Symbol, Address or Symbol + Address

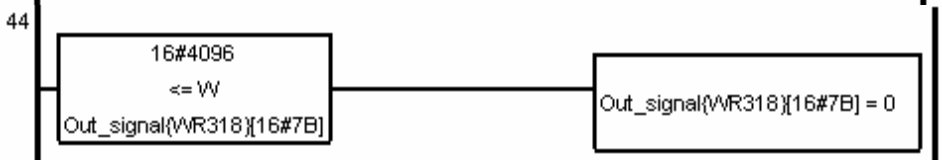


Show Symbol(+Address) + Monitor value (Decimal or Hex):
Toggling between these display alternatives is done with Shift+Ctrl+F5
In Monitor the monitor value can be added (Decimal or Hexadecimal)

Example:
Symbol +
Mon. Value
(Decimal)

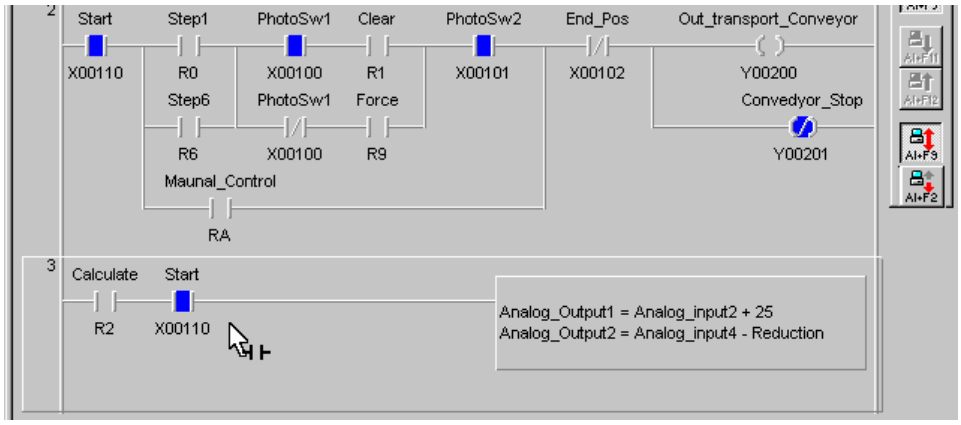


Example:
Symbol + Address
+Mon. Value
(Hexadecimal)

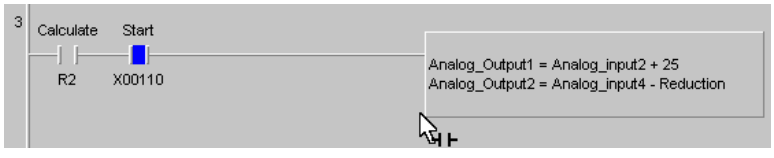


On-Line Change:

Continue to edit the program as you did in Off-Line mode.
Now the rung or rungs that are changed and not updated in the PLC are marked. (It looks like the rung is higher)
The Update button will be active  .



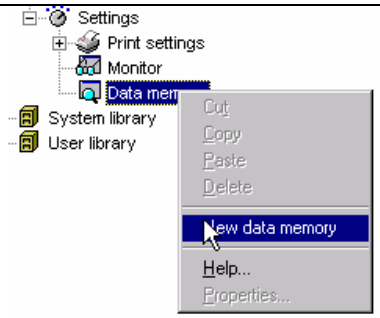
When you press the button the PLC-program will be updated with all changes and the markings will disappear. The Update button  will be inactive again



Data memory tables

To make a Data Memory table:

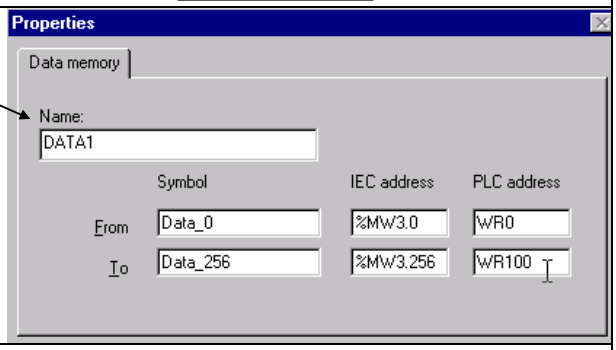
Riight click on Data memory in the tree.
Select ”New Data Memory table”.



Give a significant name to the table

Define the first and the last address in the table.

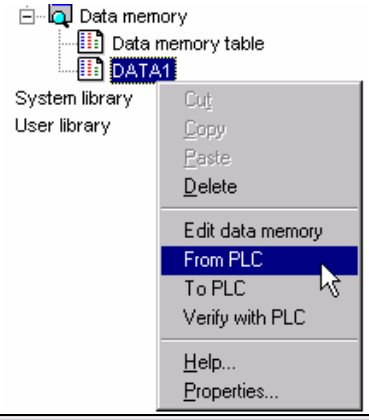
Press OK



The new table will now be present in the tree.

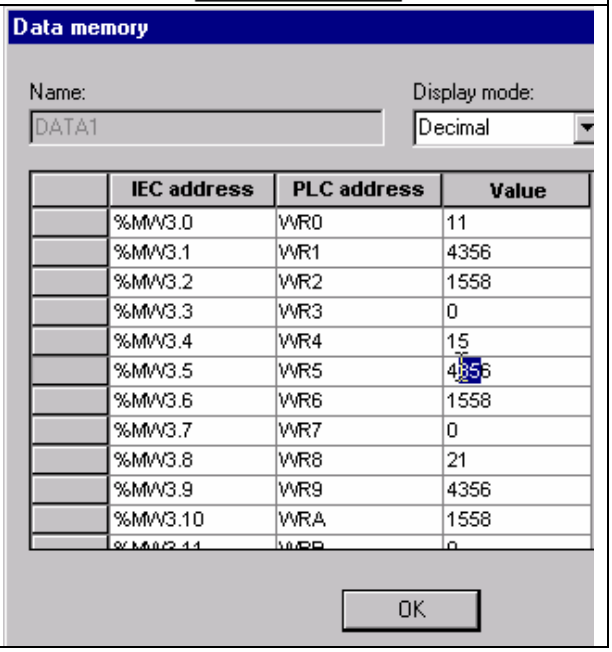
Right click on the table to do one of the following:

-Upload from the PLC:
-Edit the uploaded memory content.
-Download to the PLC
-or verify that the content in the table and the PLC are equal.



Select From PLC
and Edit data memory.

You can now modify the content
and download to the PLC.



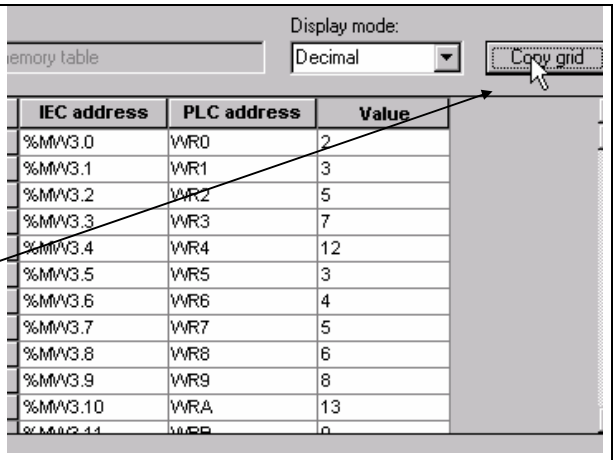
Export from Data Memory

Make a Data Memory table covering the memory area:

Right click on the Data memory table and select FROM PLC.

Select EDIT DATA MEMORY
Select Decimal Display mode.

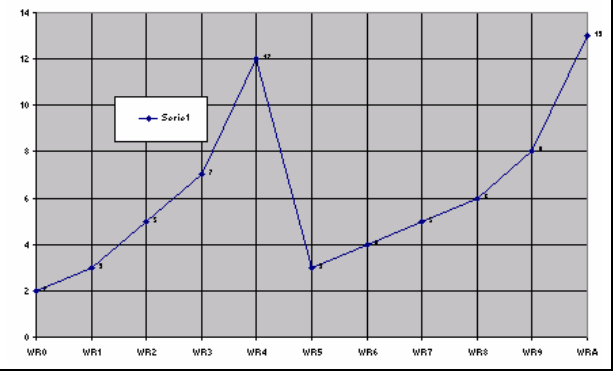
Press Copy Grid



Export to e.g. Excel to take care of the data

23	IEC address	PLC addre	Value
24	%MW3.0	WR0	2
25	%MW3.1	WR1	3
26	%MW3.2	WR2	5
27	%MW3.3	WR3	7
28	%MW3.4	WR4	12
29	%MW3.5	WR5	3
30	%MW3.6	WR6	4
31	%MW3.7	WR7	5
32	%MW3.8	WR8	6
33	%MW3.9	WR9	8
34	%MW3.10	WRA	13

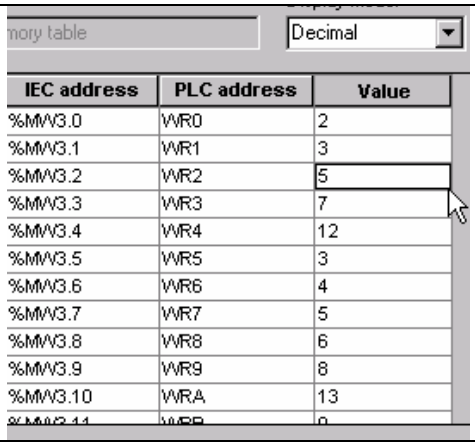
Example of application: Make graphs of the data



Import to Data Memory

Copy data from e.g. Excel.
Select EDIT DATA MEMORY.
Select Decimal mode
Mark the first cell to give data into.
Press <Ctrl+V>

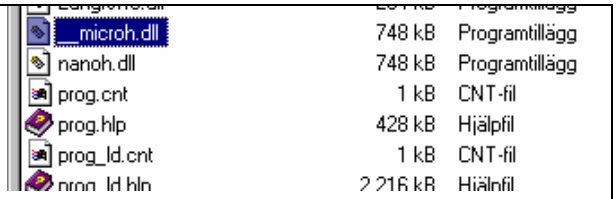
This operation can take a long time if the table has got many values.
In such case select smaller tables.



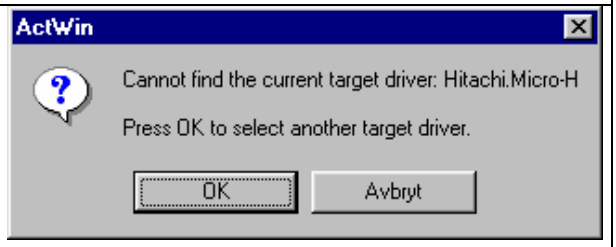
Change driver on an existing project

Before starting ActWin, change the file name on the driver you should change from: You will find the driver files in the ActWin directory.

Driver names:
Nano: NANOH.DLL
Micro: MICROH.DLL
H-Series: HITHLPLC.DLL

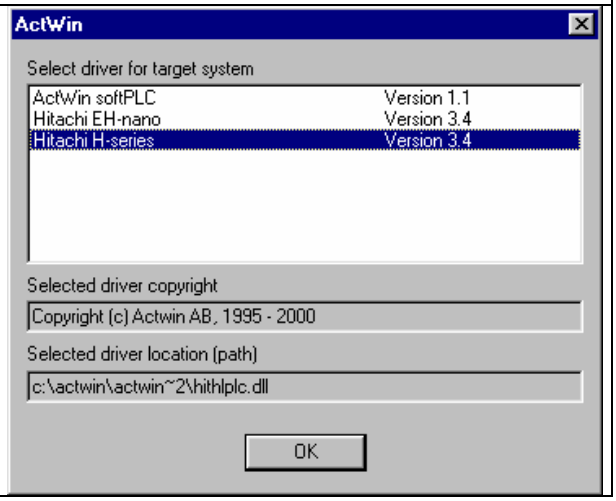


Example:
You have an existing project with the Micro driver. You want to change to H-series driver. Rename the "MICROH.DLL" file name to "__MICROH.DLL".
Start ActWin and open your project.
You will get a message that ActWin Cannot find the current target driver:
Press OK button.



Select the Hitachi H-series driver and press OK.
The project will be opened with Hitachi H-series driver.

Do not forget to change back to original name for the Micro driver. (MICROH.DLL)



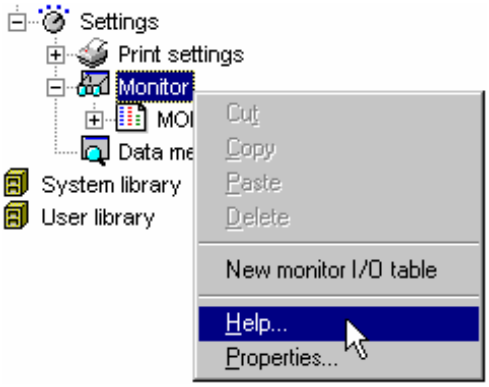
Help

Do not forget the help system.
The key <F1> will always give you help.

The help system is a complete manual, which consist of Content, Index and Search.

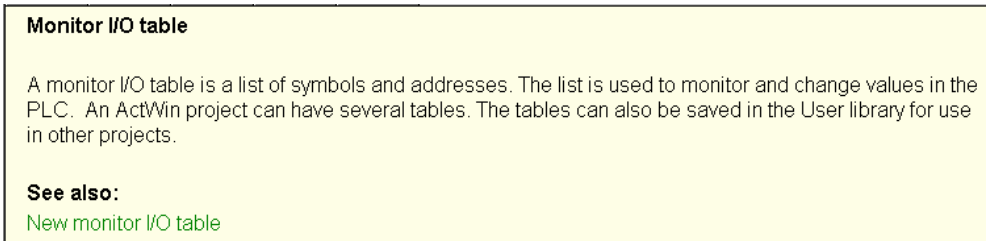
To find Help on a certain item, click on ? button and go with the mouse to the specific item and click again.

The best way to find specific help on an item is to right click  on the item.



E.g. right click  on Monitor and select Help.

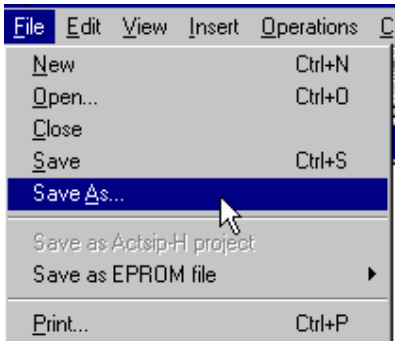
Then you will come directly to the right place in the help system.



Save

Do not forget to save the project when you are ready. It is preferable to save more frequent. Therefore you can find an Autosave possibility under ”Tools-ActWin Settings-Save”.

Use the  button to save or use the Save / Save As... options in the File menu.

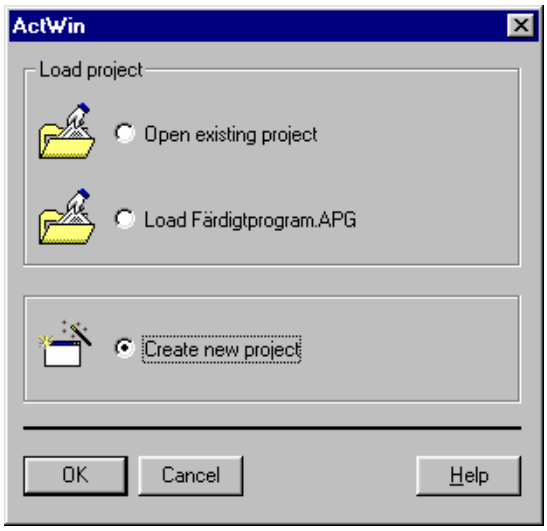


Continue to program and test the Ladder programming in a similar way. Then you will find many more features.

SFC programming

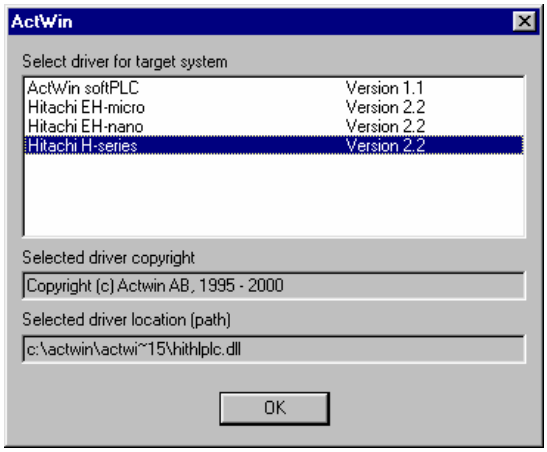
Select SFC under “Tools – ActWin Settings”

Create a new project

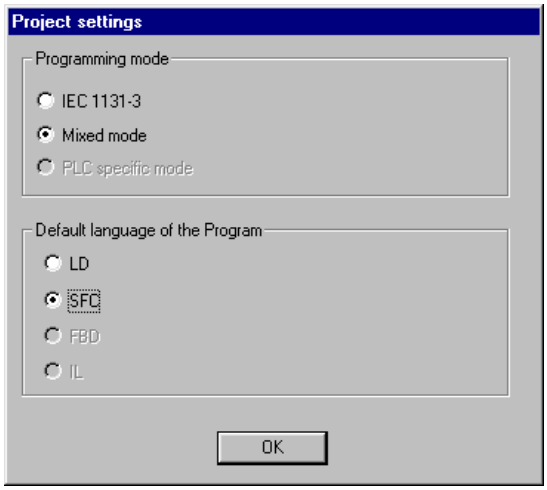


Select driver.

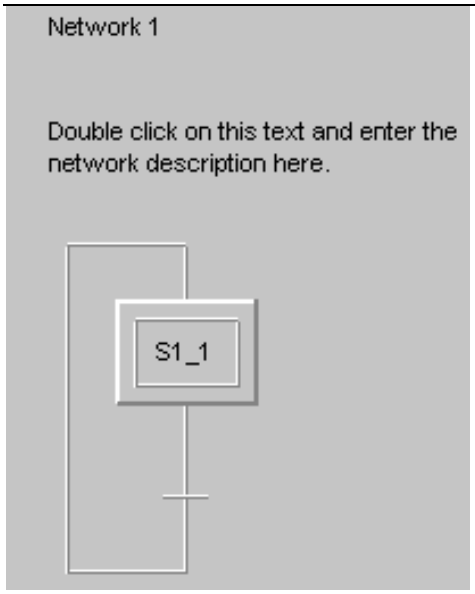
SFC is not possible to use in the Nano driver.



Select “Mixed mode” and language “SFC”



A new window based on SFC will turn up.



SFC in the IEC 61131 standard is the programming language, which is the upper structure of a project. It takes care of the sequence flow and uses the other programming languages in different parts where it is natural.
ActWin also allow let you make the complete program inside the SFC in a comfortable way.

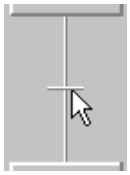
The principal of SFC programming is basically very simple.

There are *steps*.
These define states where one or more action takes place.

Normal step

Start step (one per network)

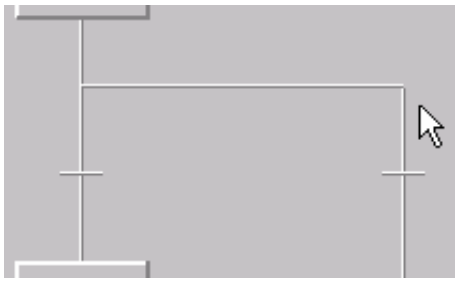
There are *transitions*.
This defines the condition to move from one step to another.



There are two different types of branches.

Alternative branch:

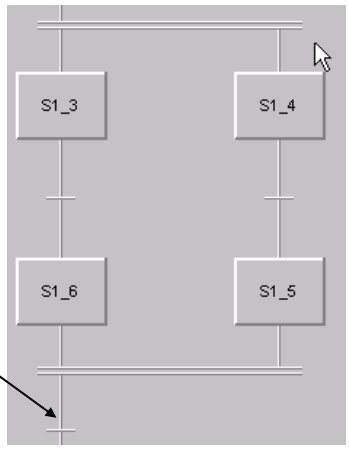
This means that the flow will be controlled by the transition, which is true.
If both are true, there is a possibility to decide the priority by the user. (The default priority is from left to right)



Parallel branch:

This means that the flow will occur in both branches simultaneously.

The flow will not leave the parallel branches before the last step in each branch is on and the transition following is true.



Action

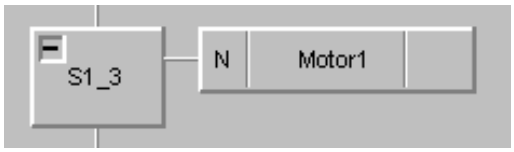
An action is something, which happens when a step is activated.
It can be all from setting an output to an activation of a complete sub program.

Ladder action:

A ladder action is given a name. It contains a complete ladder diagram of any size.

Symbol action:

ActWin will allow you to create a Symbol action, which means output control of one symbol, e.g. activation of a motor.
This gives an extended comfort in the programming as the majority of actions in a normal program are of this type.

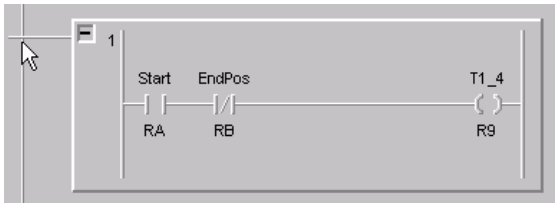


Every action can have a Qualifier
This means that you can use e.g. time delays “D”, Set “S” and Reset “R” on an action.
If you want the Motor in the example above to start 1.5 s after the step is active then you exchange the N to a D and set the time to 1.5 s. *More details about this will follow.*

Transition There are also two types of transitions:

Ladder transition:

You can define a condition consisting of one rung of any size including compare functions.
The output of the rung is the condition for the transition.



Symbol transition:

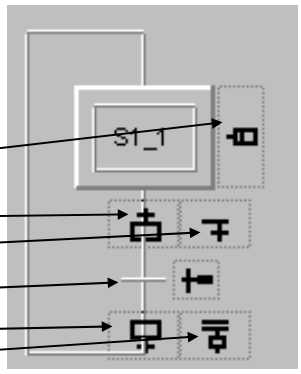
Most transitions are only one simple condition, e.g. an input like “Start_button”. Therefor ActWin allows you to define a “Symbol transition”

Start to get used to building a network

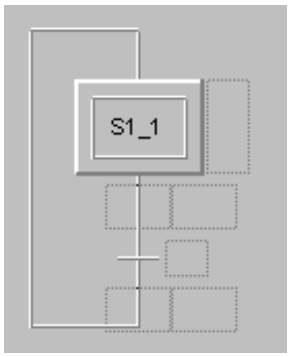
ActWin has a unique user interface in the design of networks.
It is totally dynamic.
It will keep the network syntax correct all the time.
This feature also means that a real On-Line programming in SFC is possible and supported.

There are no specific tools that have to be changed from action to action. This creates a high degree of comfort.

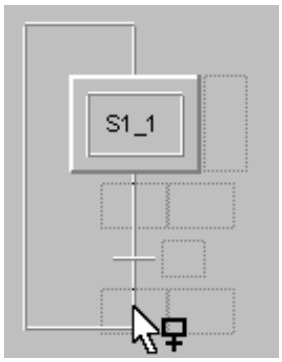
Start to get help from the “Grid help” 
A grid will appear on the network showing where insertion is possible.
Possible to insert **Actions**
Possible to insert **Transition- Step**
Possible to insert **Alternative branch**
Possible to insert **Transition**
Possible to insert **Step – Transition**
Possible to insert **Parallel branch**



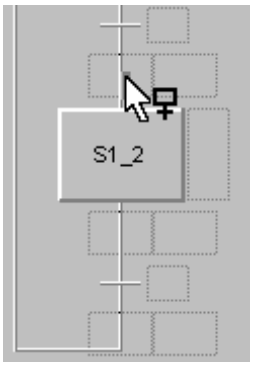
When you move the mouse from the button only the grid will remain. You can always go back and press the button again to get the detailed help.
When you get used to the editing you can turn the grid off to get a cleaner network.



Start to insert a new step plus transition.
When the mouse arrow is inside the grid the symbol for what is possible to do appears.

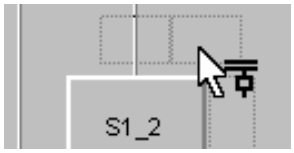


Click with the mouse

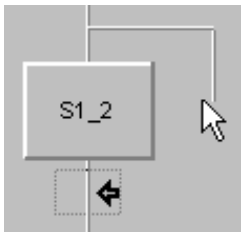


and insert a new step.

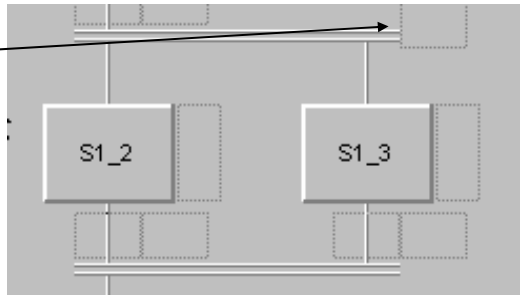
Use the same method for branches.
When you add a branch a grid showing all available connection points will come up.



Click on one of the connection points



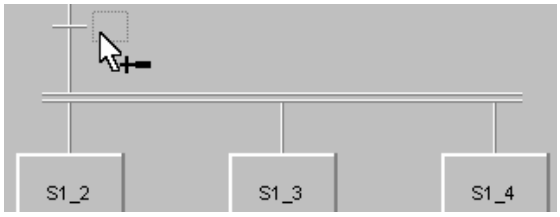
A parallel branch is created.
Click here to expand the branch.



After a short while you will get used to the way of editing and you do not need the grid.

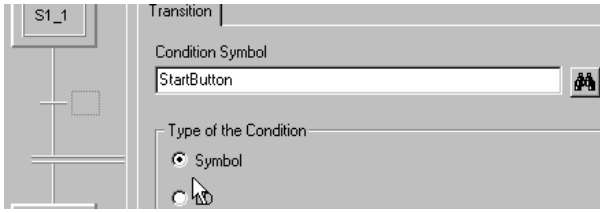
Let us turn off the grid help. 

Insert transitions.

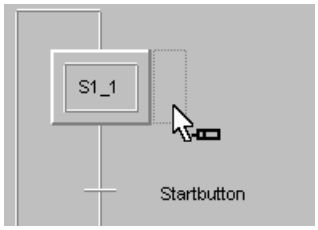


Select Symbol transition or Ladder transition.

If it is a single symbol you will get the address Search/Enter dialog.
If it is a Ladder action you can Enter a name.
To create the ladder condition, see example project later in the tutorial.

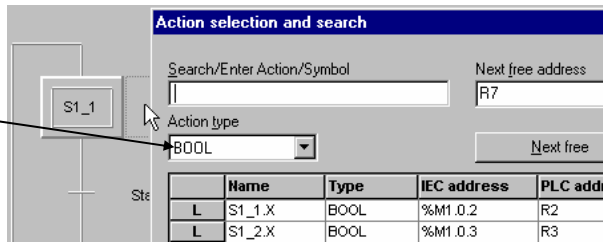


Insert an action.



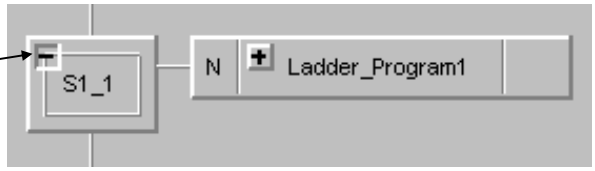
You will get the Action selection and search box.

Select BOOL (Symbol) or LD action and enter a name and address (if it is symbol)

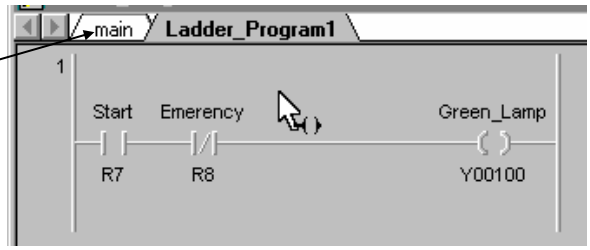


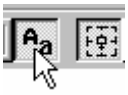
If it is a Ladder action there will be an  indicating that it contains code.

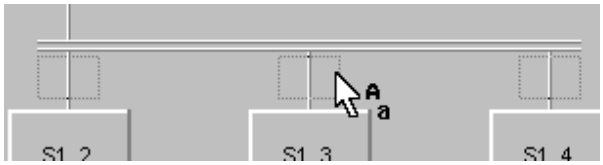
If you click on it then the action will be hidden.



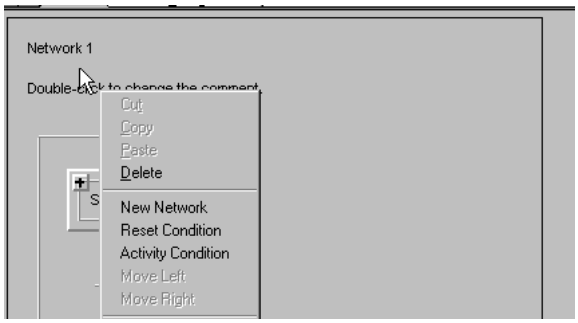
Click on the  and you will get a window where you can edit the action (program) code.
(see Ladder editing)
When you are done, click on the "main program folder" to go back to the SFC.

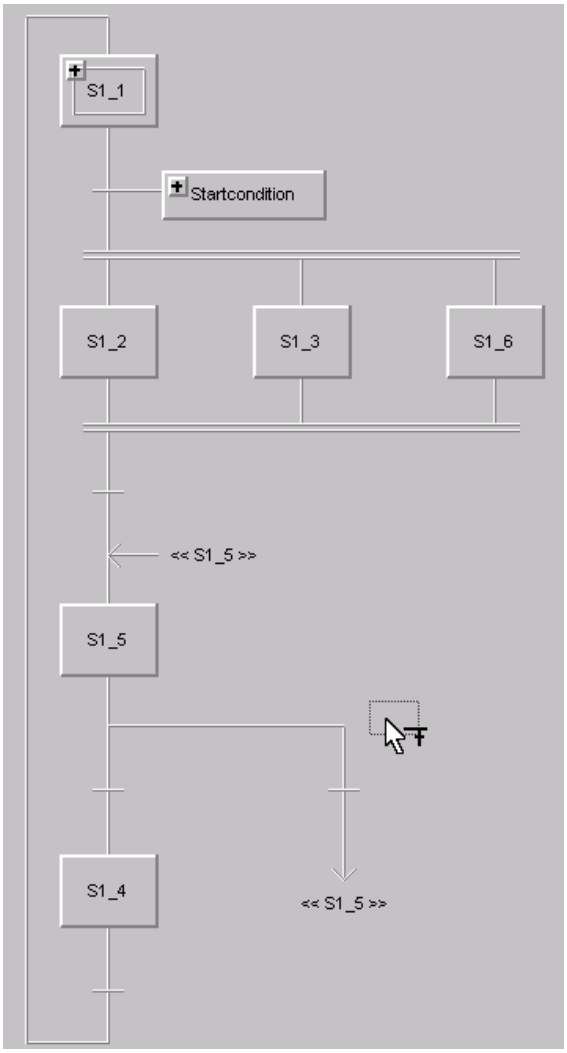


If you select  you will see all places where you can insert a Comment.
To edit the complete graph or if you want to mark the graph, right click on the network comment.



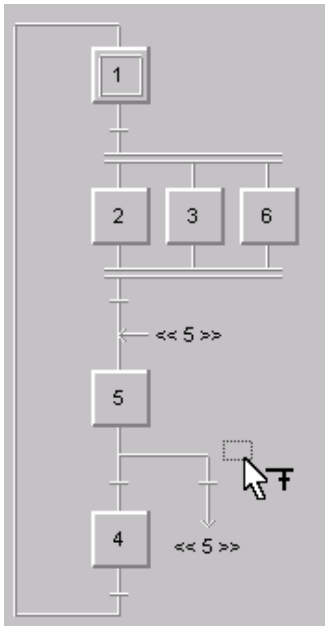
This will allow you to create a **New network**, a new **Activity Condition** or a **Reset Condition**



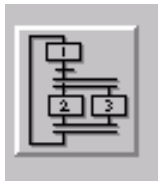


Use the zoom tools 

When the graph is marked you can zoom it individually



small zoom



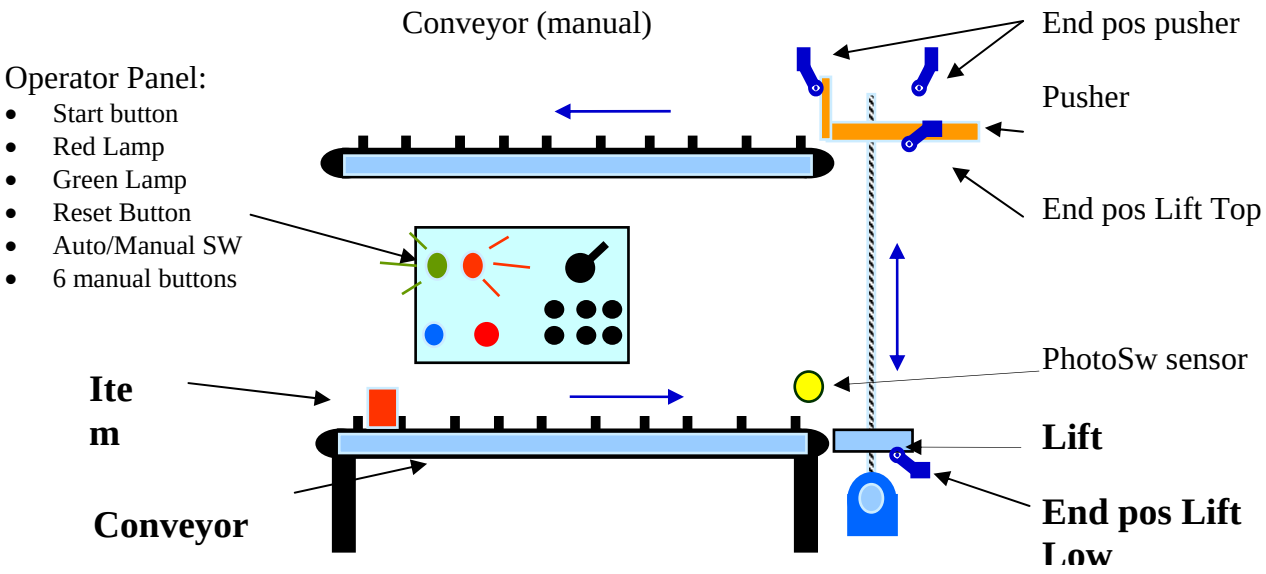
tiny zoom

Continue to get used to the editing method

Start a project

Let us make a small project:

A simple example showing the simplicity of ActWin SFC



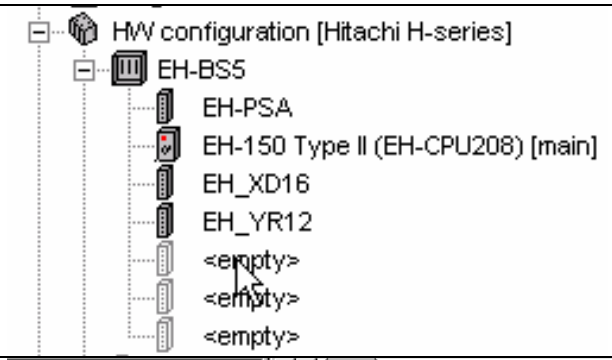
The Green lamp will be lit in the start.
When the operator pushes the Start button the conveyor will start (the condition is that the Photo switch in the end of the conveyor is not on and the Lift is down.)
When the item passes the Photo switch the lift will go up after 1 s.
The Red lamp will be lit when the lift is moving up and down.
When the lift reaches the top position the pusher will go out until it reaches the end position.
After 1.5 s the pusher will go back simultaneously as the lift goes down. When the lift is down and the pusher is back the machine is ready for a new item and starts from the beginning again.

There is an Auto/Manual switch.
In Manual mode the Manual Pushbuttons are valid for control of the Conveyor, Lift Up, Lift Down, Pusher Out, Pusher In and Upper Conveyor.

There is also one Reset button.
If the operator wants to break the process and start from the beginning this button will be used.

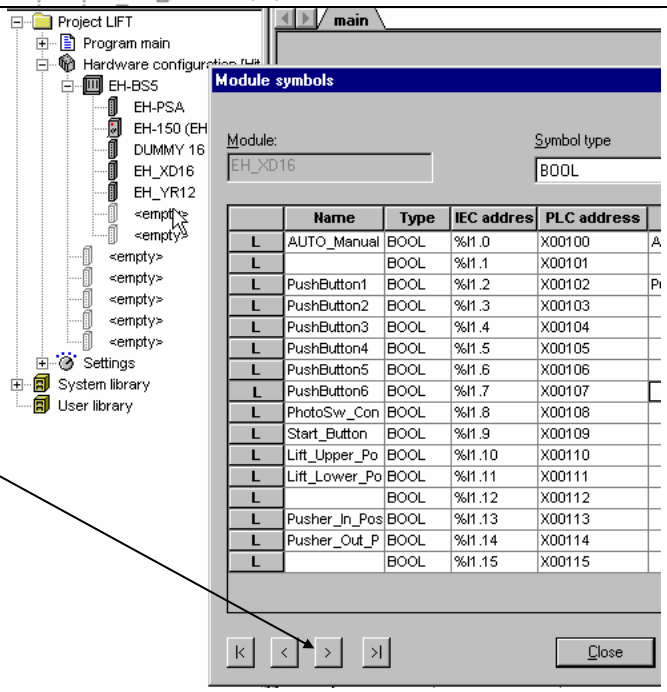
Start to make a hardware configuration.

This time we will use a EH150 with the EH-BS5 rack..

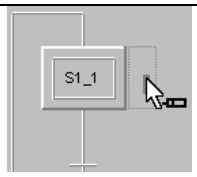


Right click on the EH_XD16 module and start the input allocation (of the already know inputs).

Continue afterwards with the output allocation.
Use the buttons to go from one module to another.

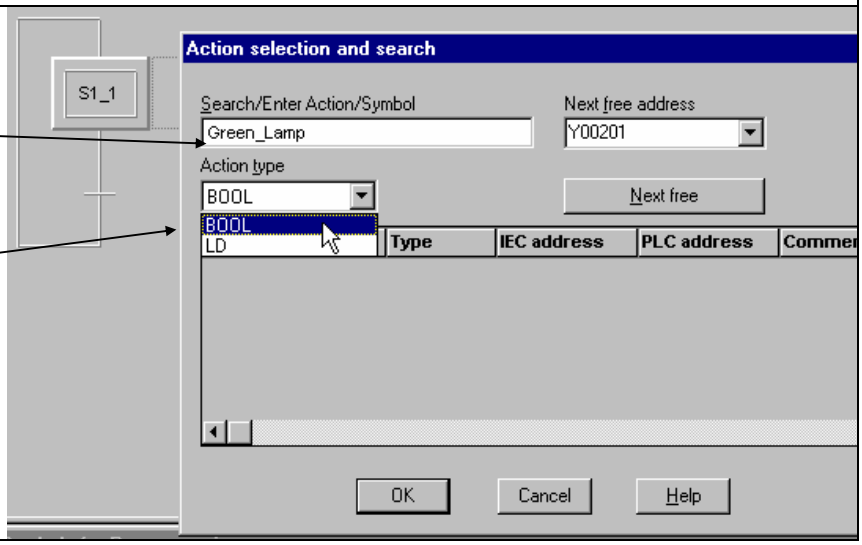


In the first step the Green Lamp will be on.
Click in the Action field



A window will appear, where you can Add the symbol "Green_Lamp".

As this is a single symbol, select BOOL



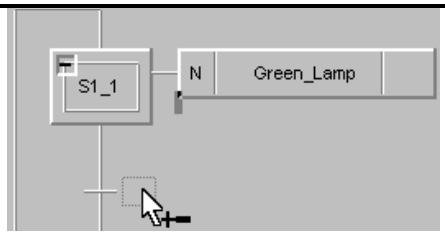
The step will now show the symbol action Green_Lamp.

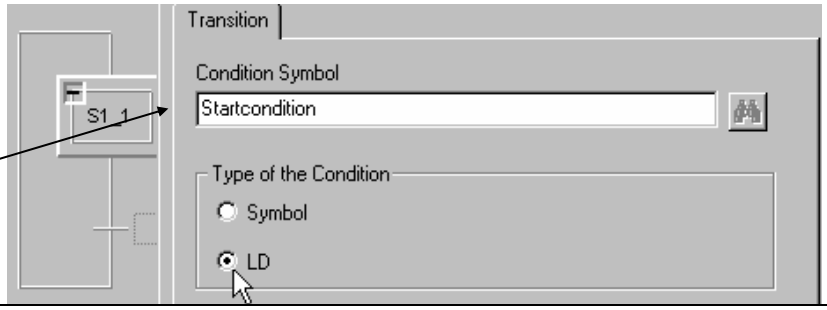
The next transition will be the start condition. This is a combination of inputs, so we have to use a ladder rung.

Click on the transition field.

Select LD.

Give the transition a descriptive name.
e.g. “Startcondition”

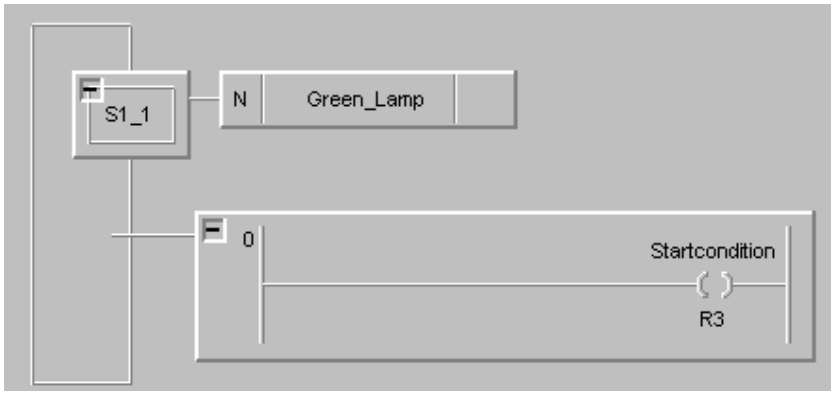




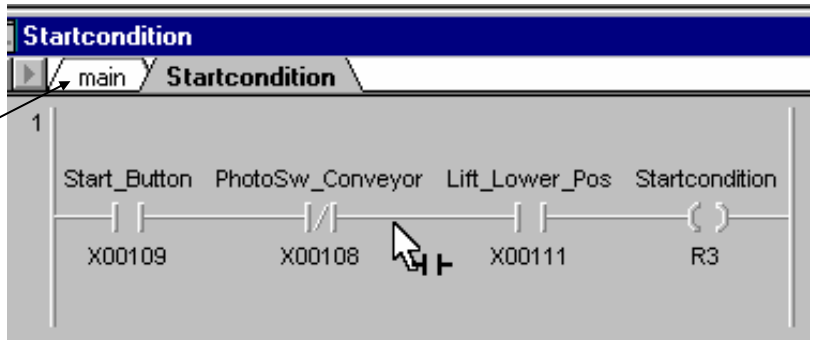
Press OK and the network will look like this:

To define the ladder condition, double click on the rung.

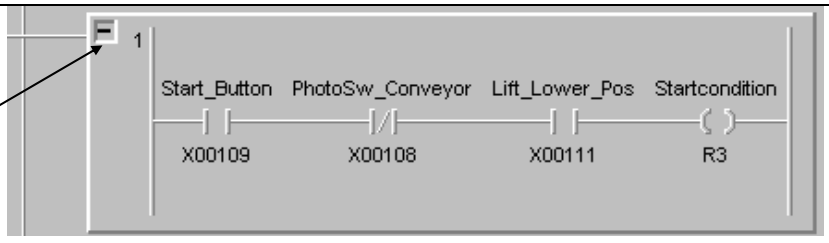
The ladder-editing window will open.
Use the same tools as in ActWin Ladder programming.



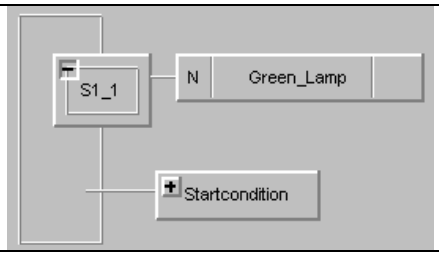
The start condition is that the Lift is down, the
Photo switch on the conveyor is not darkened and the operator pushes the start button.
Press the “main” folder to return to SFC

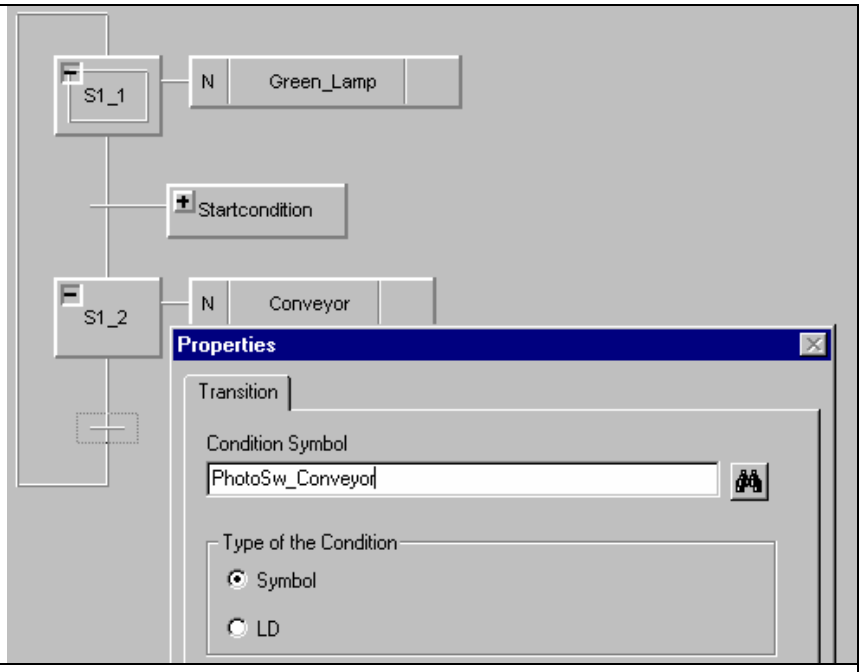
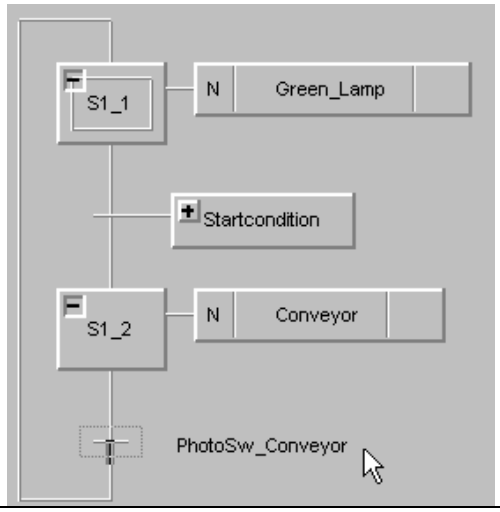
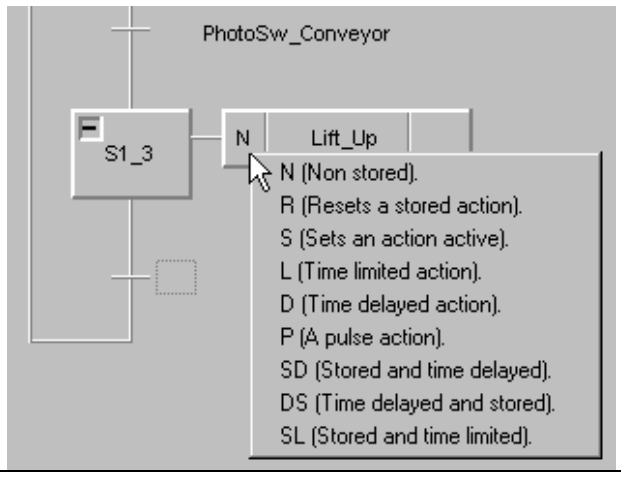


The transition now looks like this.
Observe that there is a zoom button on the steps and actions that contain something.
Click on the



The transition will look like this:



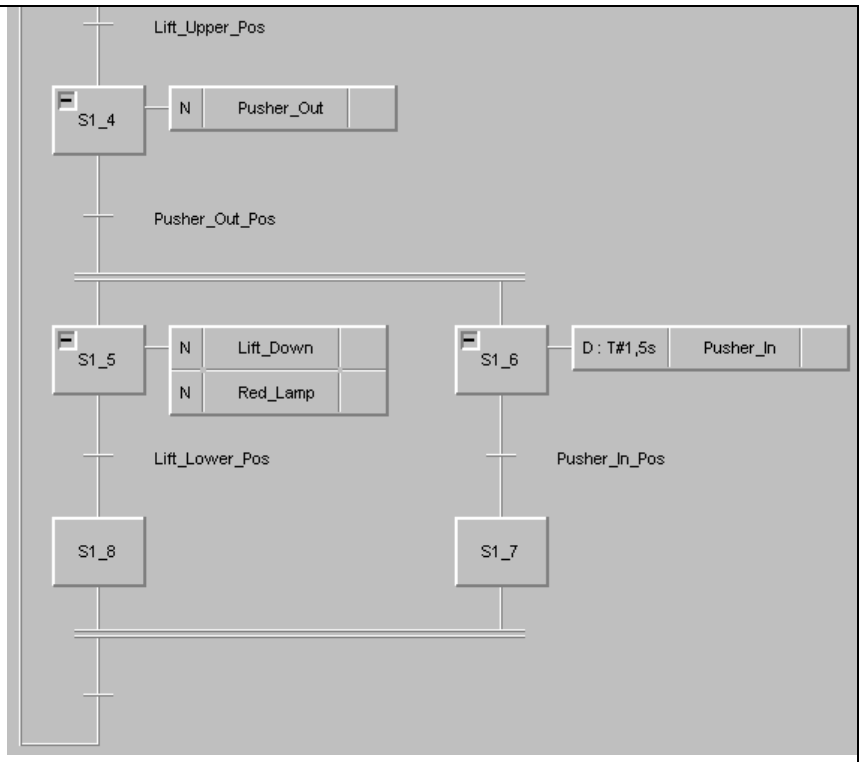
Insert a new step/transition. The conveyor shall move in the next step. Insert the symbol output “Conveyor” The next transition is the Photo switch, which can be inserted as a single symbol.	
The symbol transition does not need a ladder rung and it will look like this.	
Insert a new Step/Transition When the photo switch indicates the Lift shall go up. Insert the output symbol “Lift_up”. But it shall be a delay of 1 s. Select the Qualifier D (Delay) by right clicking on the “N” and set 1 s.	

Continue to build the rest of the program.

The Pusher goes back and the Lift goes down in parallel.

The condition to go on is that the Lift is down and the Pusher is back.

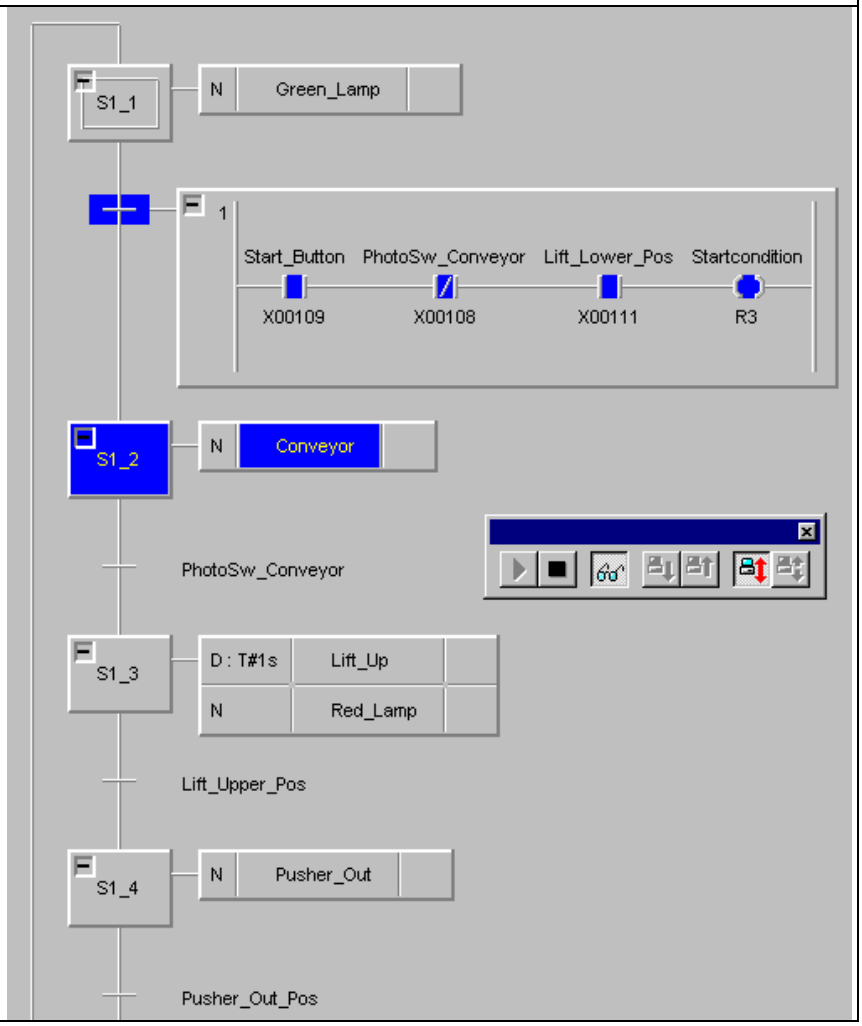
(therefore the last transition can be without condition)



Use the Communication tools to download the project, go On-Line, start Monitor and start the PLC.

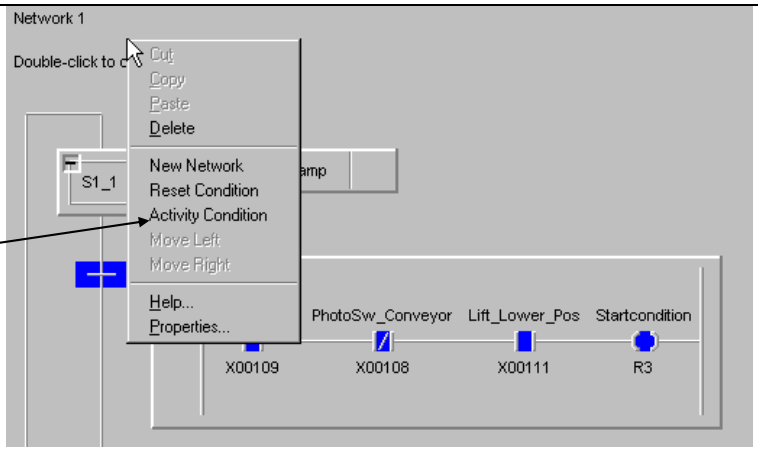
The programming can now continue On-Line during monitor.

When you want the PLC to Update, press the Update button.



Create Activity condition for the graph

We have created the automatic sequence and we want to use the AUTO_Manual switch.
Therefor we use the Activity condition.
Right click on the network comment and select "Activity Condition"

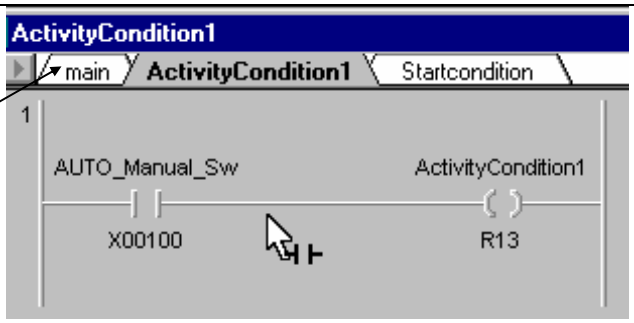


An activity condition above the network appears.
Open and define the condition.

Double clicks on the rung to edit the content just like a transition.

To go back to the network, press

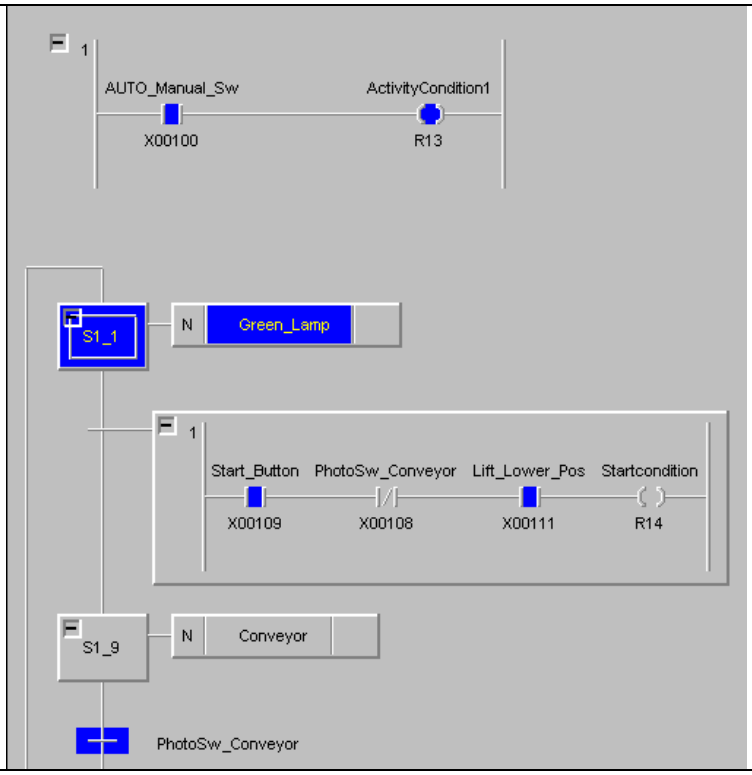
(Do not forget to press Update when you want the On-Line Update)



The network will now be monitored with the Activity condition.

In AUTO mode (X100 ON) the flow will be as before.

In Manual mode (X100 OFF) the flow will be frozen and the outputs (actions) in the network will not be activated.



Add a Reset condition. The procedure is the same as to add an Activity Condition.

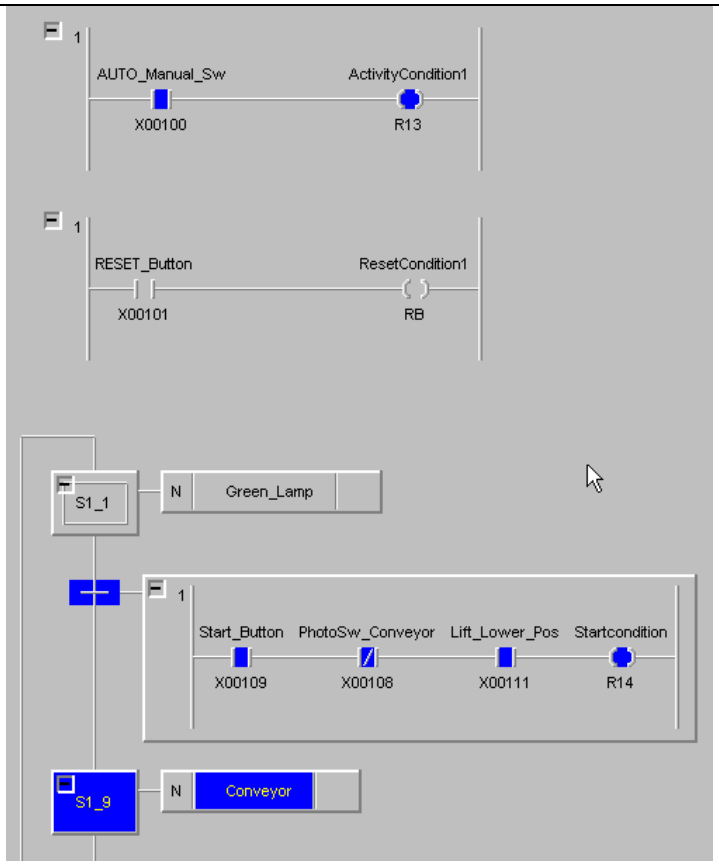
When the RESET condition is ON all steps will be disactivated except the Start step, which will be activated.

This makes it possible to start the process from the beginning.

Zoom in the conditions. 

Now the automatic control of the machine works.

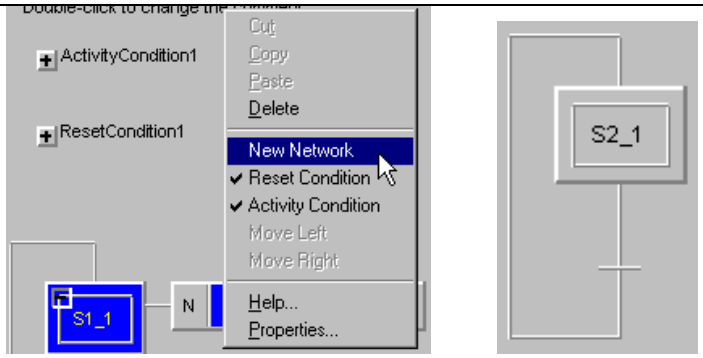
We also need a Hand control. These conditions will be described separately.



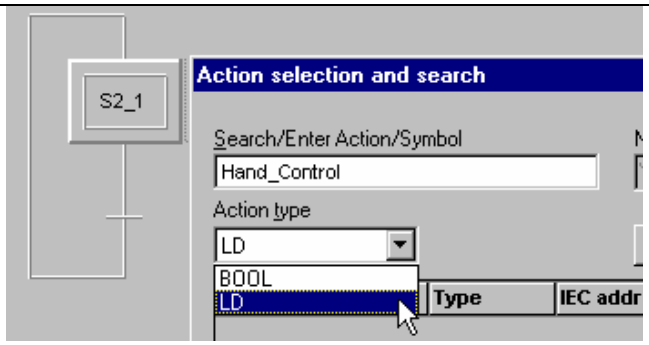
A very good way to do that is to use a ladder action and simply describe the logic's in ladder.

Make a new network.

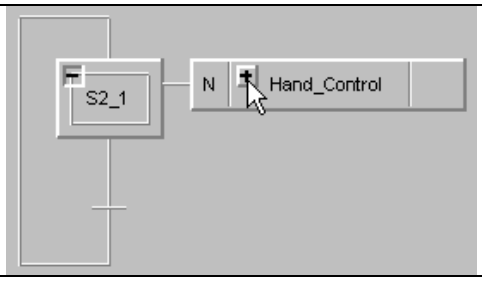
The only purpose with the network is to keep the new Ladder action. Therefor it will only have a start step and no condition on the transition.



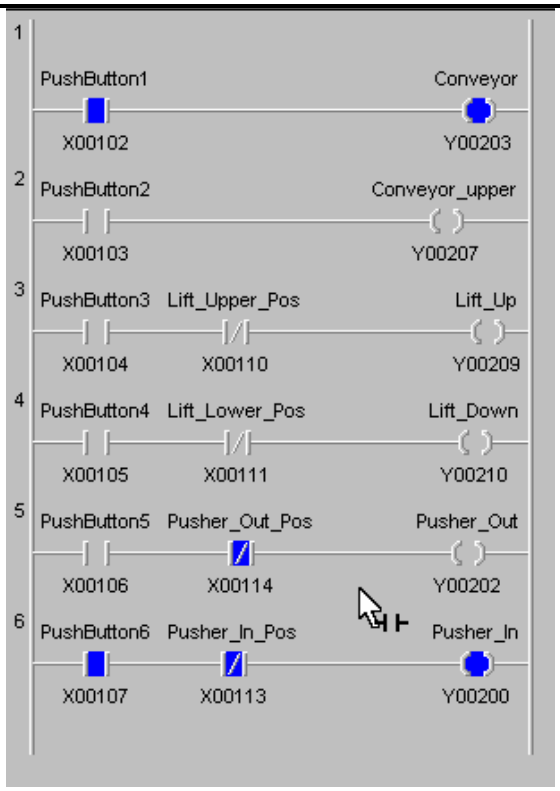
Create a Ladder action.



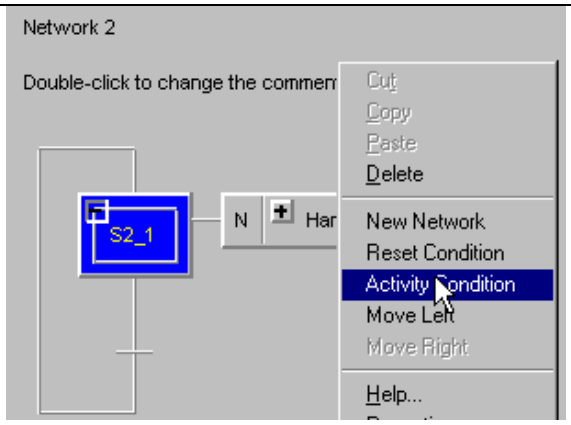
Open the ladder action



Create the typical hand control.

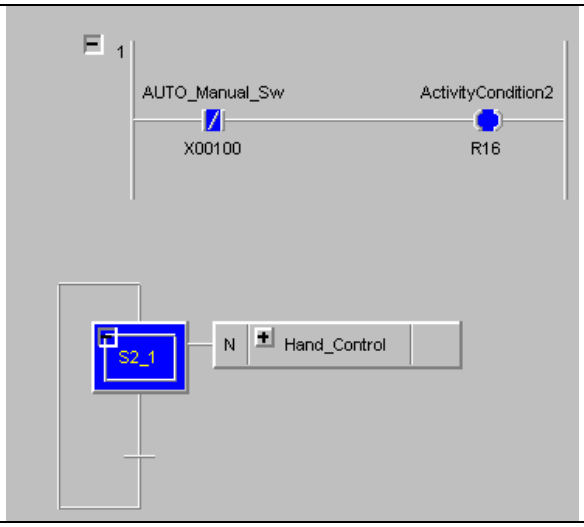


As the hand control only shall be valid in Hand (manual) mode the last thing we have to do is to define the Activity condition.



This is a special way of using a one step network and a Ladder action.

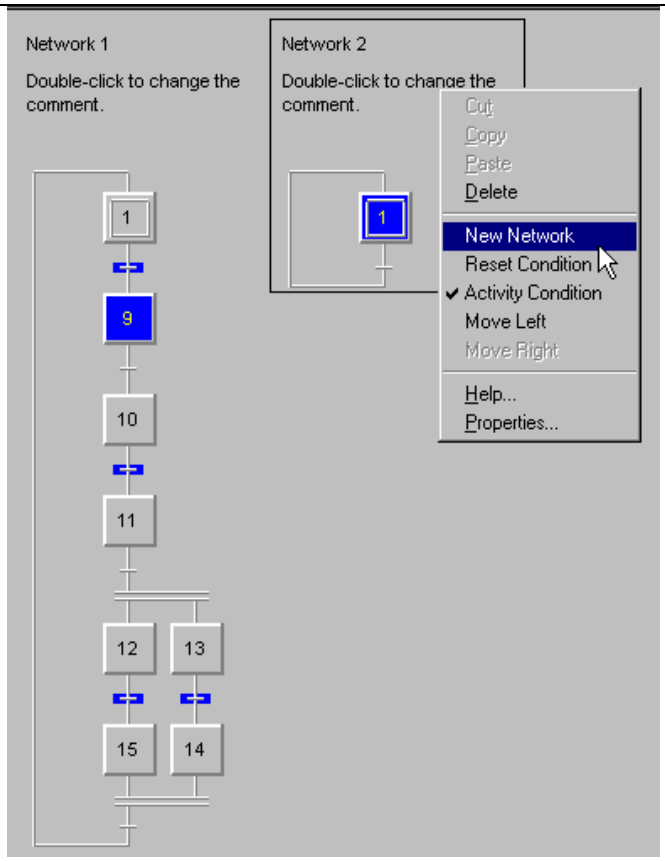
There are some more information you have to know, which is due to the standard itself. *1



*1 Note that when you use Ladder actions in other cases an output will keep the status when it leaves the step if you do not connect a special symbol in series with the output. The symbol is called <LadderActionName>.Q In this case “Hand_Control.Q”.
An action will be executed one time after it leaves the step. E.g. a counter will count an extra time if you do not connect this special symbol in series. (This could be a little confusing. But it is a consequence of the IEC1131 standard.)

Zoom the networks and start the next network

Continue to program.



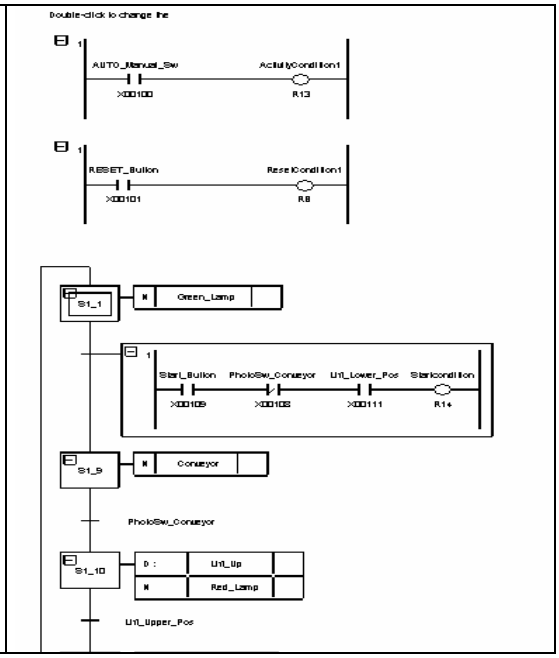
Print the project

The documentation procedure is identical to the ladder documentation.

Each network will be presented and scaled down to one paper.

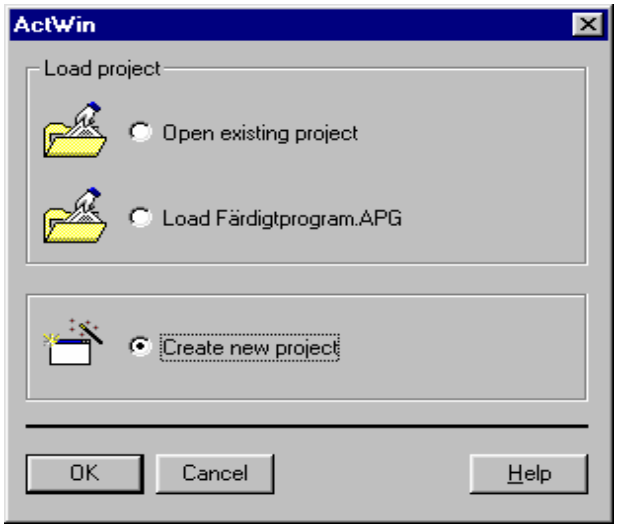
If the network is too big to be clearly read on one page a number of pages containing the network in full scale but splited will follow.

These pages can be put together to a large page for a complete overview.

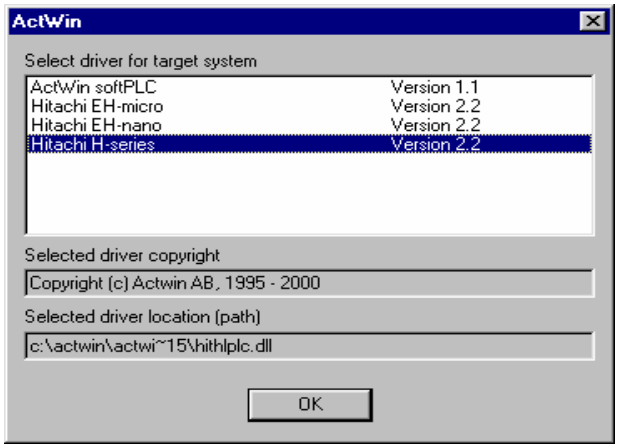


FBD programming

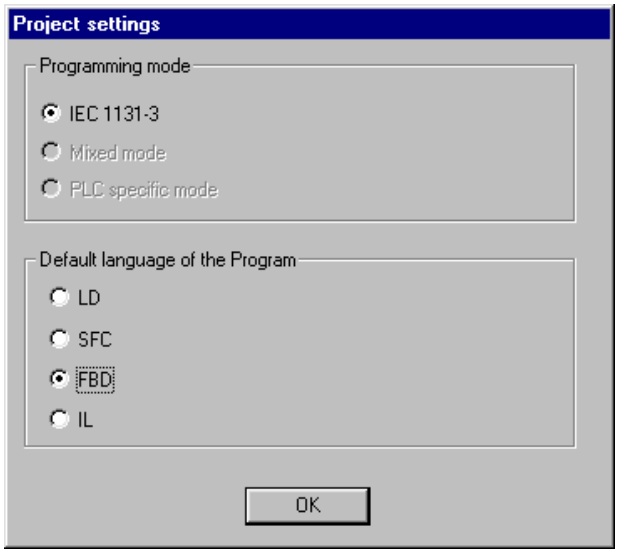
Create a new project.



Select driver.

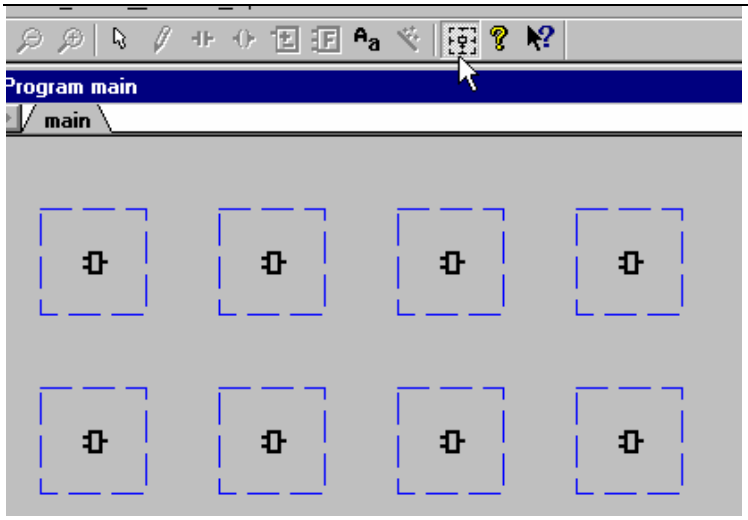


Select programming mode ”IEC 1131-3” and select language “FBD”.



A new window based on FBD will turn up.

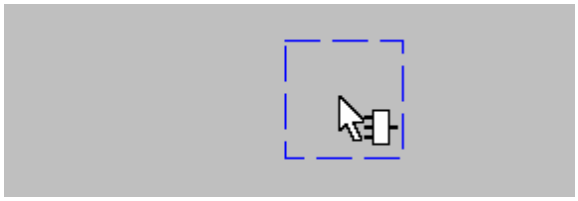
The editing screen is blank.



If you click on the grid tool you can see what areas Functions and Function Blocks can be inserted.

The editing method is the same simple principle as in SFC.

When you move the mouse on the screen The mouse cursor will show what is possible in different areas.

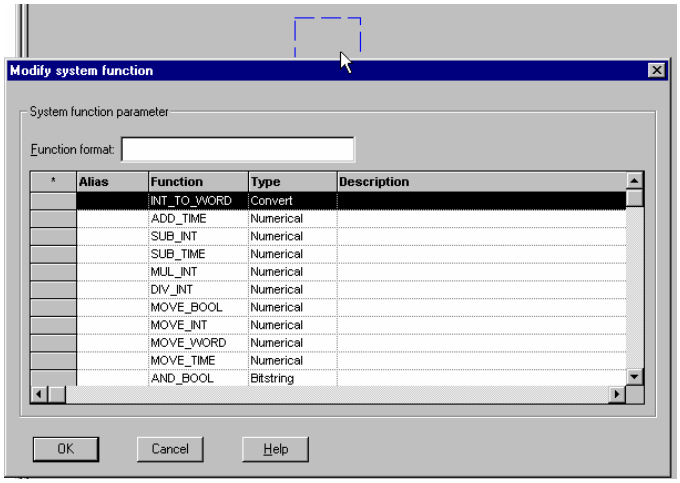


Click with the left mouse button.

A list of all available Functions and Function Blocks will turn up.

If you have any user defined Functions in the tree they will turn up together with the standard ones.

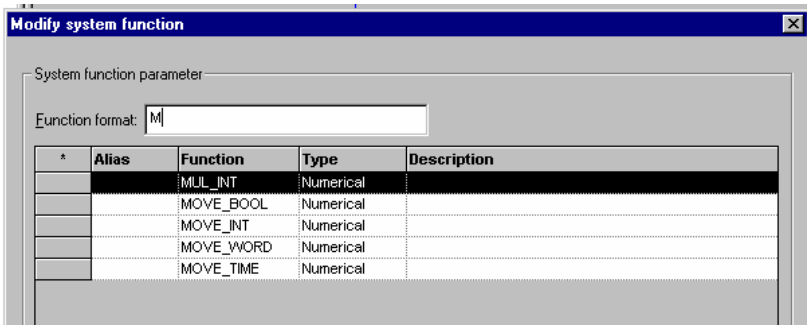
Some Functions have an “alias”. This means a short descriptive name, e.g. “ * ” for MUL_INT.



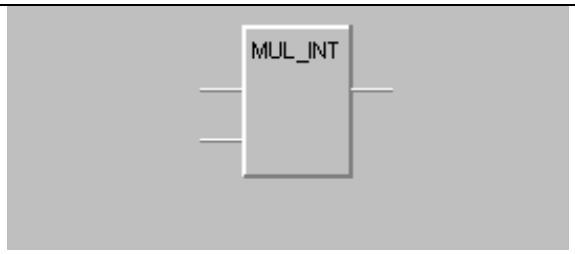
There are two different types of branches.
Type the alias or the first character of the function.

In this case type “M” and you will get a list of all functions starting with an “M”.

The MUL_INT happens to be the first choice.
It is already market.

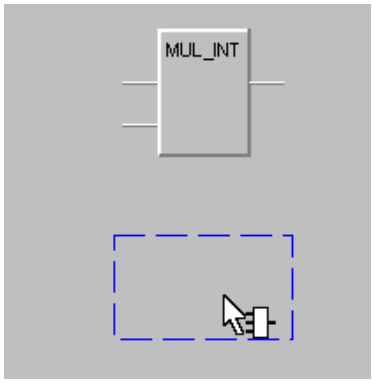


Press Enter and the Function will appear on the screen.

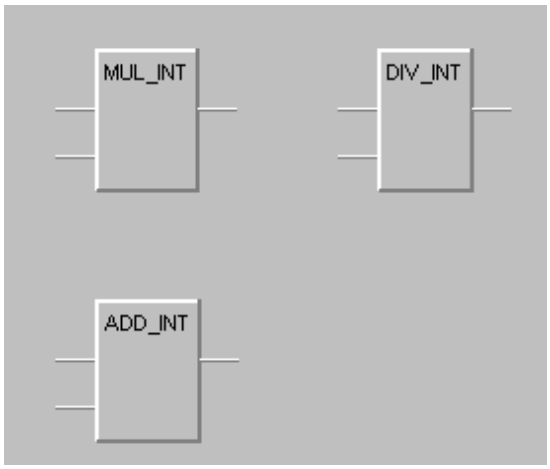


Insert a second function.

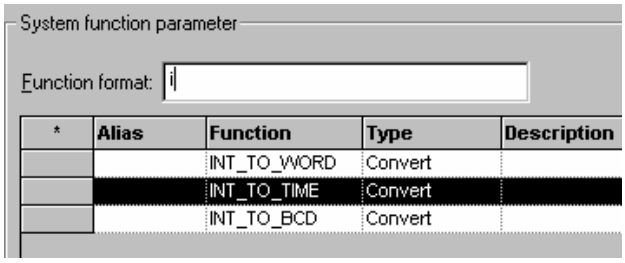
In this case we want an ADD_INT.



Continue to build the FBD.

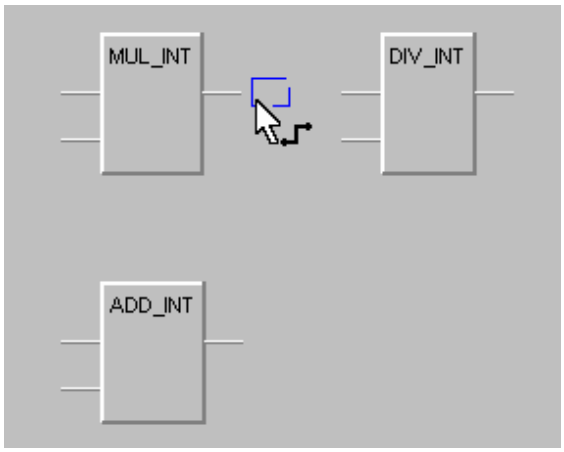


If the function is not on the top when you type the first character, continue to type until it is significant or just scroll down to the wanted Function and press Enter.



How to connect the Functions

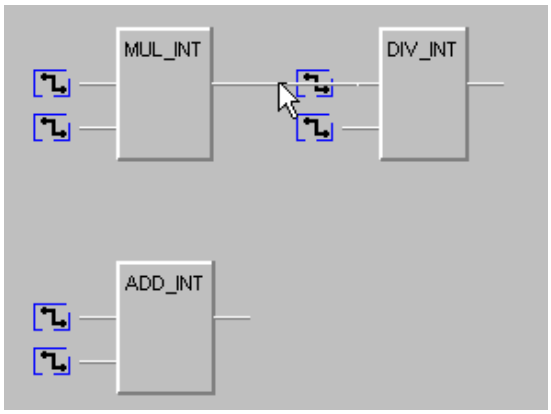
Move the cursor close to the output connection.



In this area the cursor will symbolize a connection.

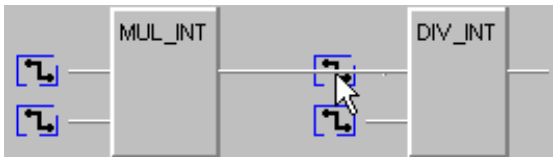
Left click and a selection between a line connection and a Symbol connection will be shown.

The default is a line connection. This means that if you only click the FBD will look like this when you release the mouse button.

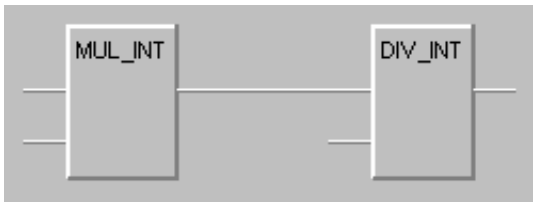


This symbol  means a possible connection point of the right type. (in this case an INT)

Click again where you want to connect.



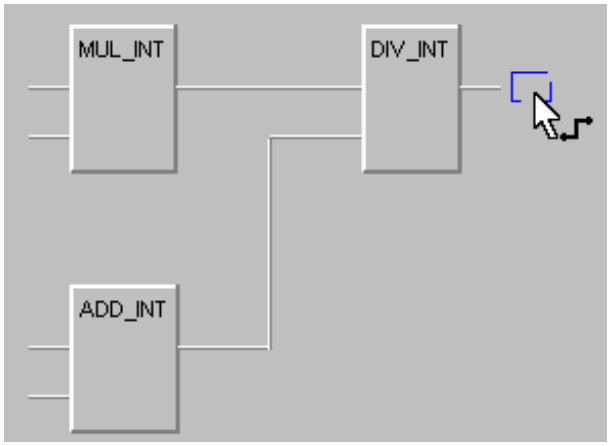
and the line will be connected.



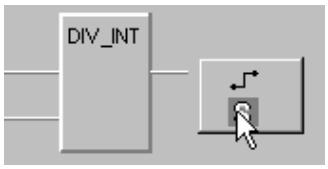
Connect the other line.

On the inputs of the ADD_INT and MUL_INT functions and on the output of the DIV_INT we want to connect Symbols in stead of connection lines.

Click as before on the connection.

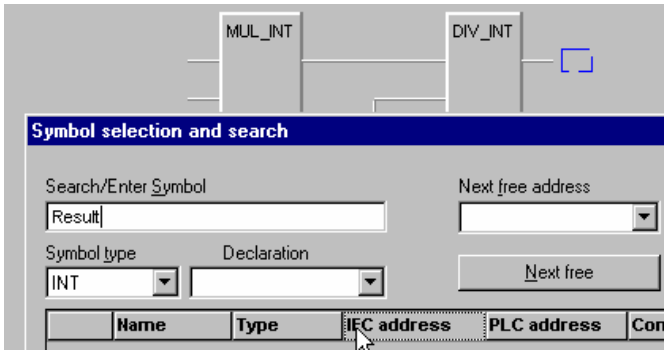


But instead of immediately releasing the mouse button, drag the mouse down to the "S" , which stands for Symbol.
Release the mouse button.

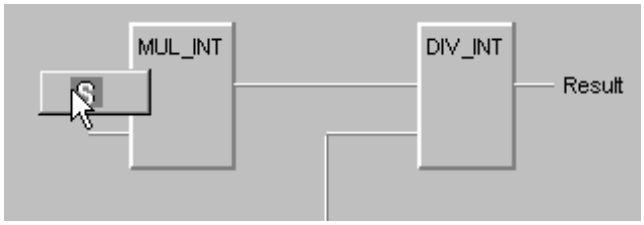


The Symbol selection and search window will show up.

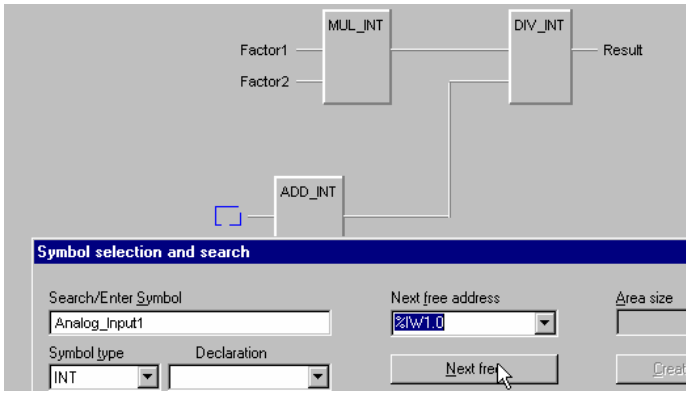
Type the Symbol name and select the address.
In this case we leave it without address.



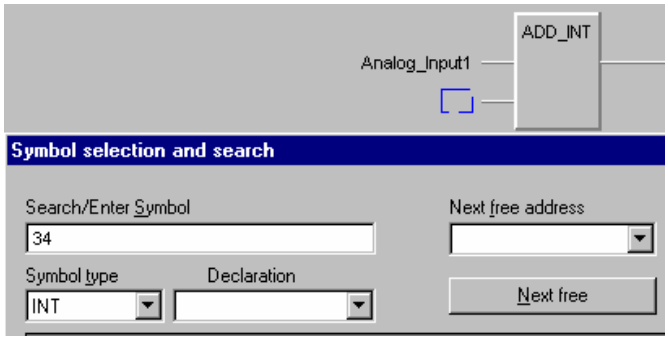
Connect the other input connections.
The method is the same, but the only choice is Symbol.



Connect Factor1 and Factor2 to the MUL_INT without addresses and Analog_Input1, which is connected to the first physical analog input, to the ADD_INT.

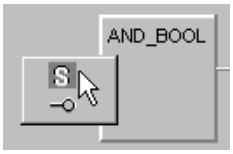


Connect a Constant instead of a symbol to the other input of the ADD_INT.

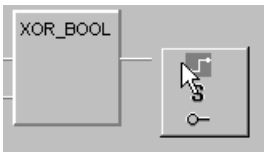


Continue with some logical functions.

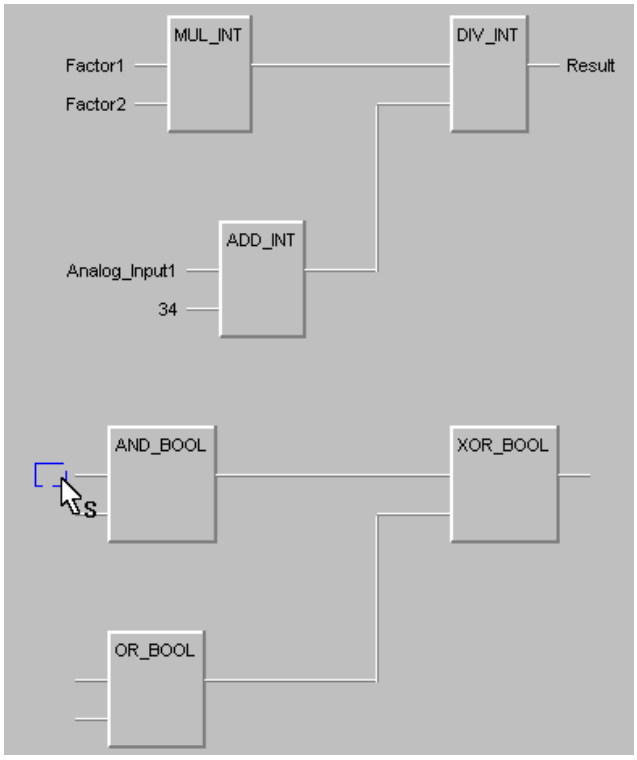
The way of connection is identical.



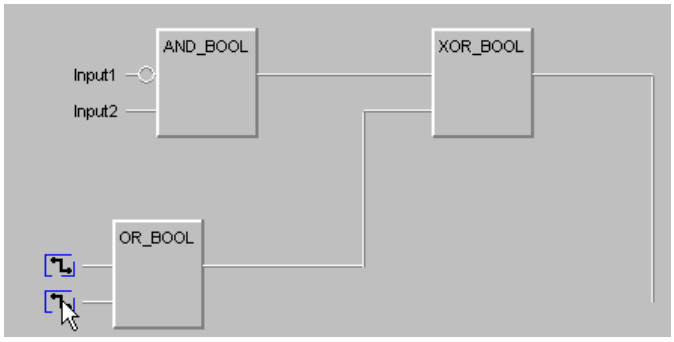
But a second choice will occur. This means Inverted input.



On the output connection there are three choices. Connection line, Symbol or Inverted Output.

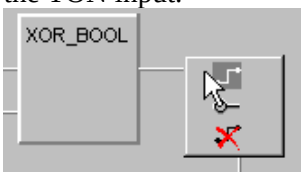


Let us connect back to the OR_BOOL.

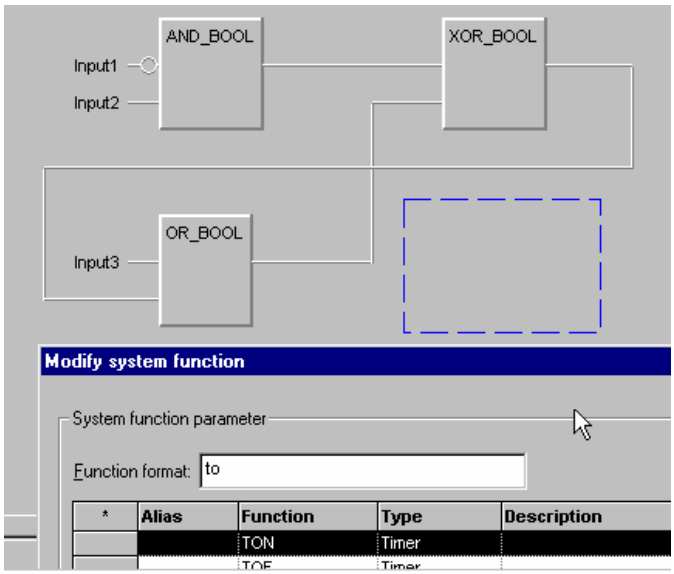


Let us connect a Timer (TON)

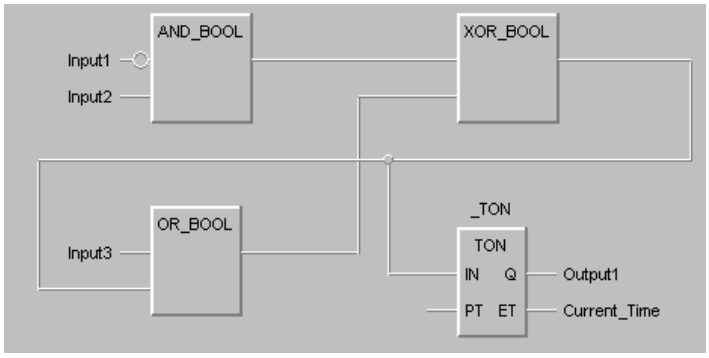
Connect the output of the XOR_BOOL to the TON input.



A third choice will now appear, the disconnection.



The diagram will automatically redraw in the most efficient way.



Connect the Timer output and the Elapsed time (ET) to symbols.

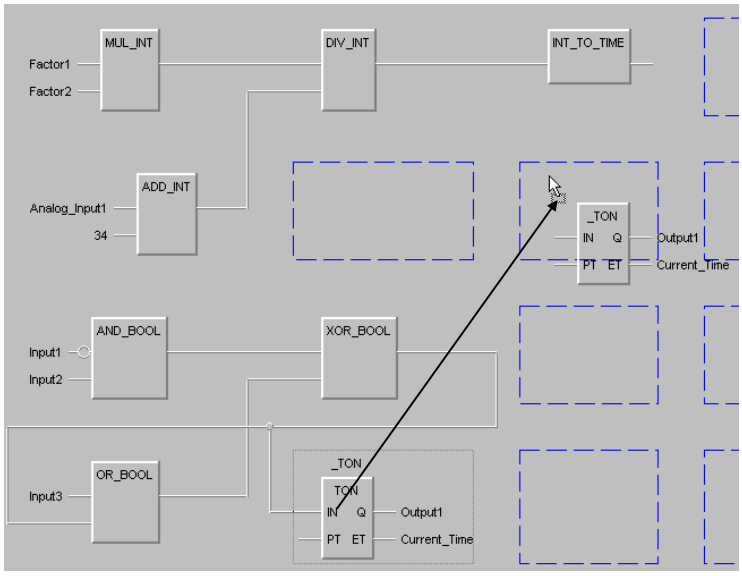
Let us preset the Timer with the value of above calculation symbol “Result”.

ET and PT (Preset time) are of the type Time. But “Result” is of the type INT. This means that we have to make conversion.

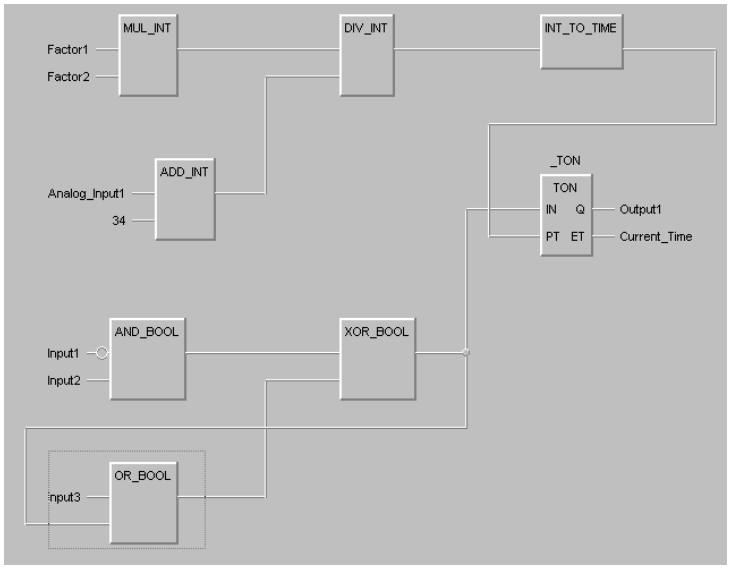
Insert a INT_TO_TIME function.
It is now OK to connect to the PT input of the TON.
But the two boxes are far away from each other on the screen.

Let us rearrange.

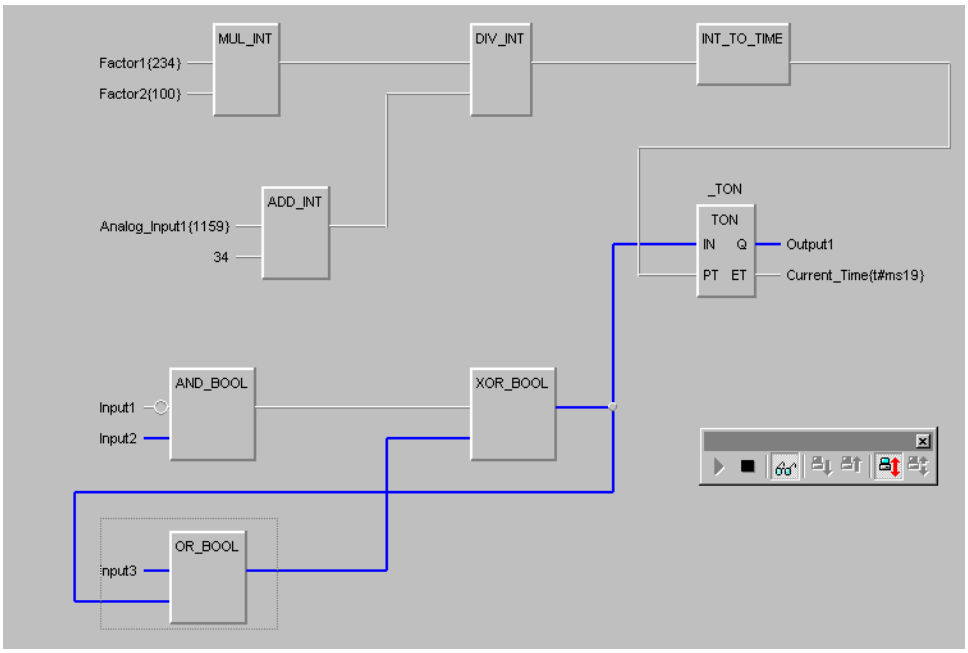
To move a function or Function Block, place the cursor on the element, hold down and move to one of the marked areas.



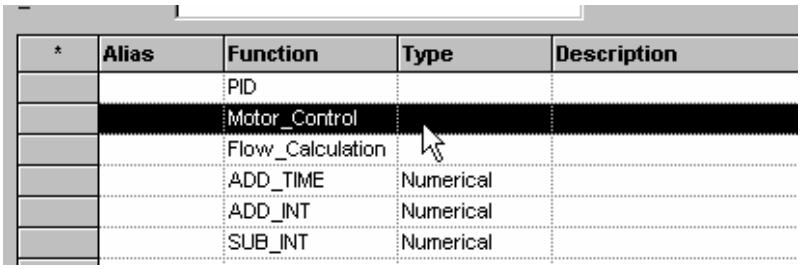
The result will be:

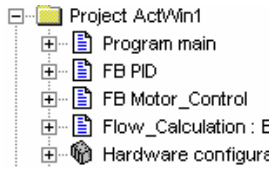


Go On-Line, start and go into Monitor and you can follow the process.



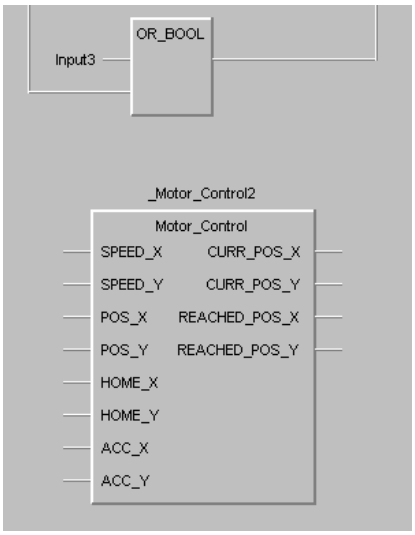
You can insert user defined Functions and Function blocks All the Functions and FBs in the tree will be present in the list.





How to produce your own Functions and Function blocks, see the General tutorial.

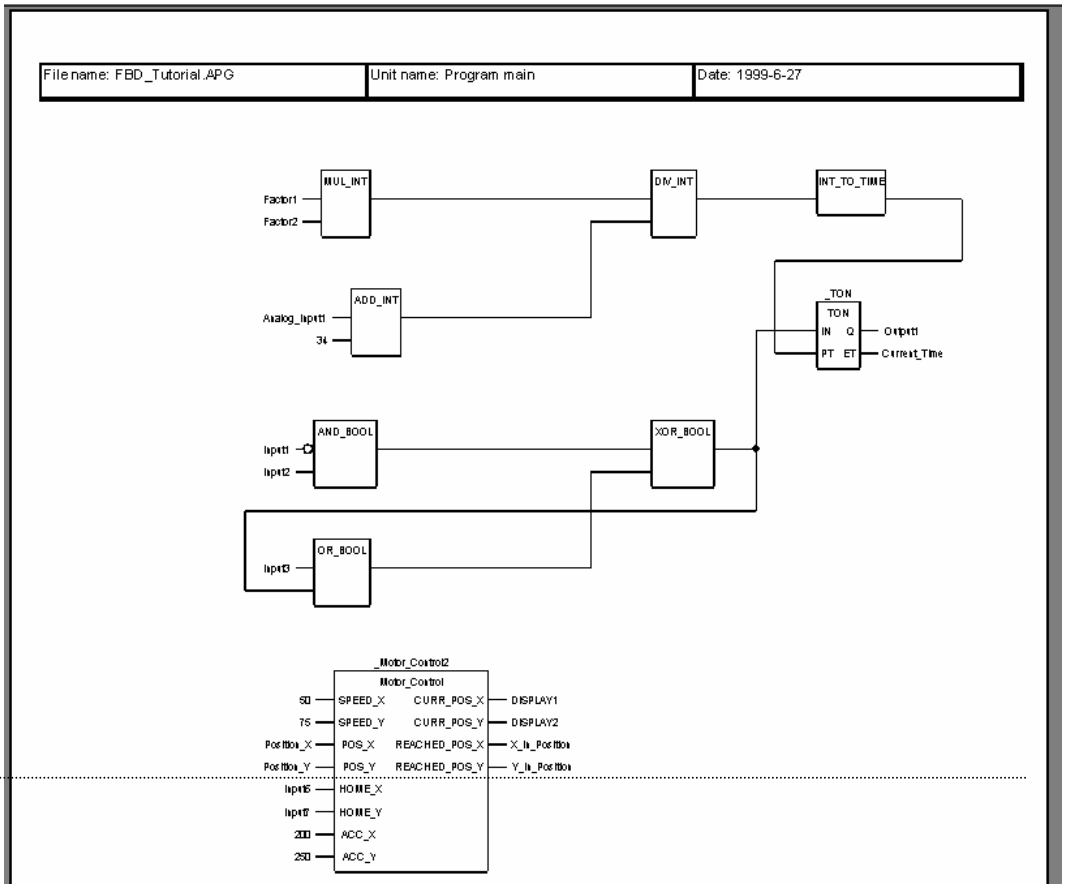
Connect the inputs and outputs as described above.



Print out the program:

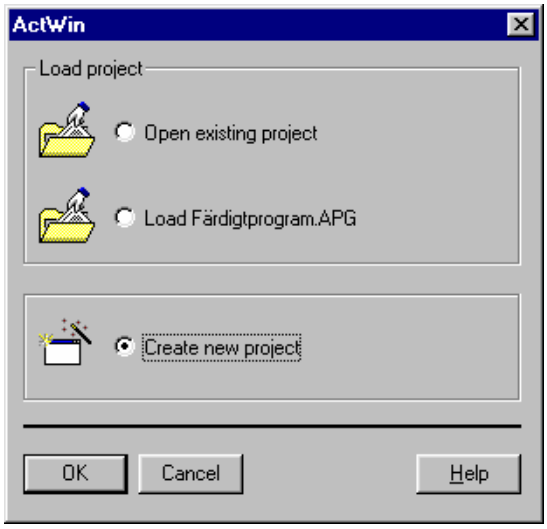
The documentation procedure is identical to the ladder documentation.

If the network is too big to be clearly read on one page a number of pages containing the network in full scale, but splitted, will follow. These pages can be put together to a large page for a complete overview.

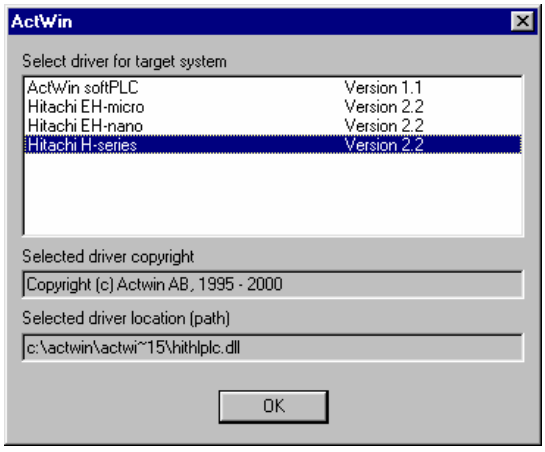


IL programming

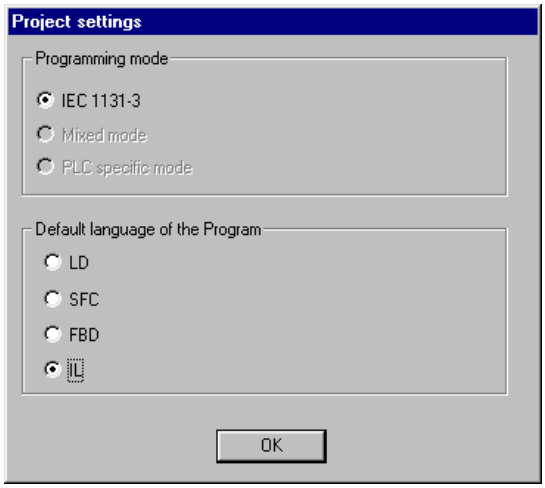
Create a new project.



Select driver.



Select programming mode “IEC 1131-3” and language “IL”



A new window based on IL will turn up.

The editing screen is blank.

The cursor points on the first Line.

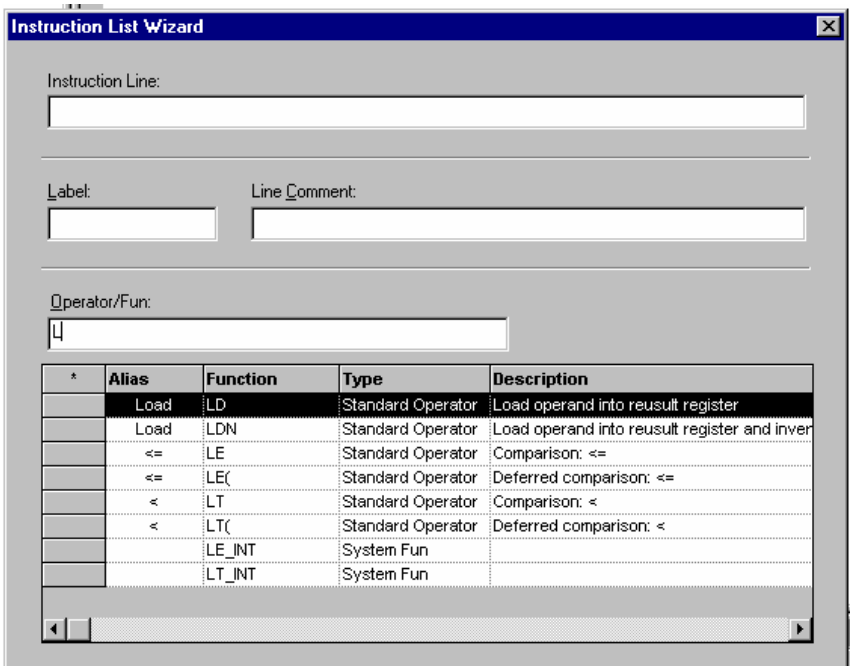
This is a text editor. But it has got a strong syntax check during the editing. Therefore it is controlled by a "Wizard", which helps you e.g. to find and enter the correct symbols.

Start to write the first instruction.

If this is e.g. "LD" (Load) then you type "L".
The wizard will appear showing all available instructions starting with an L.

The alternative LD is already marked.

Therefore press Enter. This will select LD and go to the next phase, which is the symbol allocation.

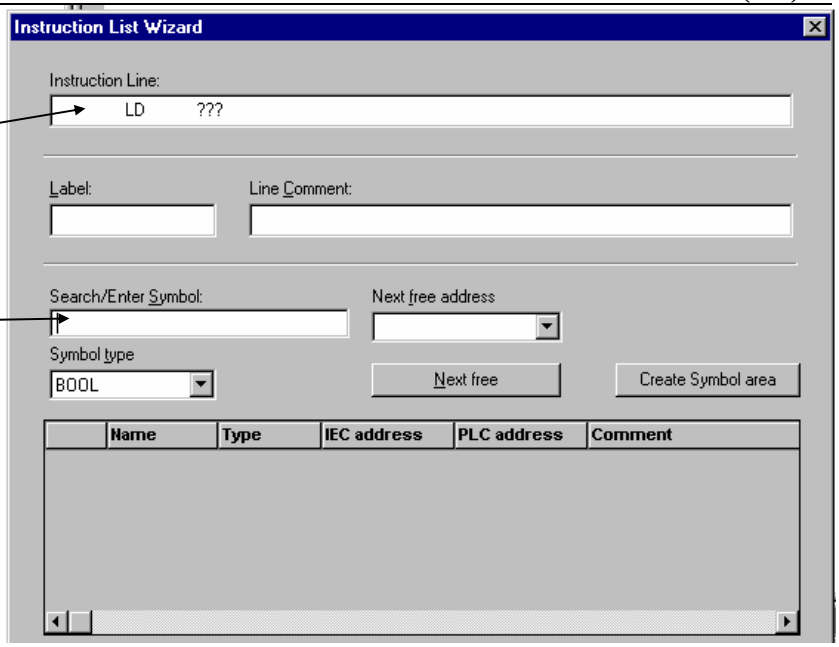


There is an alternative to selecting the instruction with Enter. If you press space the instruction will be selected but you will still stay in the instruction selection window.
When a complete instruction is present in the Operator/FUN window and you press <Space> you will also turn to the symbol allocation window. This means that you can use the same keystroke as in free text. The difference is that you will get a syntax check in addition.
In next version you will be able to select a "free text" mode. This means that the wizard will help you in the background.

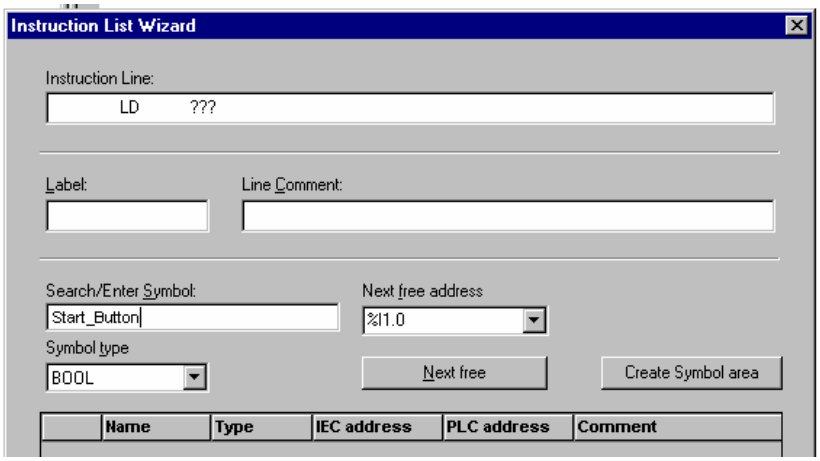
Now you can Enter or search for the symbol.

The Instruction line is built up here.

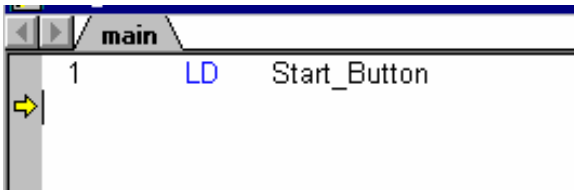
The Symbol is entered here.



Enter an Input “Start_Button”



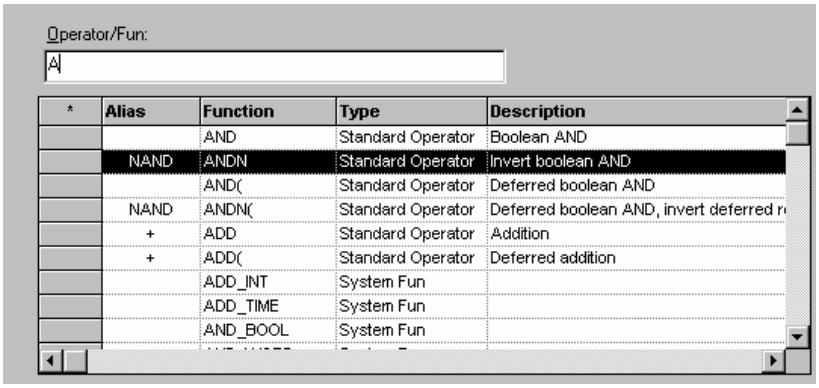
Press Enter and the result is:



Continue with the next line. Let us enter a ANDN.

Move down to the ANDN instruction and press Enter.

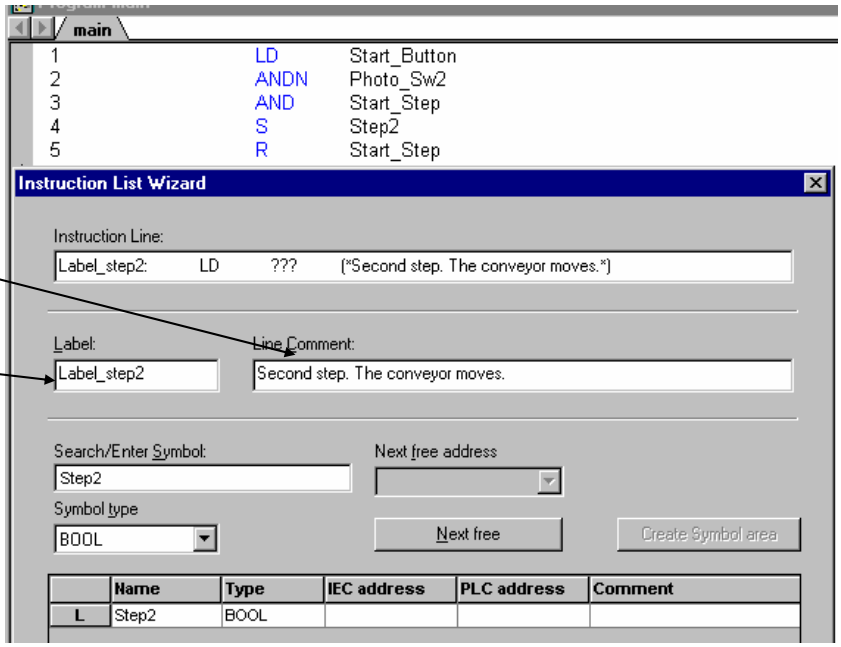
You can also use the “alias” starting with an N.



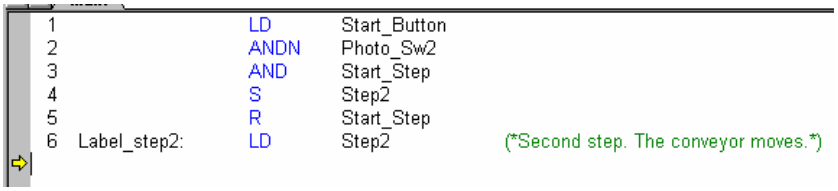
The program is built up.

To enter a comment, type here.

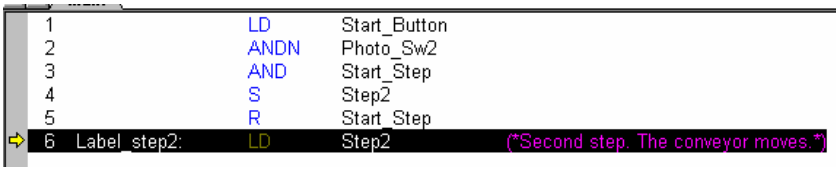
To enter a label for the line, type here.



The result is:

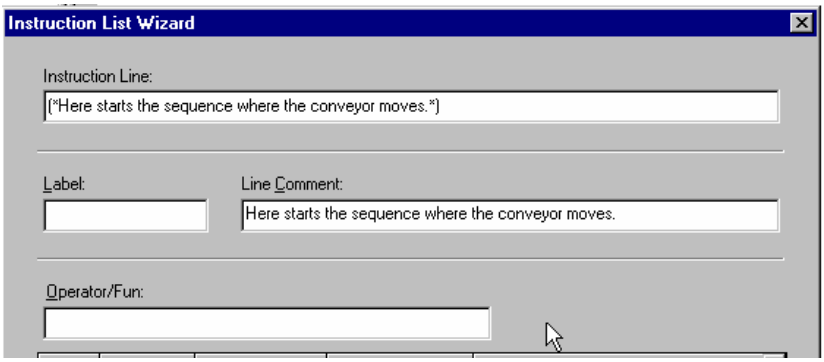


To enter a line comment, go to the line and press Ins.



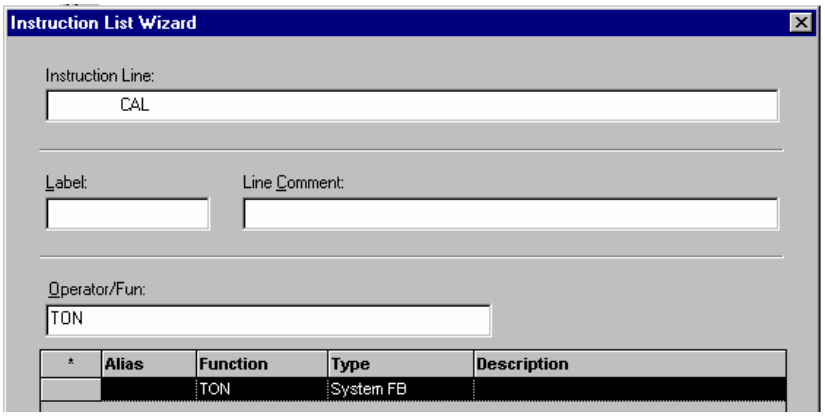
Press enter and leave the Operator/FUN field free.

Just type a Line comment.



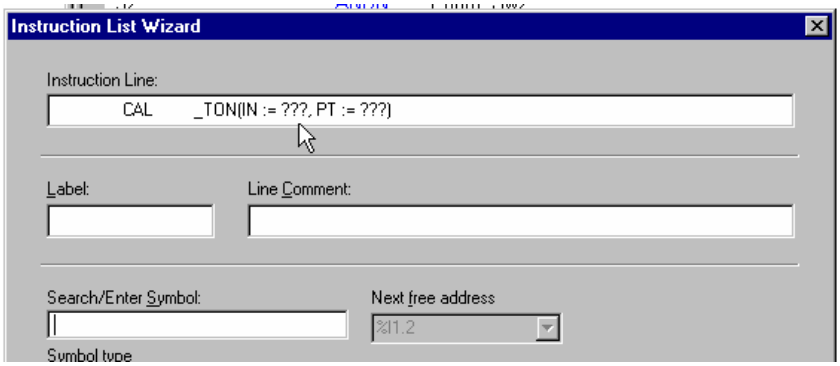
To use a Function Block, e.g. a Timer (TON) or a counter.

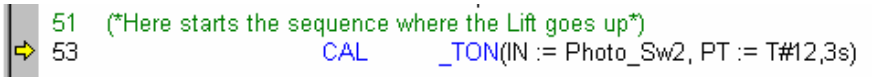
Use the CAL instruction, then select TON.



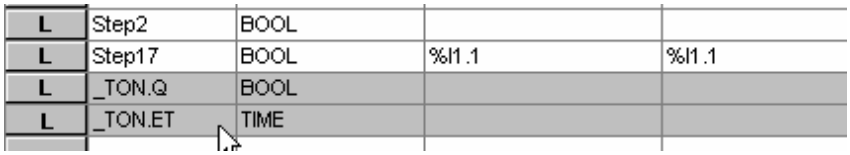
The TON will ask for two parameters.
The timer input (IN)
and The Preset Value (PT) in the mentioned order.

Select PhotoSw2 as input and 12,3 s preset
(This is written T#12,3s)





There is automatically generated the output symbols of the TON.
The output "_TON.Q"
The elapsed time "_TON.ET"



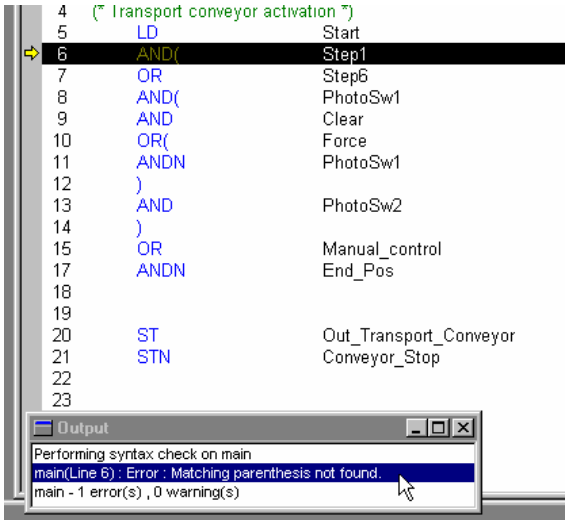
Syntax check

Select "Syntax Check" in the View menu.

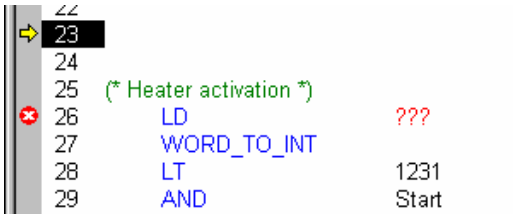
You will get a window, which informs you about the syntax errors and warnings.

Click on the error information and the error will be marked.

In this example there is a mismatch between the levels of "AND(" and ")"

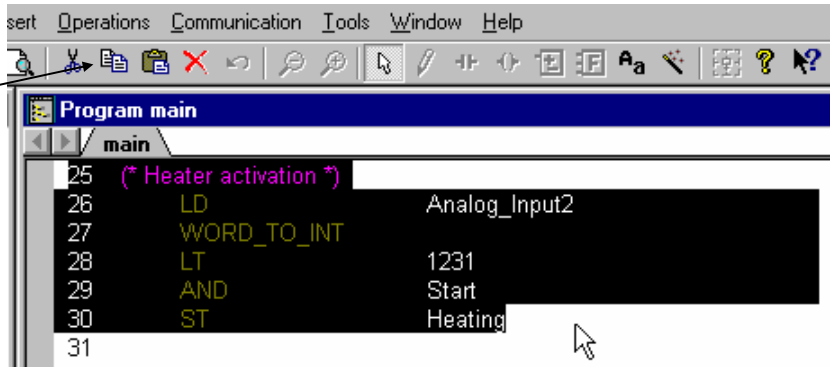


In this case the symbol "Analog_Input2" is removed from the project, which causes an error.



Copy and past in the program

Mark the instructions with the mouse.
Use the Copy, Cut and Paste commands.



On-Line and Monitoring

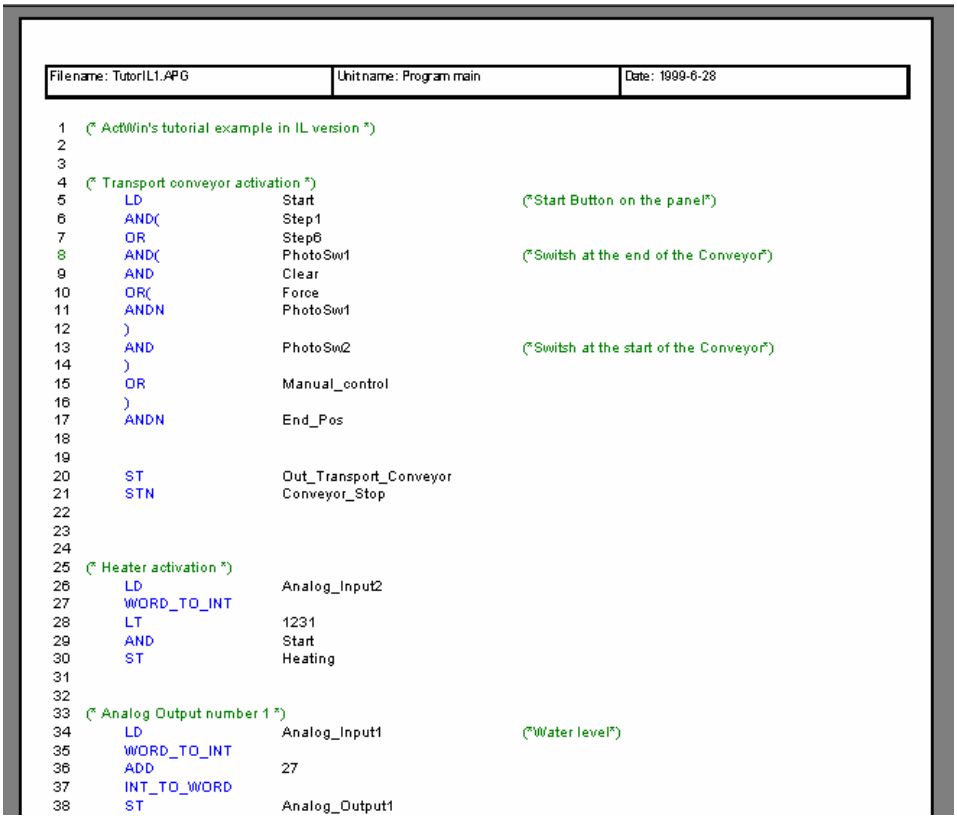
Use the On-Line tools in the same way as for the other languages.

The Monitor values are present on the right side of the IL.

```
12        )
13        AND             PhotoSw2{ 0 }
14        )
15        OR              Manual_control{ 0 }
16        )
17        ANDN            End_Pos{ 0 }
18
19
20        ST              Out_Transport_Conveyor{ 1 }
21        STN             Conveyor_Stop{ 1 }
22
23
24
25  (* Heater activation *)
26        LD              Analog_Input2{ 0 }
27        WORD_TO_INT
28        LT              1231
29        AND             Start{ 0 }
30        ST              Heating{ 0 }
31
32
33  (* Analog Output number 1 *)
34        LD              Analog_Input1{ 0 }
35        WORD_TO_INT
36        ADD             27
37        INT_TO_WORD
38        ST              Analog_Output1{ 27 }
```

Print Out

Use the print out and the preview as in the other languages.



Filename: TutorIL1.APG	Unit name: Program main	Date: 1999-6-28

```
1  (* ActWin's tutorial example in IL version *)
2
3
4  (* Transport conveyor activation *)
5       LD              Start                   (*Start Button on the panel*)
6       AND(            Step1
7       OR              Step6
8       AND(            PhotoSw1                (*Switsh at the end of the Conveyor*)
9       AND             Clear
10      OR(             Force
11      ANDN            PhotoSw1
12      )
13      AND             PhotoSw2                (*Switsh at the start of the Conveyor*)
14      )
15      OR              Manual_control
16      )
17      ANDN            End_Pos
18
19
20      ST              Out_Transport_Conveyor
21      STN             Conveyor_Stop
22
23
24
25 (* Heater activation *)
26      LD              Analog_Input2
27      WORD_TO_INT
28      LT              1231
29      AND             Start
30      ST              Heating
31
32
33 (* Analog Output number 1 *)
34      LD              Analog_Input1           (*Water level*)
35      WORD_TO_INT
36      ADD             27
37      INT_TO_WORD
38      ST              Analog_Output1
```

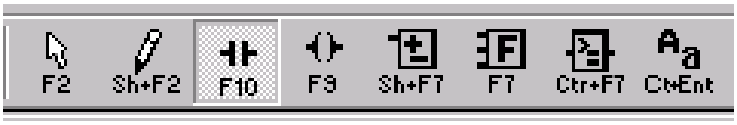

Appendix A: Ladder editing old mode.

Ladder editing buttons:

Following tools are available

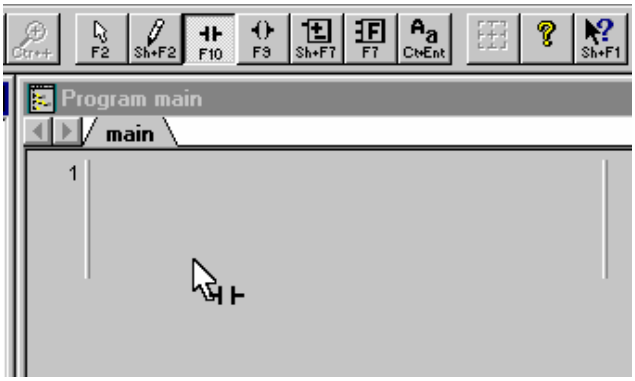
1. Selection
2. Line draw
3. Contact symbol
4. Coil symbol
5. Arithmetic instruction(s)
6. Function box (e.g. Compare box)
7. Compare box
8. Rung Comment or Section comment

Select the contact symbol with the mouse or press the F10 button.



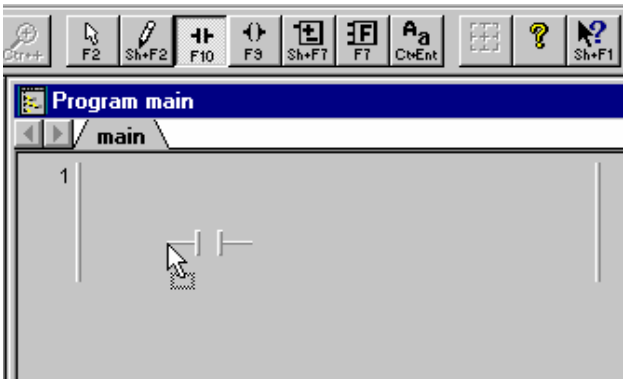
Create a contact:

Move the mouse approximately to the place where you want the contact



→

Click and keep the left button of the mouse down until you see the symbol below and drop the contact.

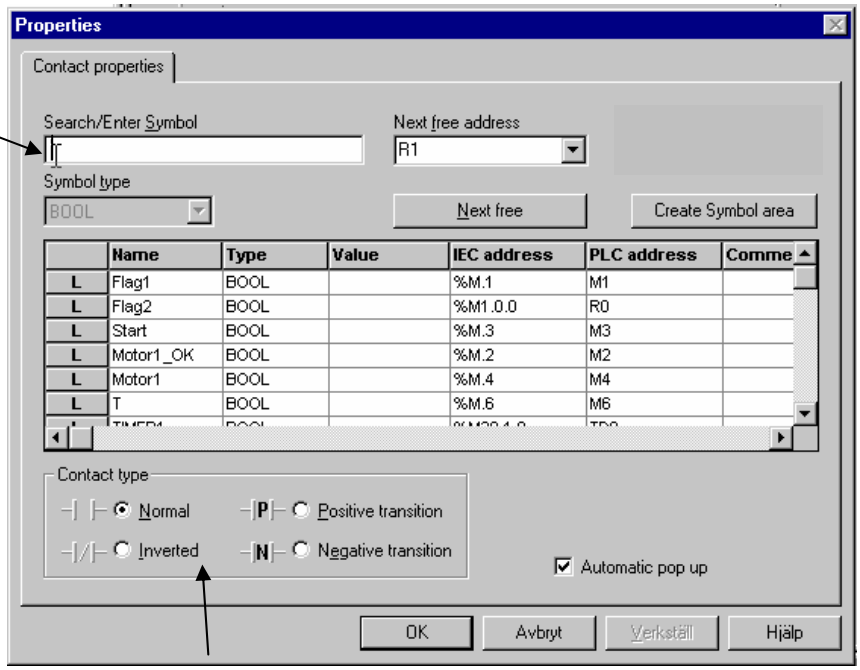


Keyboard editing: Move the cursor with the arrow buttons and press Enter or (Shift+Enter)

Symbol /address handling

The symbol /address handling is probably the most important part in a PLC programming software. The reason for this is that a significant part of the programming time is spent here. Most programming errors are connected to usage of wrong addresses or double usage of addresses. ActWin gives a maximum comfort, guideline and control in the address allocation.

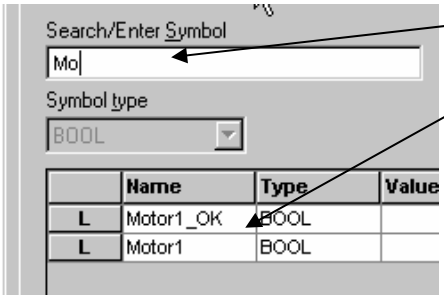
In order to give an easy way to define or search for an address and the symbol name the following window will pop up automatically:



Here you can change to an inverted contact or an edge detection.

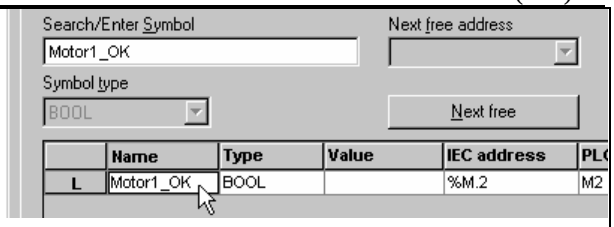
Type the name of the symbol.

When the symbol name does not exist you will always get a suggestion of the first free address. This makes allocation of new symbols very fast and you will avoid double use of addresses.

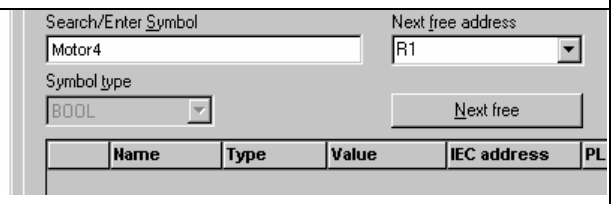


When you type the symbol, all matching symbols will be shown.

Select an existing symbol
Instead of typing the entire symbol name, you can click in the list and select the symbol you want.

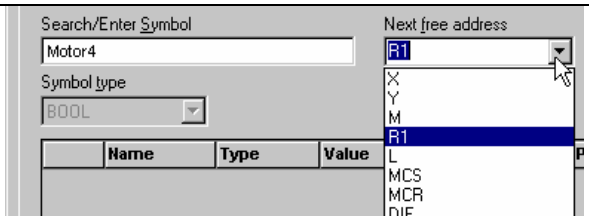


Create a new symbol
A new symbol does not have any match.
If the suggested address is OK you can press Enter to create the symbol.



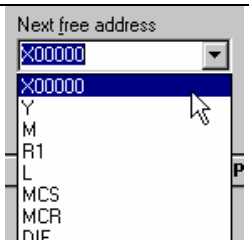
Select an address type for the symbol
If you want a special address, then click on the Memory address and select the type you want.

You can also type the address with the number directly in the Memory address window.

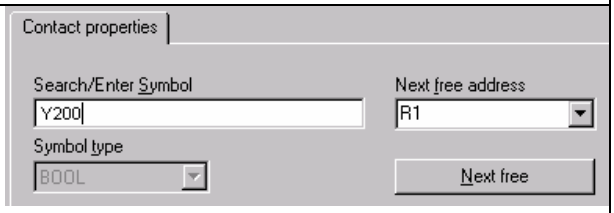


Select the address number
The first available address of the type you suggested will be suggested. Accept or type the number you want and press Enter for OK.

You can also press the Next free button to get the next available address.



Using addresses directly
Even though it is not recommended it can in some cases be comfortable to use the address directly. Just type the address. The symbol on that address will be used or if there is no symbol a new temporary symbol "__Y200" will be created. (All addresses have to have a symbol)

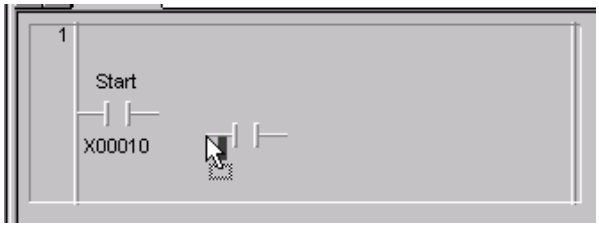


Play a little with the symbol handling and get used to this method and you will realise the comfort.

The button Create Symbol area allows you to define any number of symbols in a one operation. (see "arithmetic box" description for more details.)

Make a serial connection

Repeat the procedure with the contact and drop the new contact close to the right side of the first one.

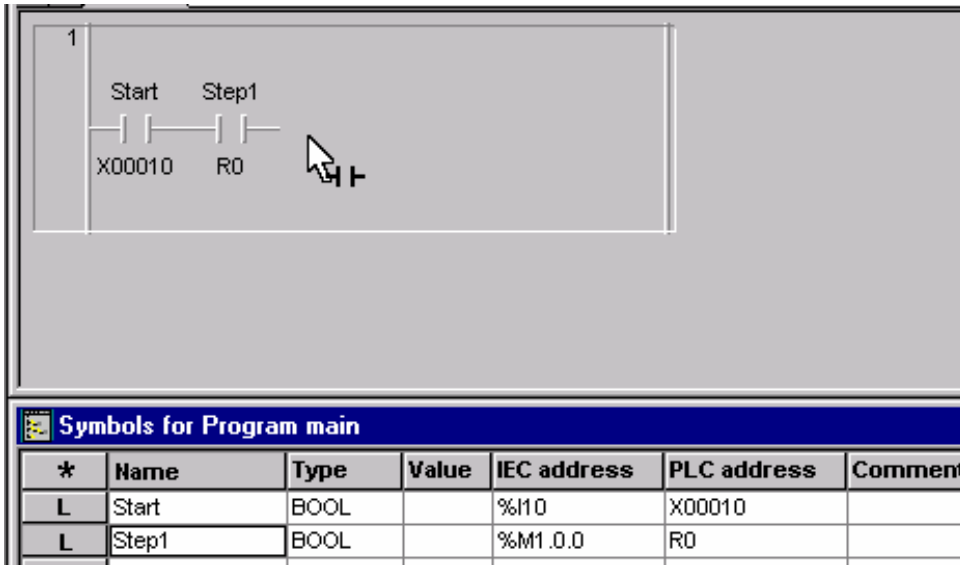


As you can see, the editing field of the rung is marked (shown as deeper). This means that the rung is not ready and approved by ActWin.
When it is completed the marking will disappear.

Give the new contact a symbol name and an address:

The new symbols will appear in the symbol window.

This window will also inform about type, (start value) PLC address and the corresponding IEC1131 address (used if IEC1131-programming is selected)

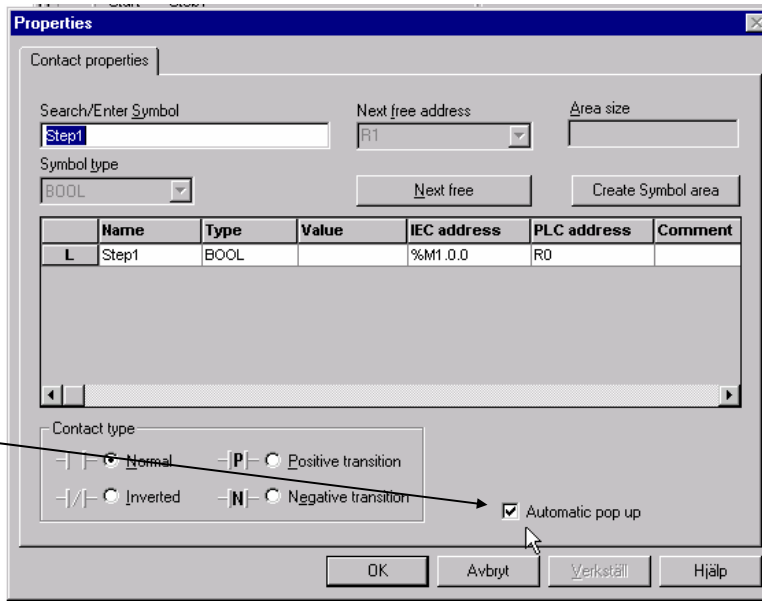


Ladder editing without symbols

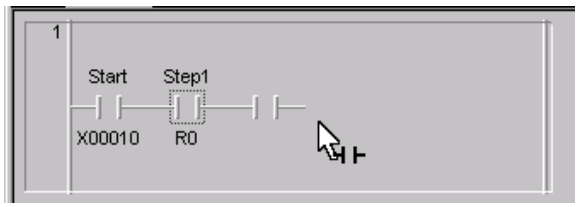
In order to make some different ladder editing without the symbol procedure for each contact, we can turn the symbol editing off.

Make a new contact in series. But instead of giving a symbol name, disable ”Automatic pop up” and press OK.

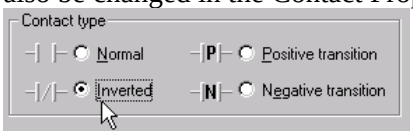
(You can also fetch this window, the Contact Properties, by right-clicking on a contact)



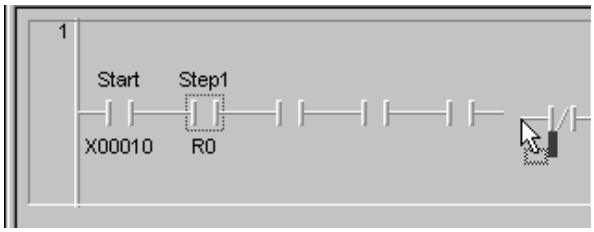
The contact will be drawn without symbol and address



To make an inverted contact,
Press the Shift key before you hold the left button on the mouse down.
(This can also be changed in the Contact Properties Window)

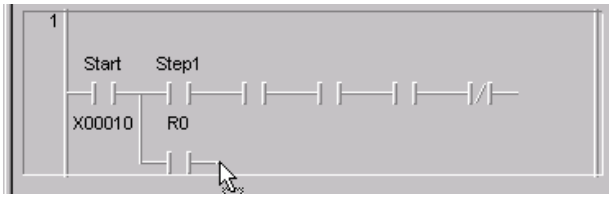


Note that the width of the ladder diagram is flexible. (the right power line moves rightwards)



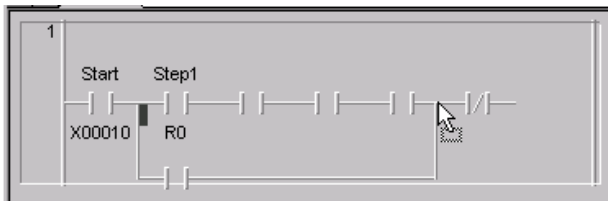
To make a parallel connection

Place the mouse arrow on the horizontal line where the parallel connections shall start.
Press the left button and drag the mouse down

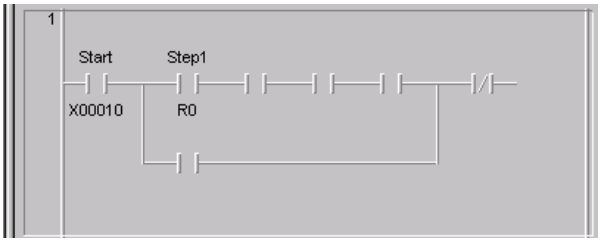


Continue to drag the mouse around the contacts you want to connect in parallel.

When you reach the horizontal line again, then release the left button.



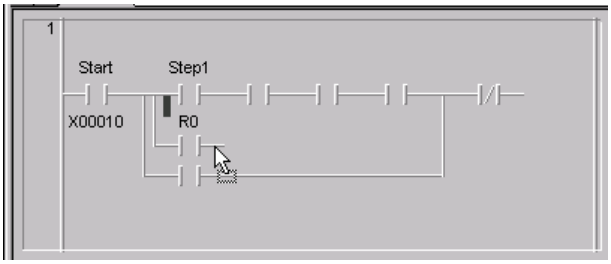
The connection is completed.

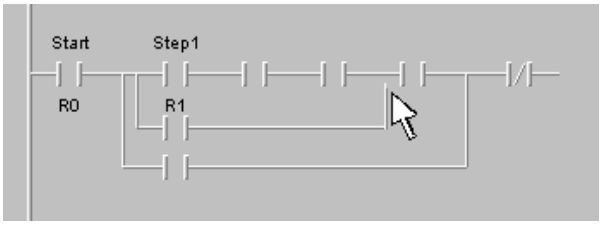


Keyboard editing
Use the keyboard arrows.
Press <Ins>. in the start point and complete with <Enter> in the end point.

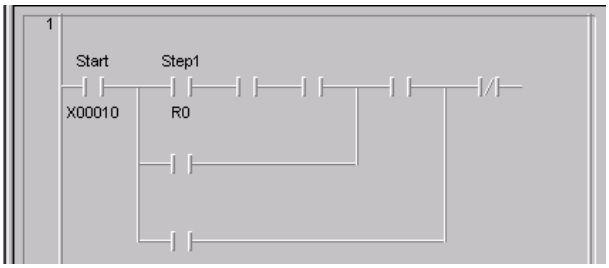
To insert a parallel connection

Make the same procedure as above inside the other connection.



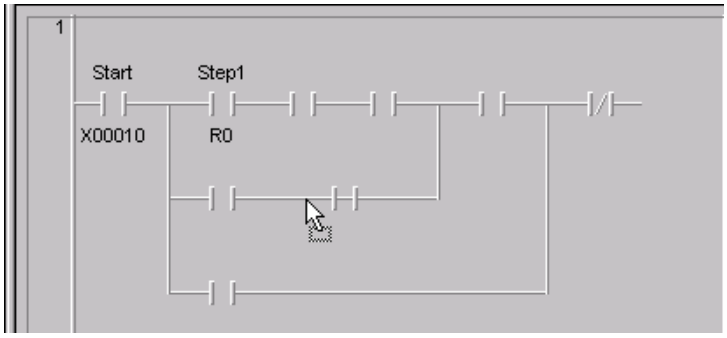


When you drop the mouse button, then the circuit will be redrawn in a proper way.



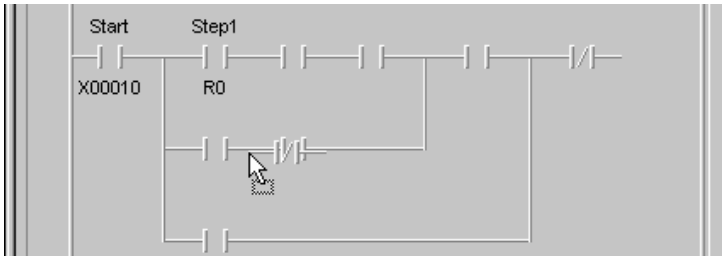
To connect a contact in series

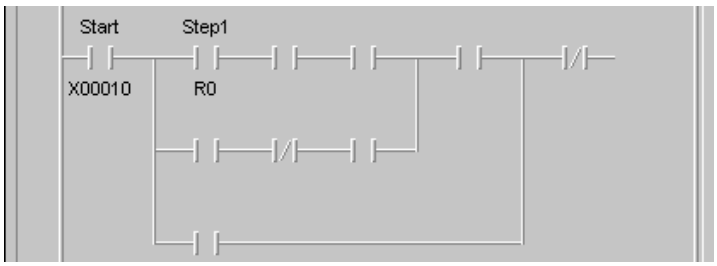
Place the mouse arrow on the line where you want the contact. Press the left button and drop the contact.



To insert a contact in series

Place the mouse arrow on the line between the contacts where you want the contact. Press the left button and drop the contact.



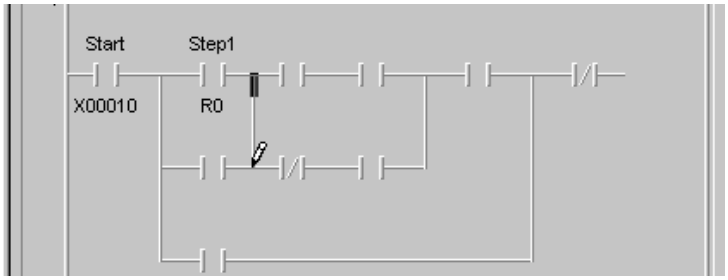


To draw a vertical line

Press the line draw tool on the toolbar.

Place the mouse on the line where you want you to start.
Press the left mouse button and drag to the line where you want to end.

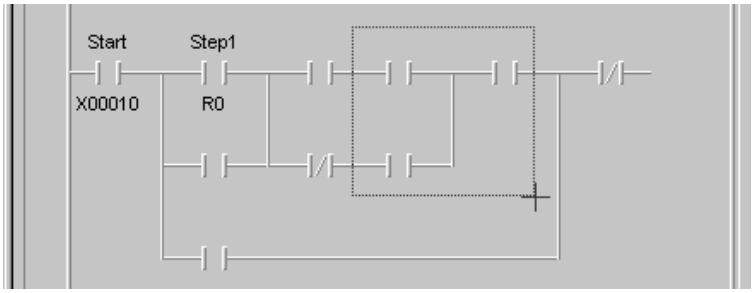
Release the button and the line will be completed.



To select one or more contacts

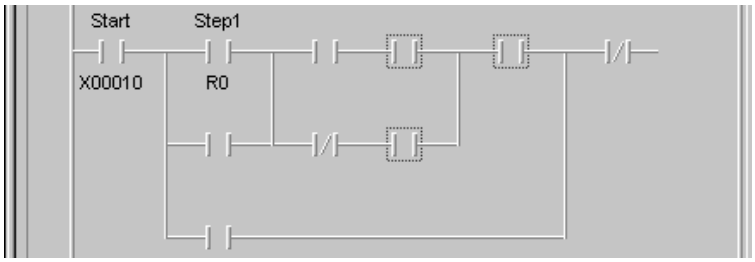
Press the selection tool on the toolbar.

Move the mouse to the start point (upper left corner of the group of contacts)
Hold the left mouse button down and drag to the bottom right corner.



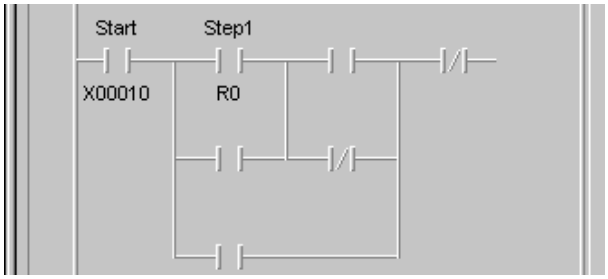
Release the button.

The contacts will be selected.



To Delete contacts

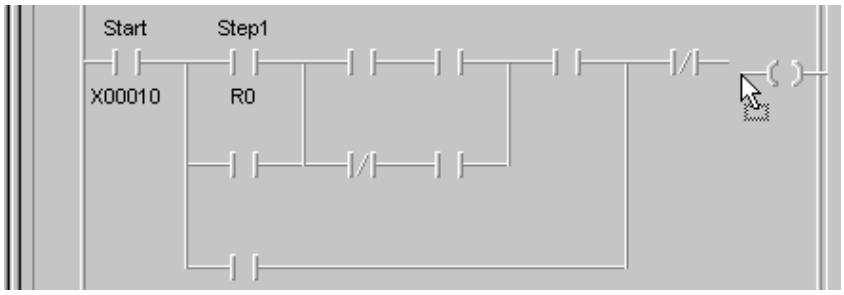
Press Delete and the rung will be redrawn without the deleted contacts.

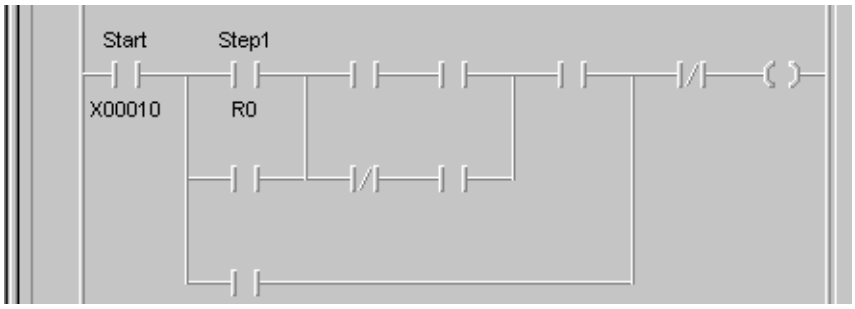


Create a coil

Select the coil symbol with the mouse.

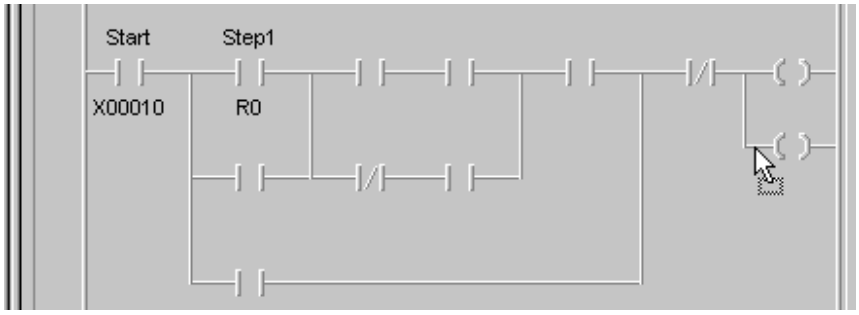
Use the same procedure as when the coil was created.





Create a parallel coil

Use the same procedure as when you made parallel connections of contacts. But drop the mouse on the right vertical line.

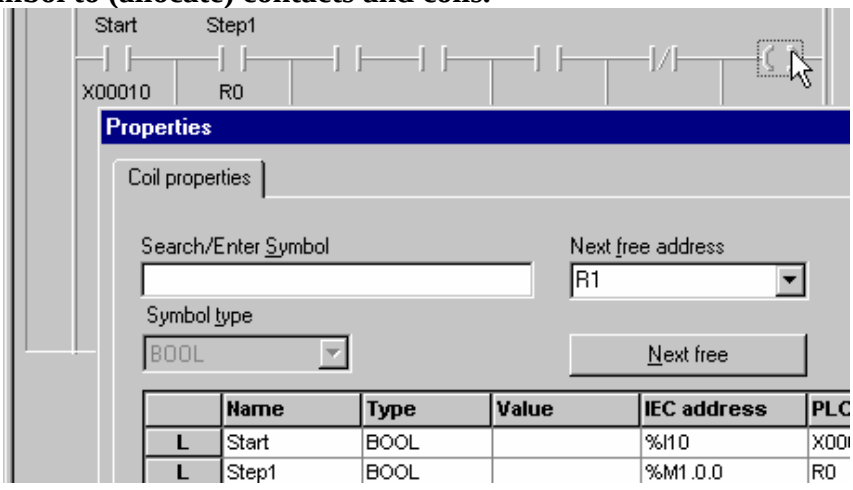


Give or change a symbol to (allocate) contacts and coils.

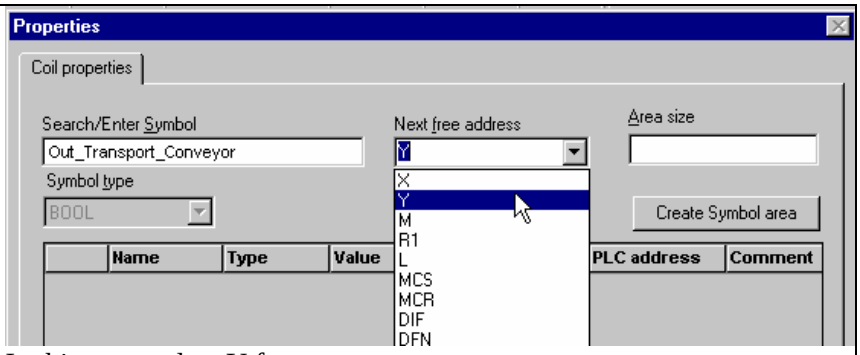
Go to the contact or coil you want to allocate.

Double Click (or click with the right mouse button

and select ”Properties”)

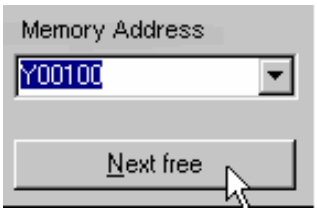


The Symbol selection and search window will appear. Type the new symbol name. *(You are not limited to any length of the symbol. Just use a significant, but not too long symbol names out of practical reason.*
Note that blanks are not allowed.)



In this case, select Y for output.

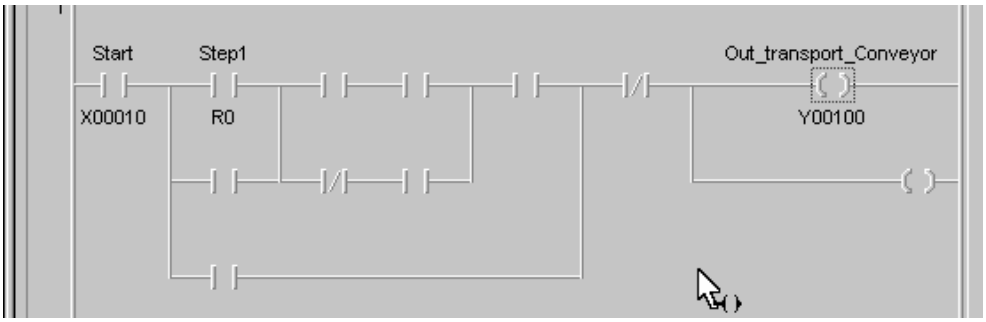
If you have not decided the address number from the beginning, press ”Next free” and the software will suggest the first free unused output address.



Press OK and the coil is allocated.

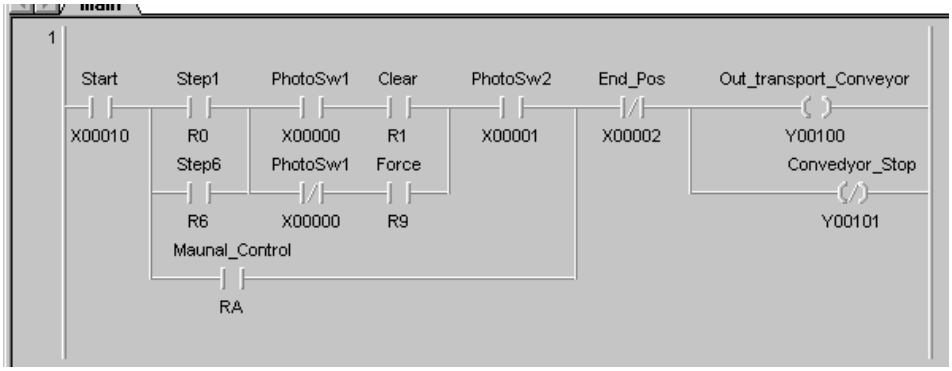
Continue with the same procedure

or select already existing symbols from the list.



Note that before the rung was completed it was shown on a “lower level”

When the rung is completed and approved by ActWin the marking disappears.

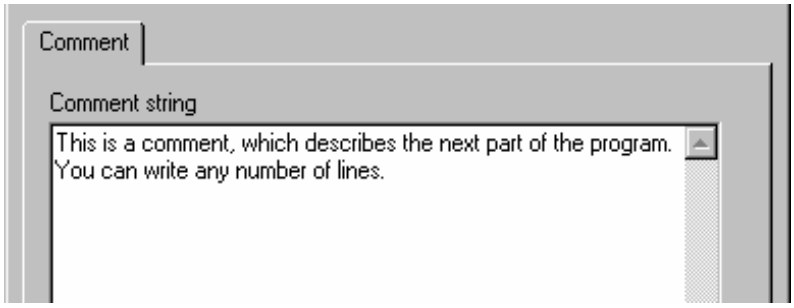


To write a rung comment

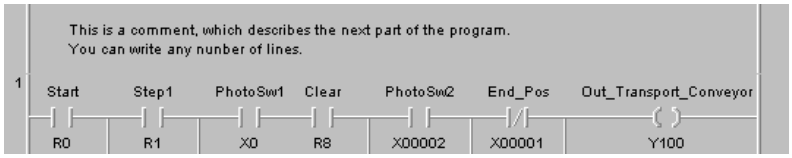
Press the button for comment. Click above the rung, where you want to write the comment.

Click on the <Comment...> symbol.

A window will open, where you can write the comment.



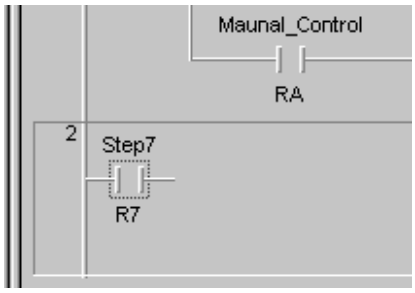
Press OK and the comment will be inserted in the ladder diagram.



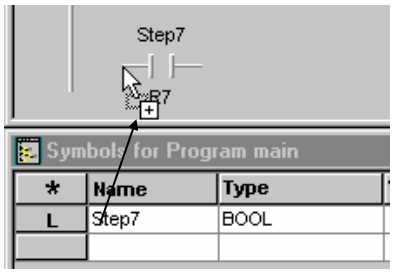
To start a second rung

Select the contact tool again.

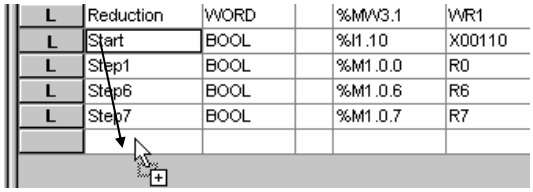
Drop a contact below the first block (or later between any blocks) and continue editing.



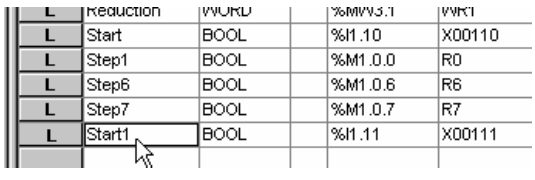
You can alternatively drag and drop the symbols from the symbol tree.



You can create new symbols in a comfortable way through drag and drop in the symbol window.

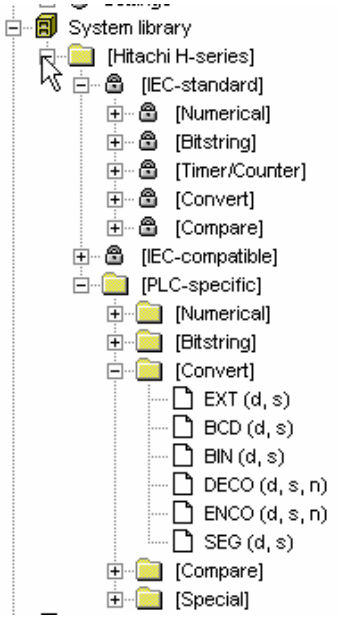


Next free address will be used and the symbol will get an index number.
In this case “Start1” with new address X111 will be created from “Start” with address X110.

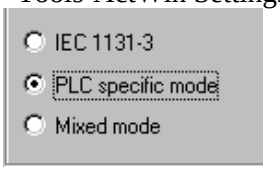


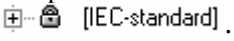
The system library

Open the system library, where you will find ”Hitachi H-series”
Open this and you will find three folders. One contains H-specific Functions. The other two contain IEC-specific functions.



Depending on the mode we have selected under ”Tools-ActWin Settings-Programming”

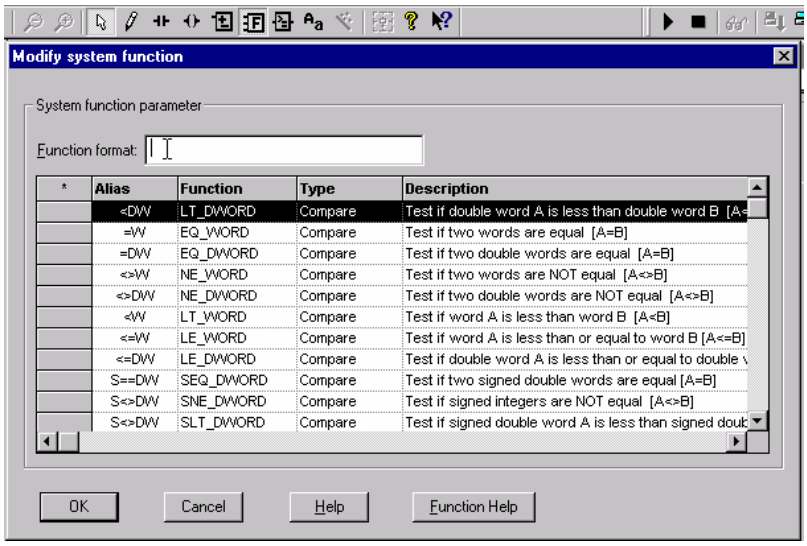


the folders are open or locked, e.g.  .

In this case the only open folder is the ”PLC-specific”

To make a compare box or to insert a F or FB:

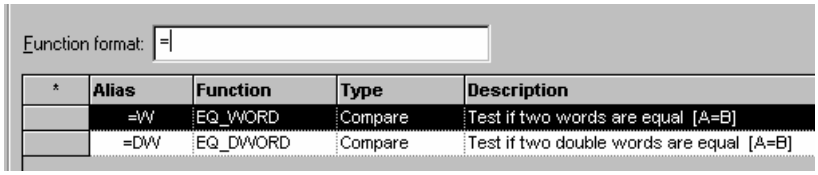
Select the Function tool.
There is now a very quick way of selecting the functions.



Every function has an “alias”, which means a short logical name.

You can scroll down and select the right function.

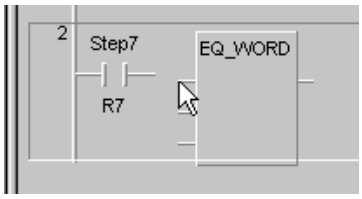
You can find the right function by typing the beginning of the alias



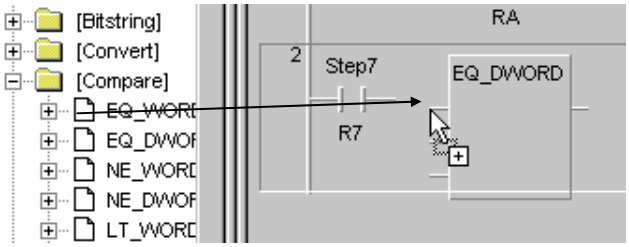
or the beginning of the function name.

There is also a more detailed description of the functions.

Click and keep the left mouse button down on the function and drag it approximately to the place where you want to connect it.



You can also insert a function in the ladder diagram
(the upper line is the logic condition for the comparison)
Drop the button and the function is connected.
The two lower lines are the values.
To allocate the value lines, double click on the line and define a value or a contant.

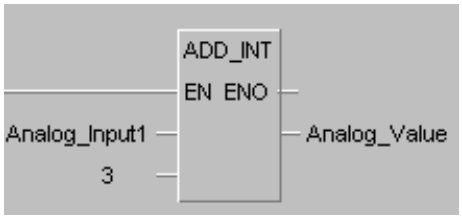


To create a User defined Function (F) or Function Block (FB):

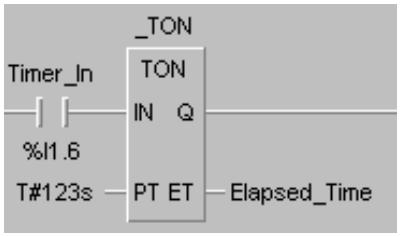
A part of a program, that will be repeated in the same program or in other programs can be included in a Function or a Function Block.

(this must be done in IEC or mixed mode)

The difference between Functions and Function Blocks is that a Function does not keep any memory and it is therefore always possible to tell the result of a Function calculation just by looking at it.
E.g. an ADD_INT is a function.



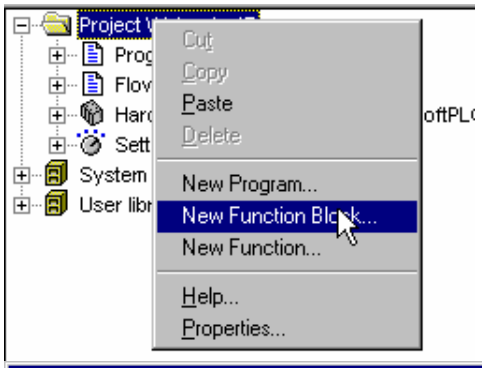
A Function Block can keep a status from execution to execution.
E.g. a CTU or a TON are Function Blocks.



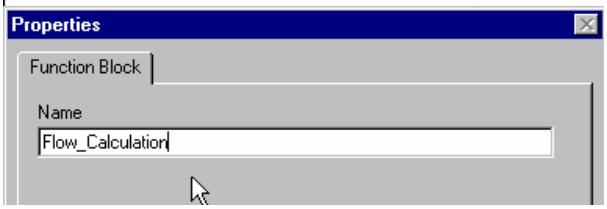
It is possible to create user defined Functions and FBs.

Create a Function Block

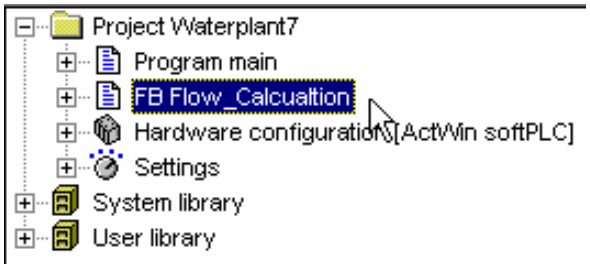
Right click on the Project Folder and select New Function Block... (also possible from the Insert-menu.)



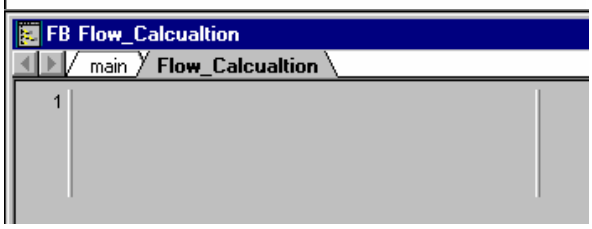
Give a name to the FB.



The new Function Block appears in the tree.



Double click on the new FB and a new window will appear where you can start to define the FB.

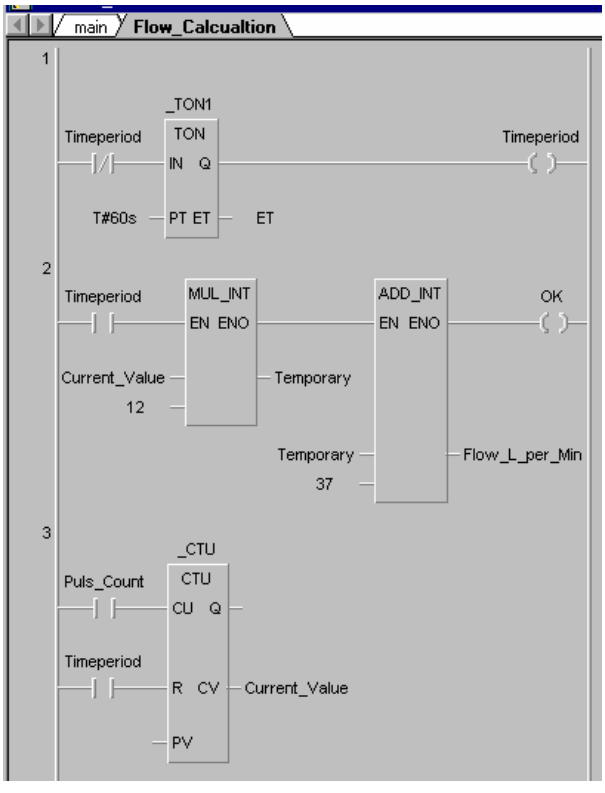


In the application we are producing we use a calculation for water Flow several times. The in parameters are different pulse counters.

Build the content of the FB exactly like you build a program.

You can also take a part from an existing program simply by Copy and Paste from the program to the FB.

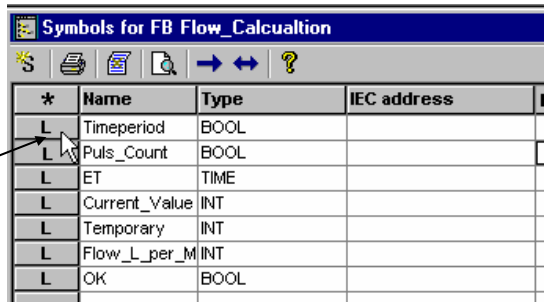
There are no physical addresses in the FB. But you have to define if they are **Input addresses, Output addresses** or if they are only to be represented **Locally** in the FB

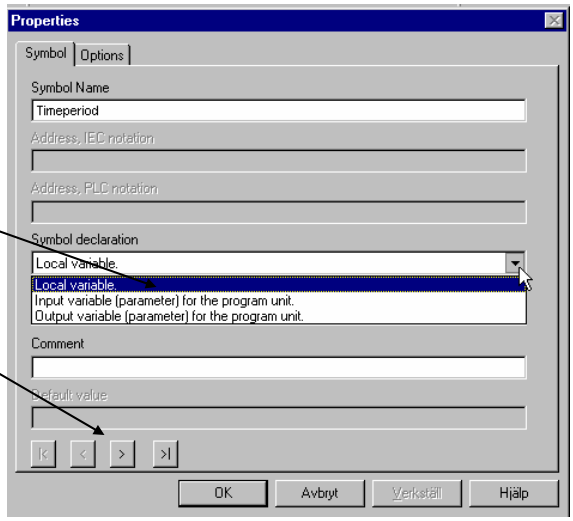


.

Go to the Symbol Window that has been automatically created for the FB.

Double click on the L.
"L" stands for Local and all symbols will be Local by default.
The property window for the symbol appears.

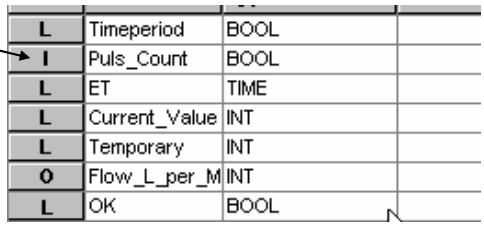




You can now select if you want to change to an Input or Output symbol.

Repeat for the other symbols.
You can also use these buttons to go quickly between the symbols.

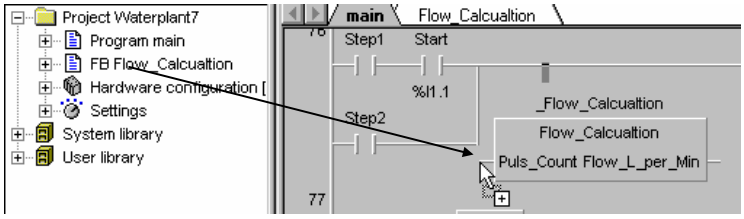
In this case we only need one Input and one Output symbol.
The others can stay Local.



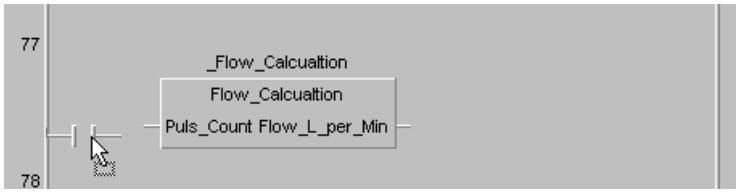
Go back to the Main program through clicking on the Main folder at the top of the project tree.

The new Function Block is now present in the tree.

This means that you can use this block one or several times in the program.

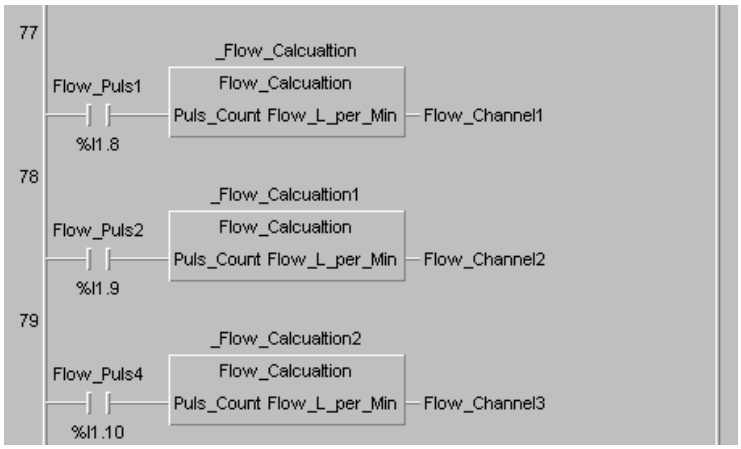


Drag the FB from the tree and drop it in the program
Connect an input and an output to the FB.

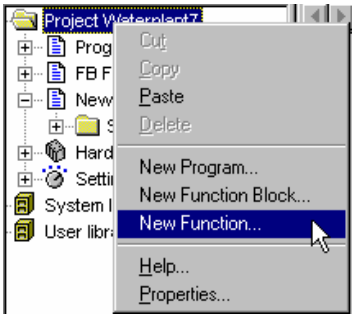


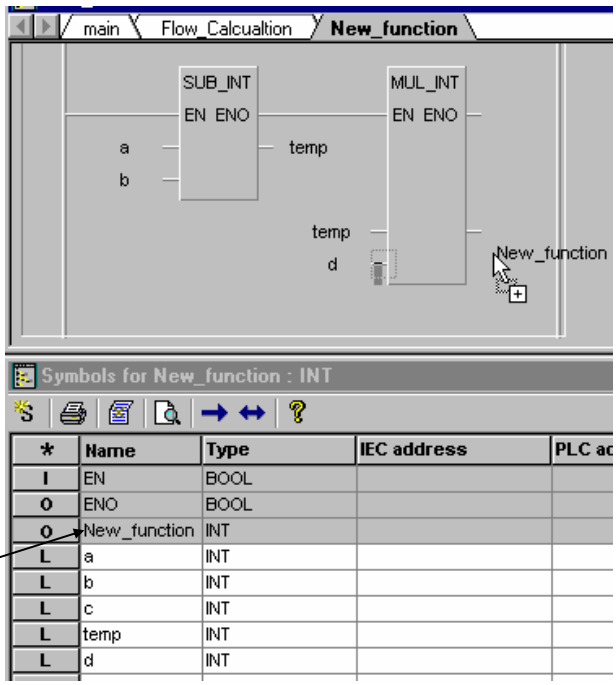
Repeat for the number of times you want to use the FB.

All these Function Blocks will work as separate instances, which means that they will work independently from each other.



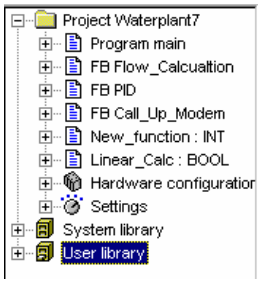
User defined Function:





The difference, compared to creating a new FB, if you create a new function is that it has automatically one EN (enable) input and one ENO (Enable Output) and besides that only one Output.
The name of the Output is identical to the Function name. (In this case "New_function")

You can build up any number of Functions and Function blocks to be used one or several times in your program.



Appendix B: ActWin Macro

The macro handling in ActWin will allow you:

- ✓ to create any kind of an “H specific Function block” or Macro.
- ✓ to control fixed addresses, such as specific IO modules etc. which is impossible with standard FB.

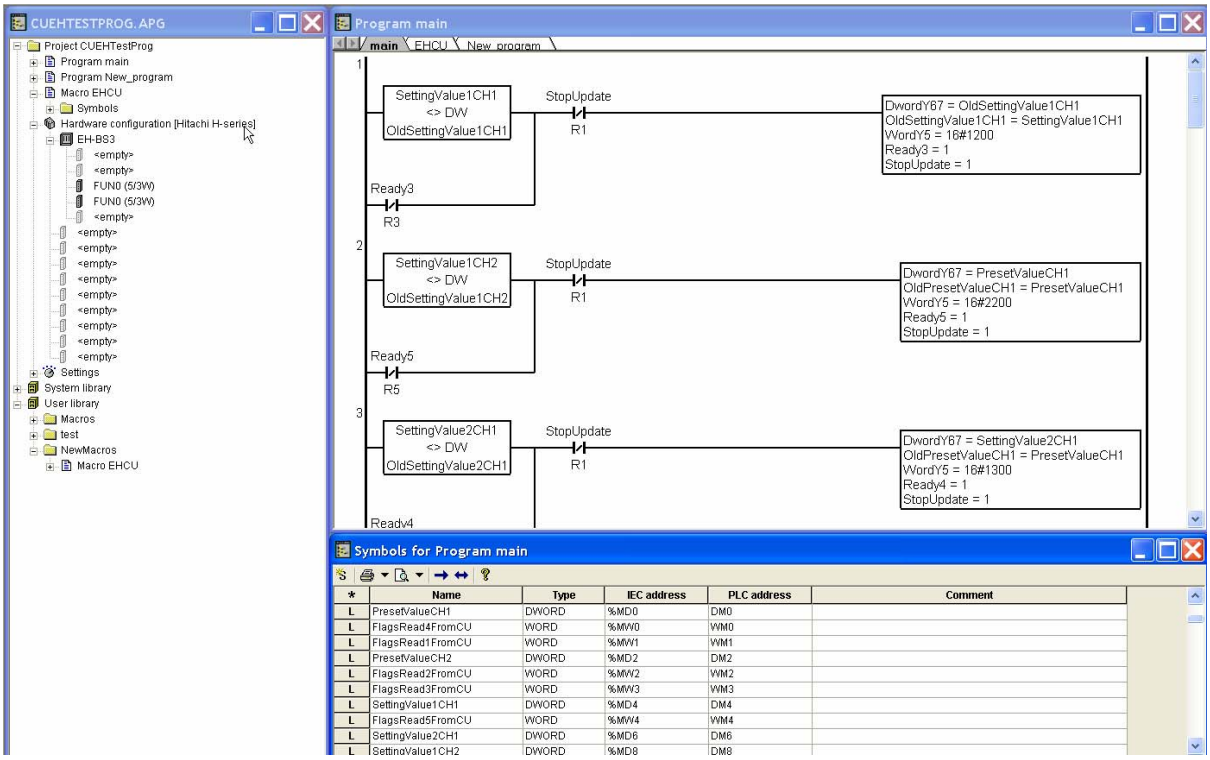
Therefore the macro handling in ActWin will allow for the usage of (for the average user) complicated coding and complex modules.

This Tech note describes how to create a macro and how to use it in a program.

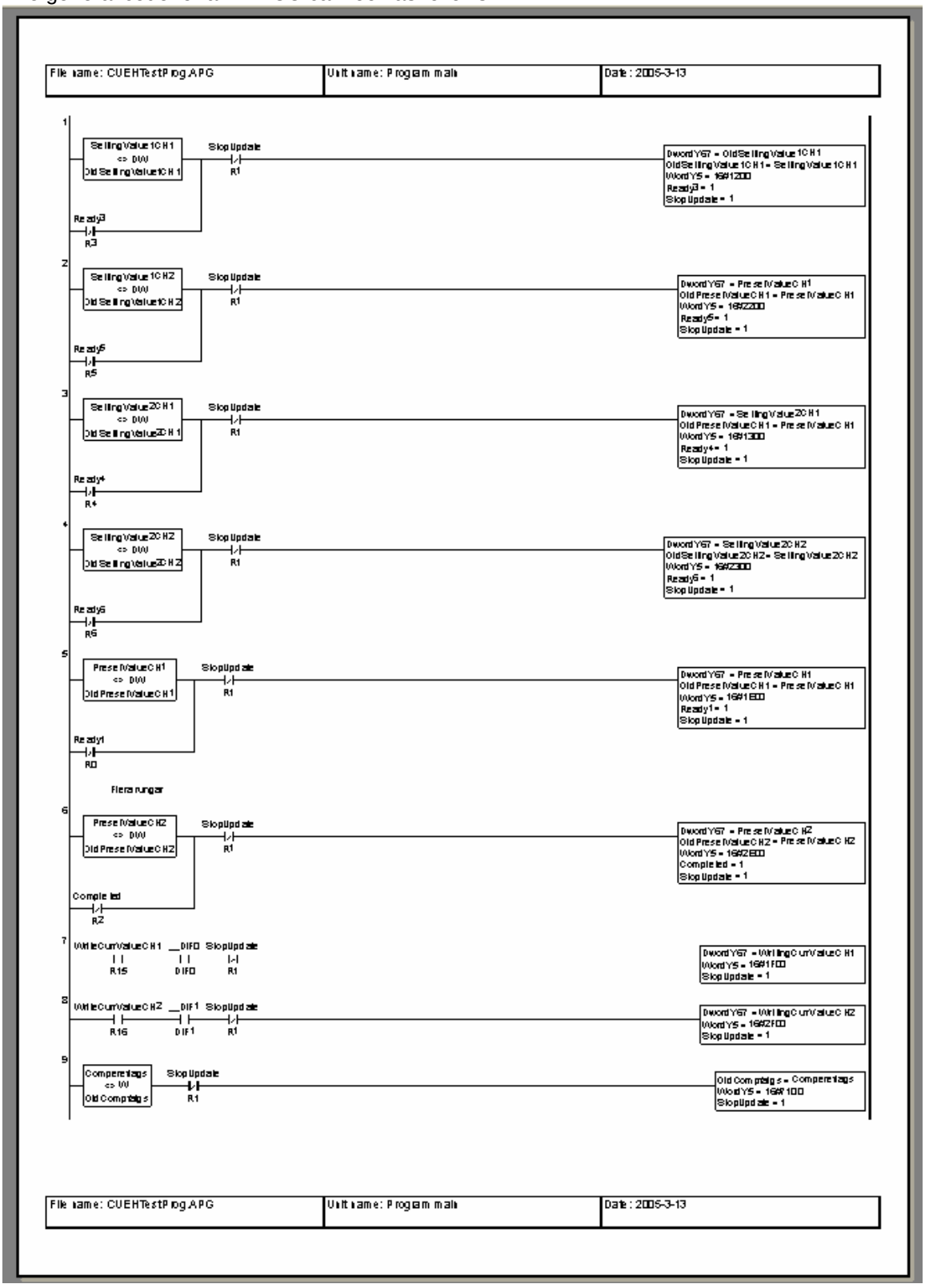
How to create a Macro

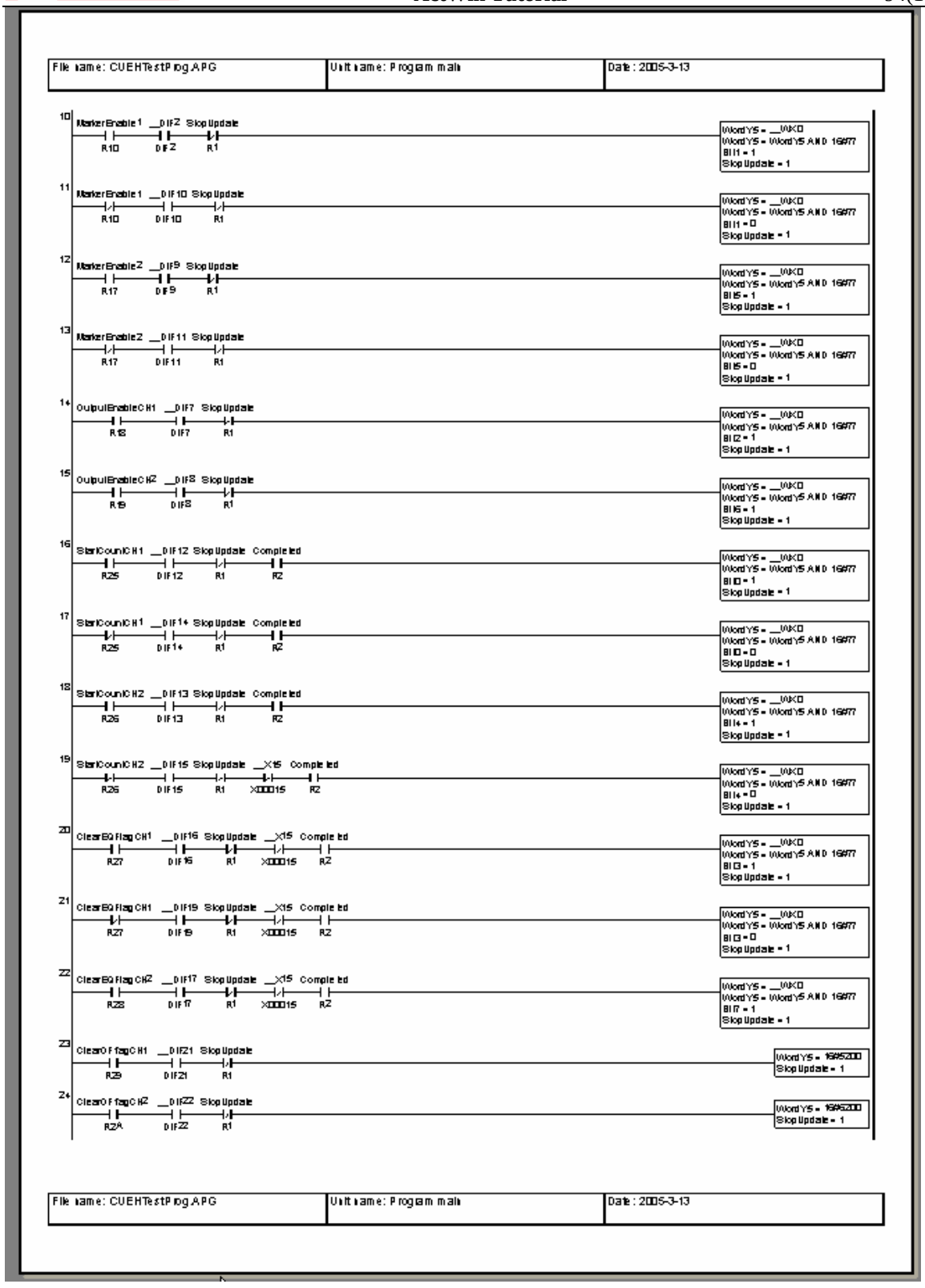
Example of a macro to the EH-CU module, the counter module to EH150 system.

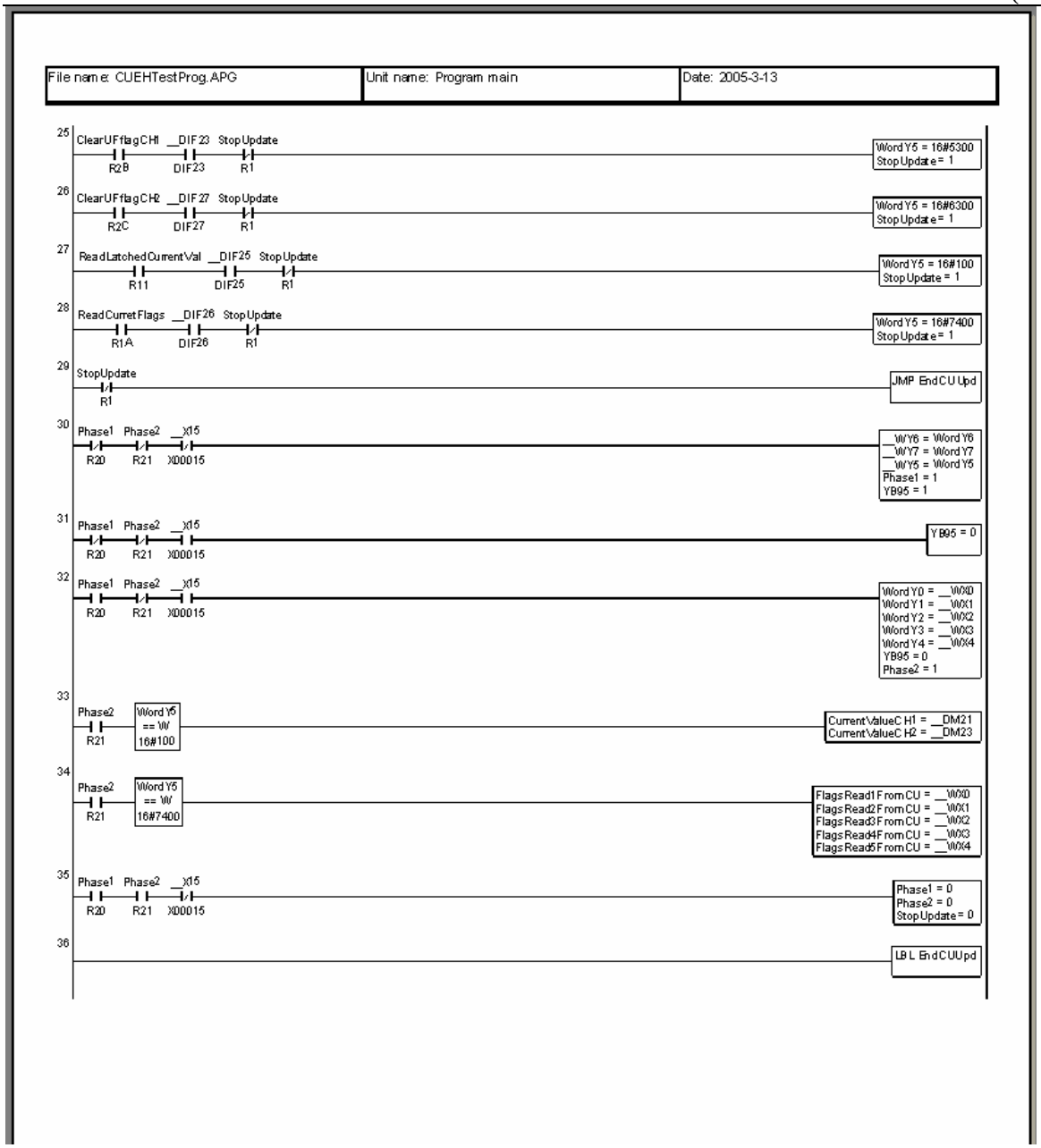
First write the code for the part of the program you want to transfer to a macro in the normal way or copy from an existing project. (The code can also be written or modified inside the macro itself.)



The general code for an EH CU can look as follows:




File name: CUEHTestProg.APG
Unit name: Program main
Date : 2005-3-13
10 MarkerEnable1 __DIFZ Skip Update
R10 DIFZ R1
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit1 = 1
Skip Update = 1
11 MarkerEnable1 __DIF10 Skip Update
R10 DIF10 R1
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit1 = 0
Skip Update = 1
12 MarkerEnable2 __DIF9 Skip Update
R17 DIF9 R1
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit5 = 1
Skip Update = 1
13 MarkerEnable2 __DIF11 Skip Update
R17 DIF11 R1
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit5 = 0
Skip Update = 1
14 OutputEnableCH1 __DIF7 Skip Update
R18 DIF7 R1
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit2 = 1
Skip Update = 1
15 OutputEnableCH2 __DIF8 Skip Update
R19 DIF8 R1
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit5 = 1
Skip Update = 1
16 StartCountCH1 __DIF12 Skip Update Completed
R25 DIF12 R1 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit0 = 1
Skip Update = 1
17 StartCountCH1 __DIF14 Skip Update Completed
R25 DIF14 R1 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit0 = 0
Skip Update = 1
18 StartCountCH2 __DIF13 Skip Update Completed
R26 DIF13 R1 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit4 = 1
Skip Update = 1
19 StartCountCH2 __DIF15 Skip Update __X15 Completed
R26 DIF15 R1 X00015 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit4 = 0
Skip Update = 1
20 ClearBQFlagCH1 __DIF16 Skip Update __X15 Completed
R27 DIF16 R1 X00015 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit3 = 1
Skip Update = 1
21 ClearBQFlagCH1 __DIF19 Skip Update __X15 Completed
R27 DIF19 R1 X00015 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit3 = 0
Skip Update = 1
22 ClearBQFlagCH2 __DIF17 Skip Update __X15 Completed
R28 DIF17 R1 X00015 R2
WordYS = __WKO
WordYS = WordYS AND 16#FF
Bit7 = 1
Skip Update = 1
23 ClearOFFlagCH1 __DIF21 Skip Update
R29 DIF21 R1
WordYS = 16#5200
Skip Update = 1
24 ClearOFFlagCH2 __DIF22 Skip Update
R2A DIF22 R1
WordYS = 16#5200
Skip Update = 1
File name: CUEHTestProg.APG
Unit name: Program main
Date : 2005-3-13

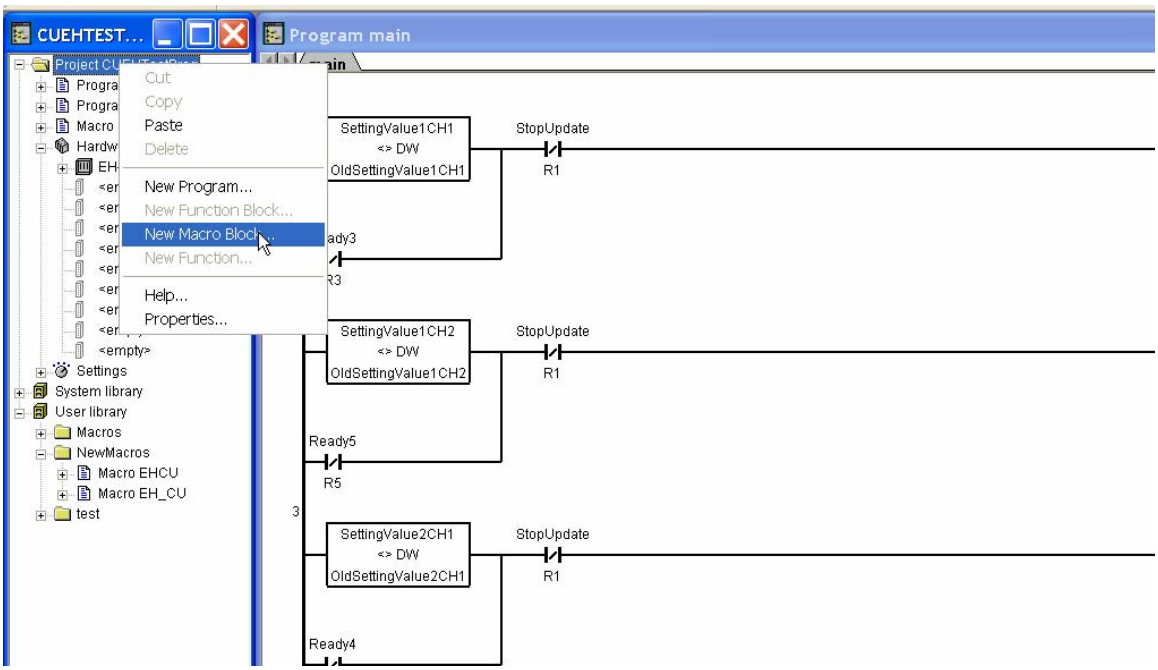


It is clear that this is difficult to write each time for an average programmer and it takes very long time even for an expert.

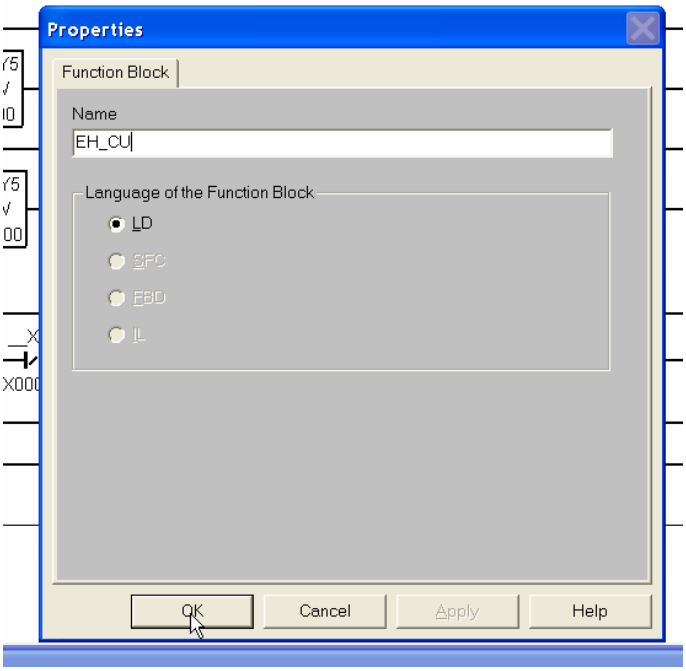
The procedure to create a new macro is as follows (assuming that the macro ladder code is created in a program unit):

1. Define a new macro

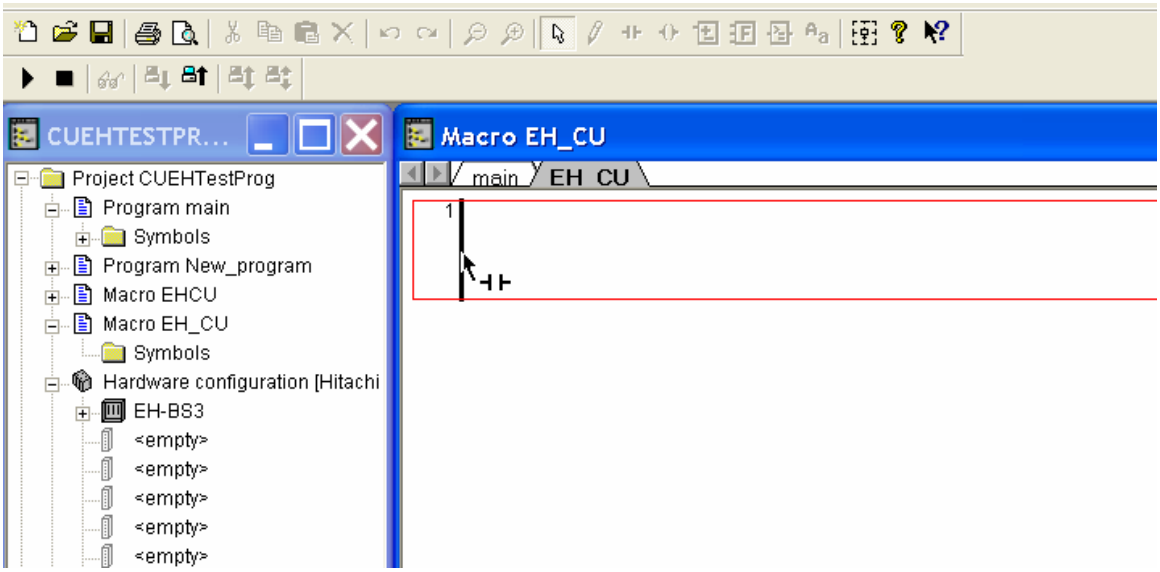
Right click On the Project folder and select New Macro Block.



A window will pop up where you give a name to the macro:

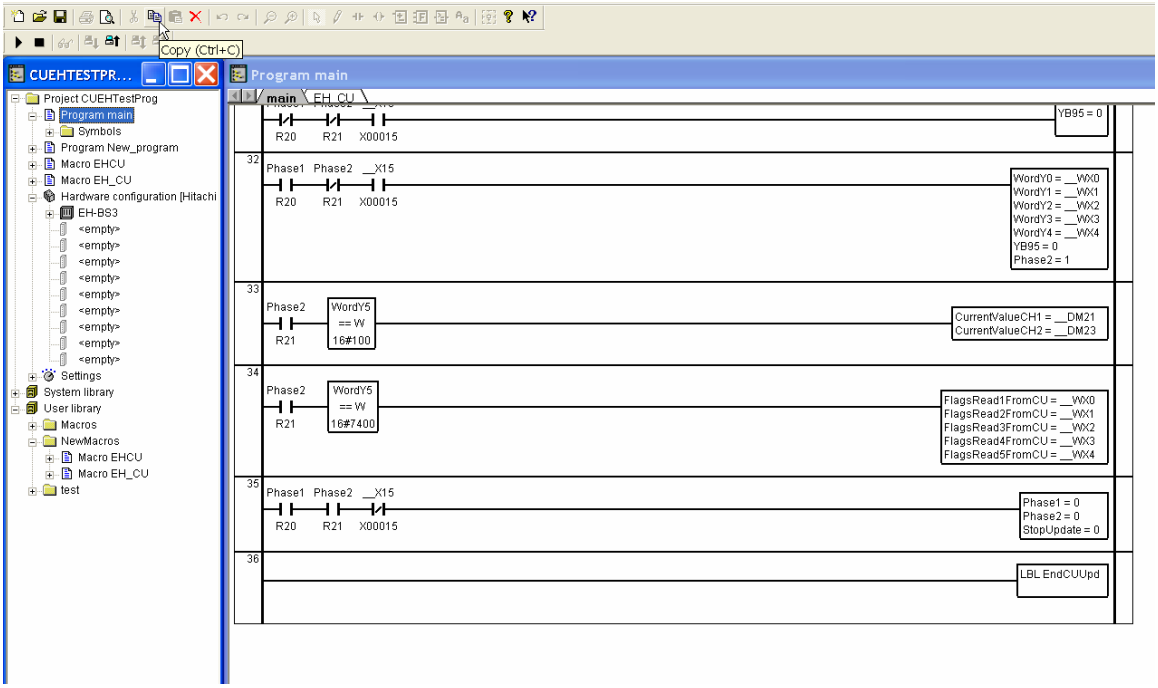


A new empty “macro” program unit is now created with a new tab in the programming window.

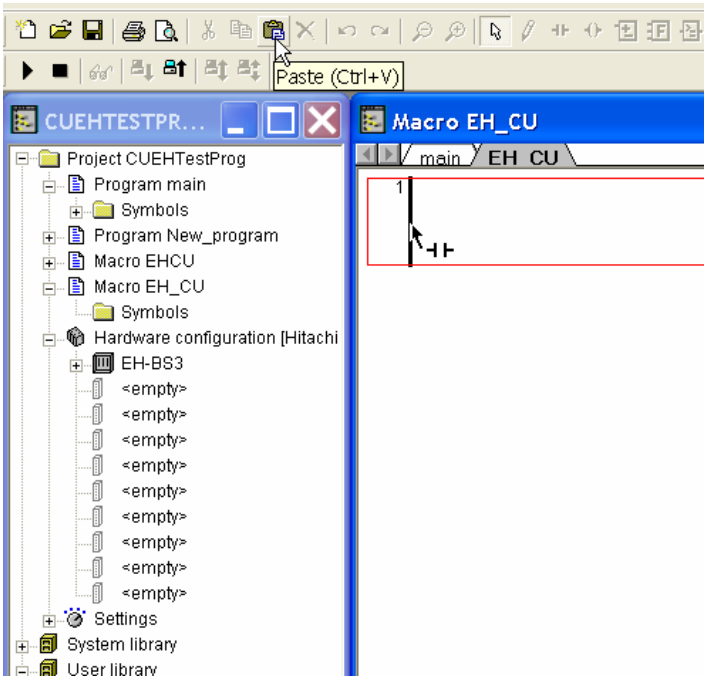


2. Insert the macro code

Go back to the program. Mark all rungs and copy.



Go back to the macro and paste:

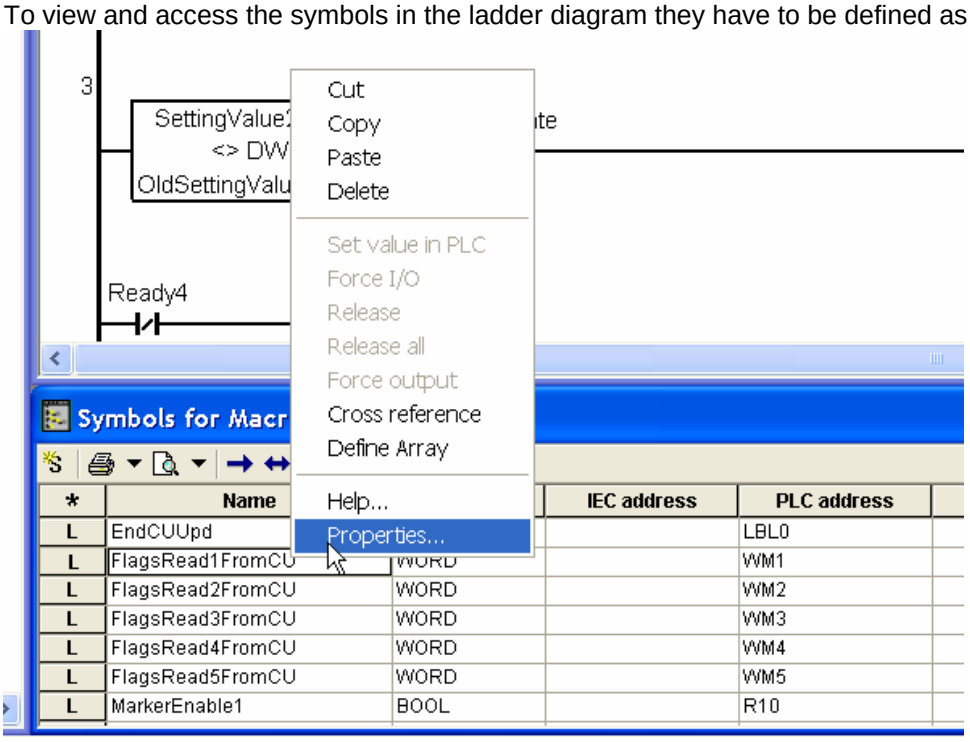


The program code will be inserted in the Macro.

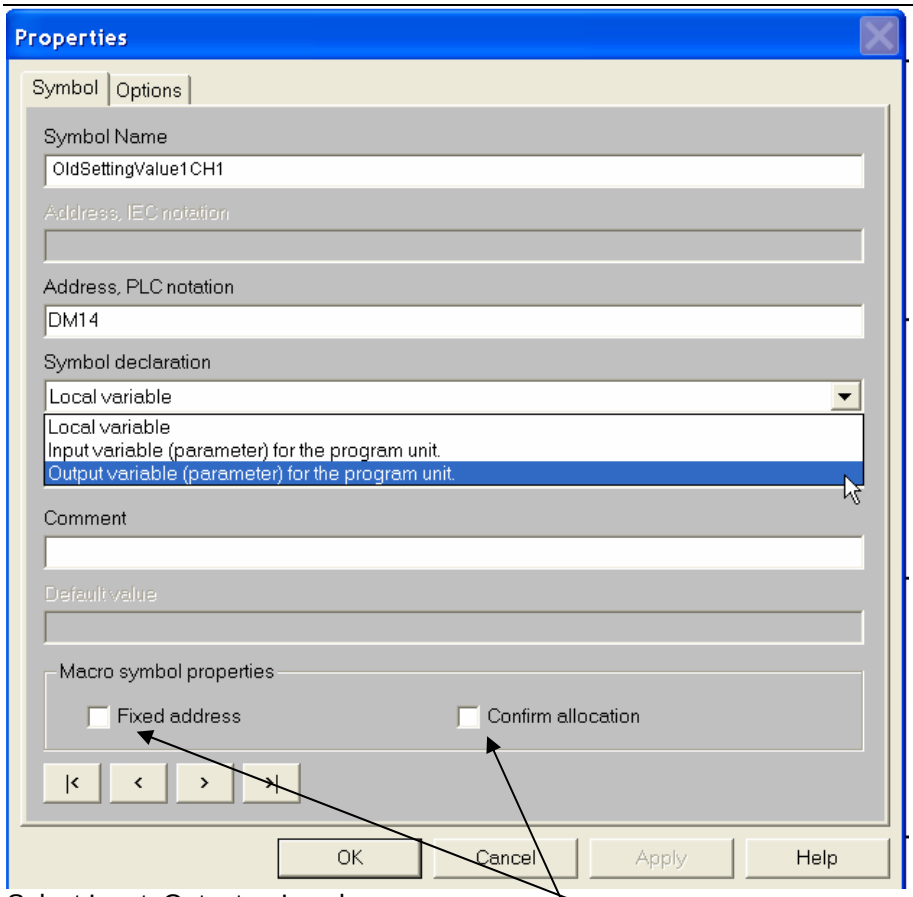
3. Now the symbols have to be defined:

As default all symbols are Local. This means in this case that they will not be shown outside the macro box.

To view and access the symbols in the ladder diagram they have to be defined as Input or Output.



Mark the symbol and right click and select Properties.



Select Input, Output or Local.

In the box you can also select if the symbol shall be on a fixed address.

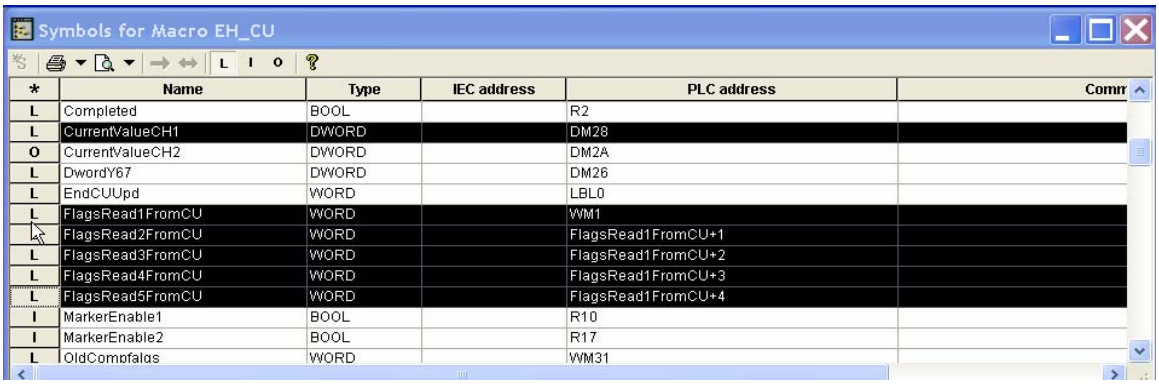
E.g. the Init pulse R7E7 or the real time clock are always fixed addresses. This means that the macro shall always select this physical address.

You can also select if the address shall be confirmed by the user when the macro is inserted.

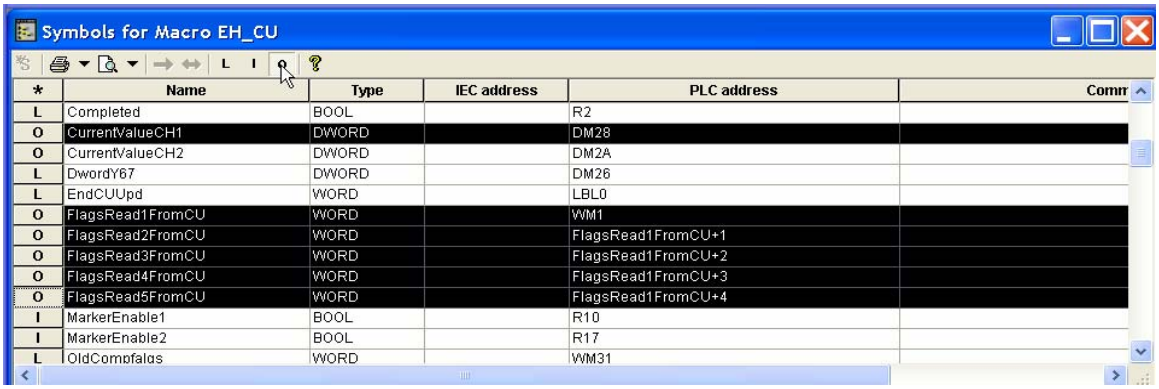
E.g. an hardware address belonging to an I/O board will be different depending on where in the rack the modules is and the user can select which module the macro belongs to.

The macro symbol allocation is described more detailed later in this document.

There is a more comfortable way to select if the symbol shall be Input, Output or Local. Just mark all symbols of one kind in the symbol window.



And press the button “L”, “I” or “O”. All the symbols will change type simultaneously.



Observe that “Local” is not exactly the same as a Local in IEC61131. A local can be used in the main program.

In such case the symbol name used will be <macro name>.<Symbol of the Local>. E.g. “Markerenable1” can be referred as “_EH_CU.Markerenable1” in the program.

When a macro is inserted into the project the macro symbols will be allocated as follows:

Generally, if a symbol is not defined as Confirm or Fixed, ActWin will select a free address when the macro is inserted in the project. In the special case when symbols with overlapping addresses exists, e.g. M0 is used as well as WM0 (or WM21 as well as DM20), then they will normally be allocated together also after inserting the macro even if the actual address could be different.

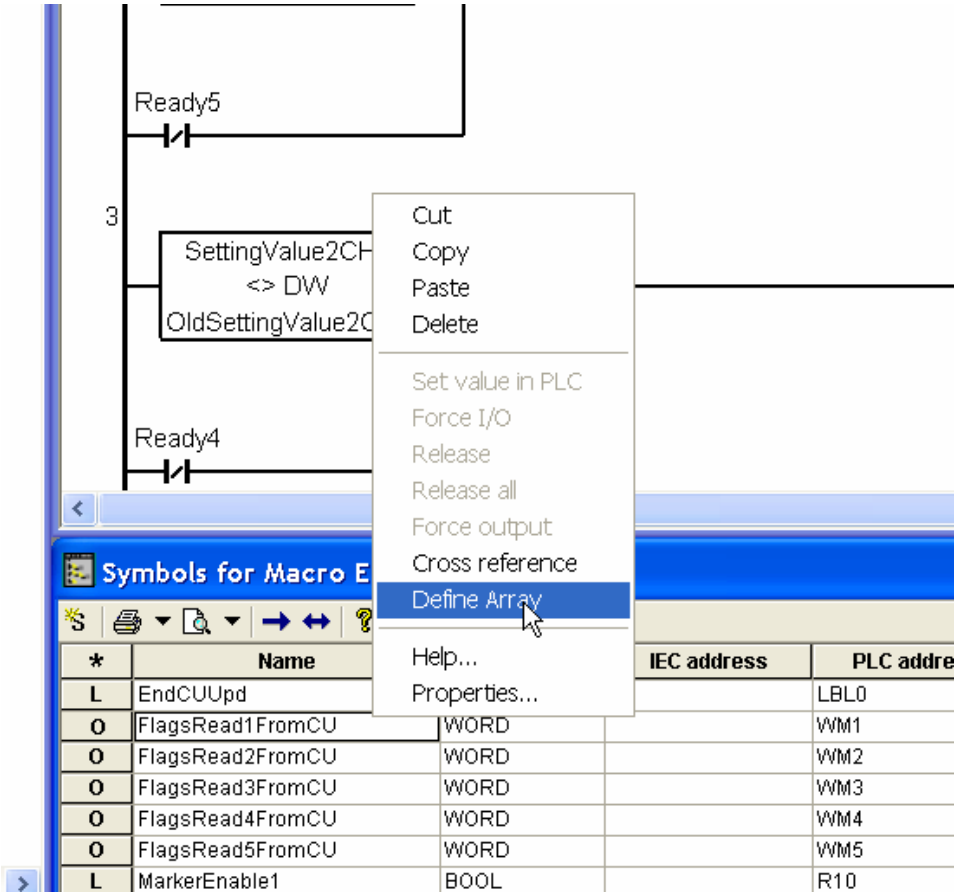
This default behavior can be modified by using the Confirm or Fixed settings or by defining arrays (see below).

The following allocation rules apply (in this order):

1. Symbols defined as Fixed will always be allocated to the selected address
2. If the symbol is defined as a member of an array (see below), the address will always be calculated as the base symbol address plus offset (a Confirmed setting or overlapping relationship is ignored in this case)
3. If the macro symbol address (e.g. X0) is overlapped by another macro symbol (e.g. WX0), the symbol will be allocated at the parent address (the bit address will remain in the word in this case)
4. If the symbol is defined as Confirm the user can modify the address when the macro is inserted
5. If none of above, ActWin will select the first free address equal to or higher than the macro symbol address

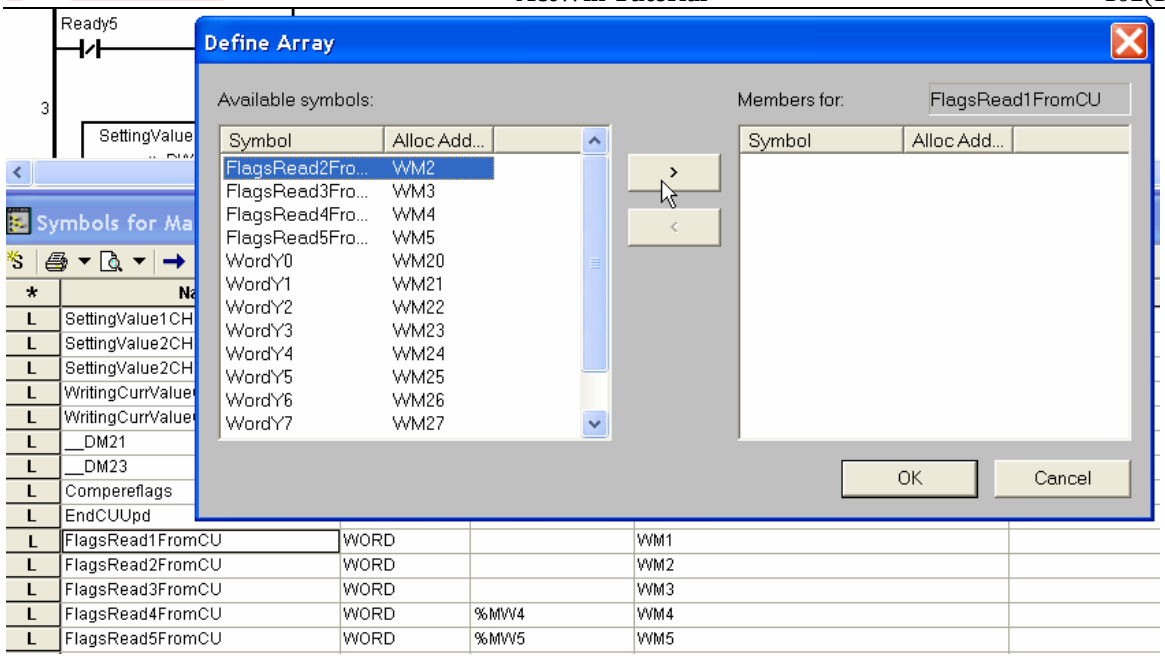
If symbols have to be in a special order like an array, then they can be defined as belonging to an array.

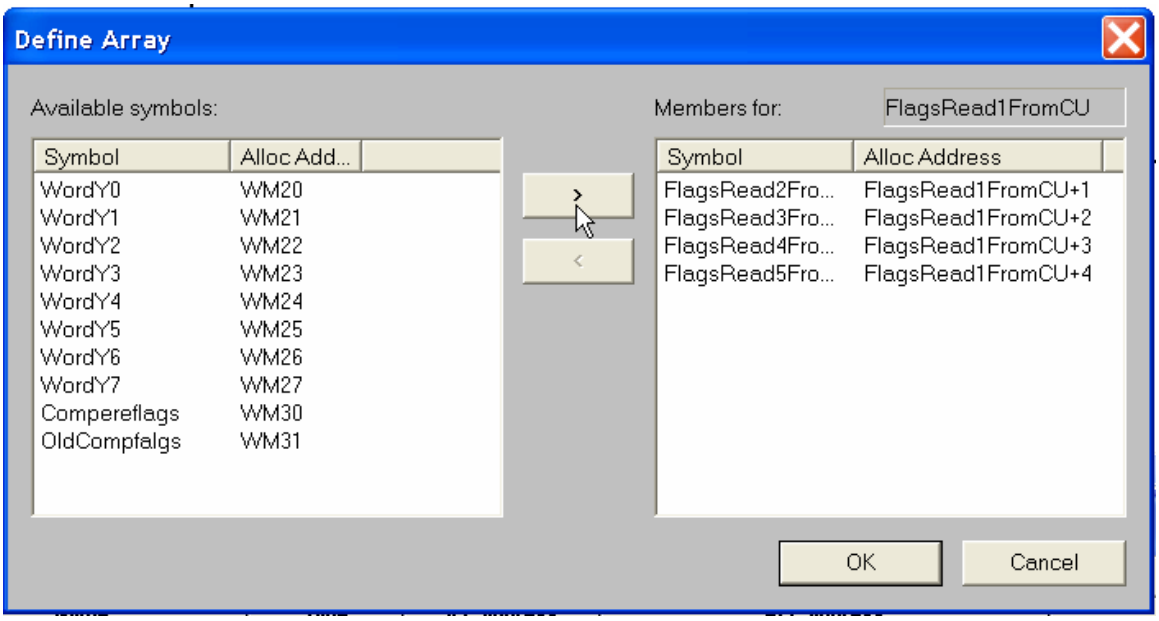
In this case, select the symbol with the lowest address in the array, right click and select “Define Array”.
All addresses between the base address and the selected address must have a symbol name so they can be selected from the list.



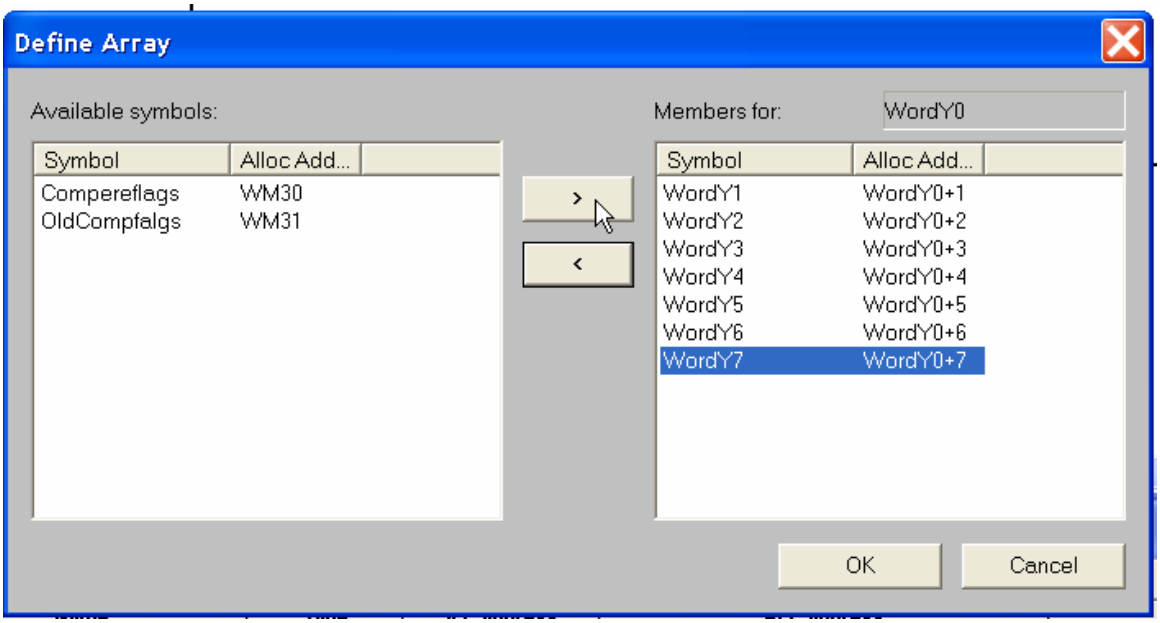
A list of all available symbols of the same type will be shown. Select in the right order through pressing the > button.

The “FlagsReadXFromCU” are bit definitions, which should be in the same area.

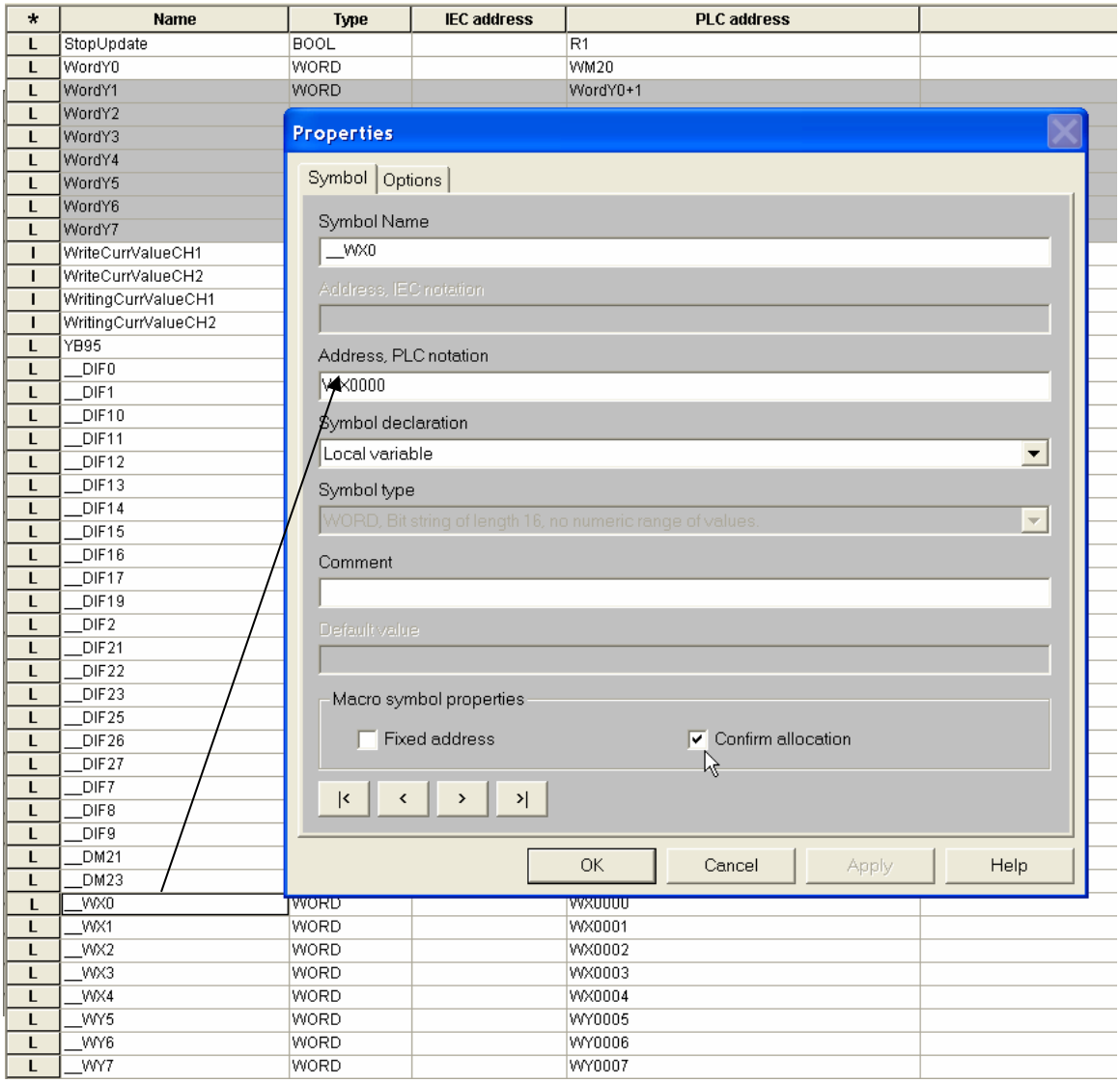

Ready5
3
SettingValue
Define Array
Available symbols:
Members for:
FlagsRead1FromCU
Symbol
Alloc Add...
FlagsRead2Fro... WM2
FlagsRead3Fro... WM3
FlagsRead4Fro... WM4
FlagsRead5Fro... WM5
WordY0 WM20
WordY1 WM21
WordY2 WM22
WordY3 WM23
WordY4 WM24
WordY5 WM25
WordY6 WM26
WordY7 WM27
OK
Cancel
Symbols for Ma
SettingValue1CH
SettingValue2CH
SettingValue2CH
WritingCurrValue
WritingCurrValue
__DM21
__DM23
Compereflags
EndCUUpd
FlagsRead1FromCU WORD WM1
FlagsRead2FromCU WORD WM2
FlagsRead3FromCU WORD WM3
FlagsRead4FromCU WORD %MW4 WM4
FlagsRead5FromCU WORD %MW5 WM5


Define Array
Available symbols:
Members for:
FlagsRead1FromCU
Symbol
Alloc Add...
Alloc Address
WordY0 WM20
WordY1 WM21
WordY2 WM22
WordY3 WM23
WordY4 WM24
WordY5 WM25
WordY6 WM26
WordY7 WM27
Compereflags WM30
OldCompfalgs WM31
FlagsRead2Fro... FlagsRead1FromCU+1
FlagsRead3Fro... FlagsRead1FromCU+2
FlagsRead4Fro... FlagsRead1FromCU+3
FlagsRead5Fro... FlagsRead1FromCU+4
OK
Cancel

The “WordYn” should also belong to the same area etc.



Define the physical addresses as Confirm. This will force a popup window when inserting the macro where the user can select addresses depending on module position etc.



*	Name	Type	IEC address	PLC address
L	StopUpdate	BOOL		R1
L	WordY0	WORD		WM20
L	WordY1	WORD		WordY0+1
L	WordY2			
L	WordY3			
L	WordY4			
L	WordY5			
L	WordY6			
L	WordY7			
I	WriteCurrValueCH1			
I	WriteCurrValueCH2			
I	WritingCurrValueCH1			
I	WritingCurrValueCH2			
L	YB95			
L	__DIF0			
L	__DIF1			
L	__DIF10			
L	__DIF11			
L	__DIF12			
L	__DIF13			
L	__DIF14			
L	__DIF15			
L	__DIF16			
L	__DIF17			
L	__DIF19			
L	__DIF2			
L	__DIF21			
L	__DIF22			
L	__DIF23			
L	__DIF25			
L	__DIF26			
L	__DIF27			
L	__DIF7			
L	__DIF8			
L	__DIF9			
L	__DM21			
L	__DM23			
L	__WX0	WORD		WX0000
L	__WX1	WORD		WX0001
L	__WX2	WORD		WX0002
L	__WX3	WORD		WX0003
L	__WX4	WORD		WX0004
L	__WY5	WORD		WY0005
L	__WY6	WORD		WY0006
L	__WY7	WORD		WY0007

L	__DIF8	BOOL		DIF8
L	__DIF9	BOOL		DIF9
L	__DM21	DWORD		DM21
L	__DM23	DWORD		DM23
L	__WX0	WORD		WX0000 Confirm
L	__WX1	WORD		__WX0+1
L	__WX2	WORD		__WX0+2
L	__WX3	WORD		__WX0+3
L	__WX4	WORD		__WX0+4
L	__WY5	WORD		WY0005 Confirm
L	__WY6	WORD		__WY5+1
L	__WY7	WORD		__WY5+2
L	__X15	BOOL		X00015

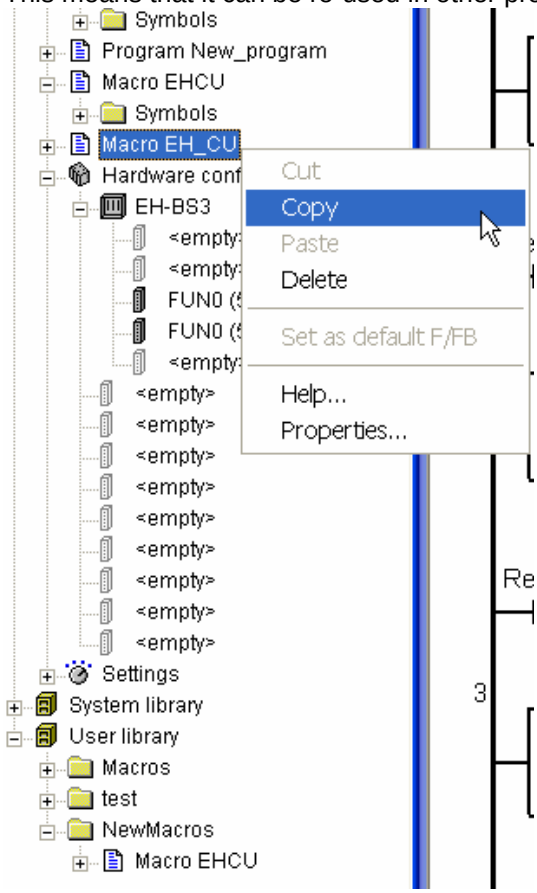
The total symbol address definition will look like:

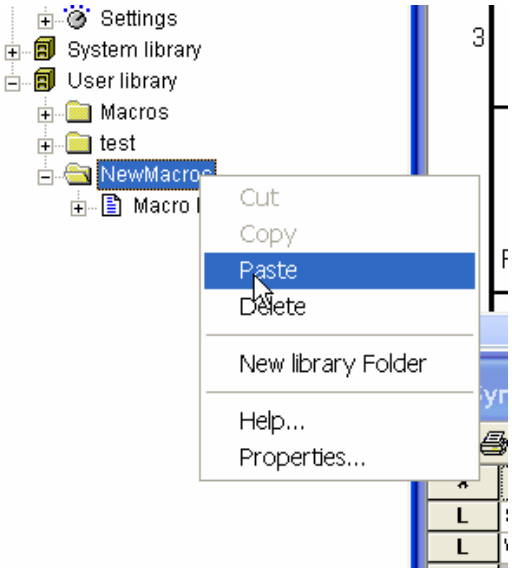
*	Name	Type	IEC address	PLC address
L	Bit0	BOOL		M250
L	Bit1	BOOL		M251
L	Bit2	BOOL		M252
L	Bit3	BOOL		M253
L	Bit4	BOOL		M254
L	Bit5	BOOL		M255
L	Bit6	BOOL		M256
L	Bit7	BOOL		M257
I	ClearEQFlagCH1	BOOL		R27
I	ClearEQFlagCH2	BOOL		R28
I	ClearOFflagCH1	BOOL		R29
I	ClearOFflagCH2	BOOL		R2A
I	ClearUFflagCH1	BOOL		R2B
I	ClearUFflagCH2	BOOL		R2C
L	Compereflags	WORD		WM30
L	Completed	BOOL		R2
O	CurrentValueCH1	DWORD		DM28
O	CurrentValueCH2	DWORD		DM2A
L	DwordY67	DWORD		DM26
L	EndCUUpd	WORD		LBL0
O	FlagsRead1FromCU	WORD		WM1
O	FlagsRead2FromCU	WORD		FlagsRead1FromCU+1
O	FlagsRead3FromCU	WORD		FlagsRead1FromCU+2
O	FlagsRead4FromCU	WORD		FlagsRead1FromCU+3
O	FlagsRead5FromCU	WORD		FlagsRead1FromCU+4
I	MarkerEnable1	BOOL		R10
I	MarkerEnable2	BOOL		R17
L	OldCompfalgs	WORD		WM31
L	OldPresetValueCH1	DWORD		DM10
L	OldPresetValueCH2	DWORD		DM12
L	OldSettingValue1CH1	DWORD		DM14
L	OldSettingValue1CH2	DWORD		DM18
L	OldSettingValue2CH1	DWORD		DM16
L	OldSettingValue2CH2	DWORD		DM1A
L	OutputEnableCH1	BOOL		R18
L	OutputEnableCH2	BOOL		R19
L	Phase1	BOOL		R20
L	Phase2	BOOL		R21
I	PresetValueCH1	DWORD		DM0
I	PresetValueCH2	DWORD		DM2
I	ReadCurretFlags	BOOL		R1A
I	ReadLatchedCurrentVal	BOOL		R11
L	Ready1	BOOL		R0
L	Ready3	BOOL		R3
L	Ready4	BOOL		R4
L	Ready5	BOOL		R5

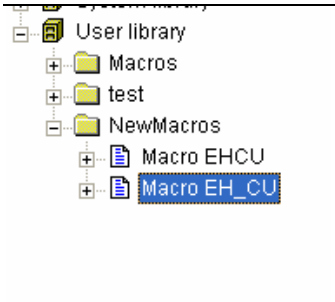
L	Ready6	BOOL		R6
I	SettingValue1CH1	DWORD		DM4
I	SettingValue1CH2	DWORD		DM8
I	SettingValue2CH1	DWORD		DM6
I	SettingValue2CH2	DWORD		DMA
I	StartCountCH1	BOOL		R25
I	StartCountCH2	BOOL		R26
L	StopUpdate	BOOL		R1
L	WordY0	WORD		WM20
L	WordY1	WORD		WordY0+1
L	WordY2	WORD		WordY0+2
L	WordY3	WORD		WordY0+3
L	WordY4	WORD		WordY0+4
L	WordY5	WORD		WordY0+5
L	WordY6	WORD		WordY0+6
L	WordY7	WORD		WordY0+7
I	WriteCurrValueCH1	BOOL		R15
I	WriteCurrValueCH2	BOOL		R16
I	WritingCurrValueCH1	DWORD		DMC
I	WritingCurrValueCH2	DWORD		DME
L	YB95	BOOL		Y00095
L	__DIF0	BOOL		DIF0
L	__DIF1	BOOL		DIF1
L	__DIF10	BOOL		DIF10
L	__DIF11	BOOL		DIF11
L	__DIF12	BOOL		DIF12
L	__DIF13	BOOL		DIF13
L	__DIF14	BOOL		DIF14
L	__DIF15	BOOL		DIF15
L	__DIF16	BOOL		DIF16
L	__DIF17	BOOL		DIF17
L	__DIF19	BOOL		DIF19
L	__DIF2	BOOL		DIF2
L	__DIF21	BOOL		DIF21
L	__DIF22	BOOL		DIF22
L	__DIF23	BOOL		DIF23
L	__DIF25	BOOL		DIF25
L	__DIF26	BOOL		DIF26
L	__DIF27	BOOL		DIF27
L	__DIF7	BOOL		DIF7
L	__DIF8	BOOL		DIF8
L	__DIF9	BOOL		DIF9
L	__DM21	DWORD		DM21
L	__DM23	DWORD		DM23
L	__WX0	WORD		WX0000 Confirm
L	__WX1	WORD		__WX0+1
L	__WX2	WORD		__WX0+2
L	__WX3	WORD		__WX0+3
L	__WX4	WORD		__WX0+4
L	__WY5	WORD		WY0005 Confirm
L	__WY6	WORD		__WY5+1
L	__WY7	WORD		__WY5+2
L	__X15	BOOL		X00015

Now the macro is ready:

Store the macro in the user library using Copy and Paste.
This means that it can be re-used in other projects and you can share the library with other users.



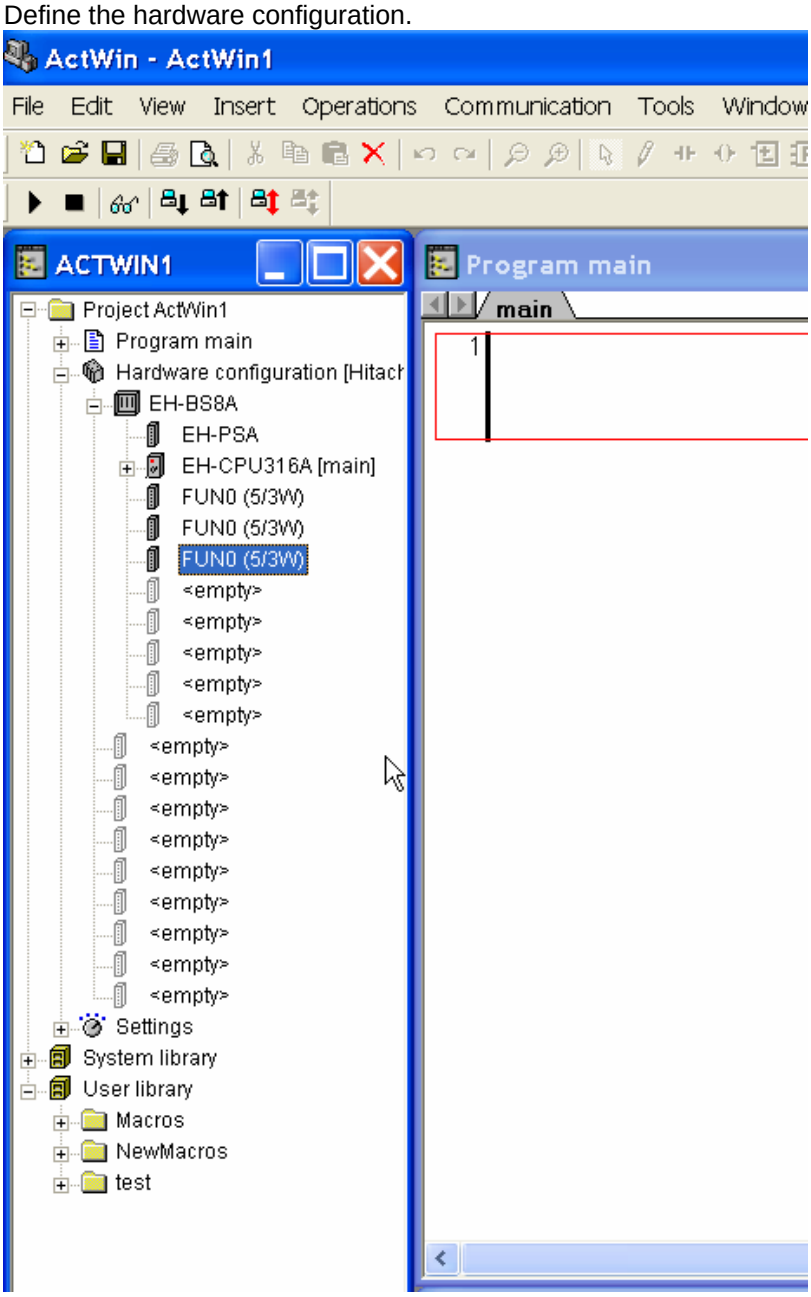




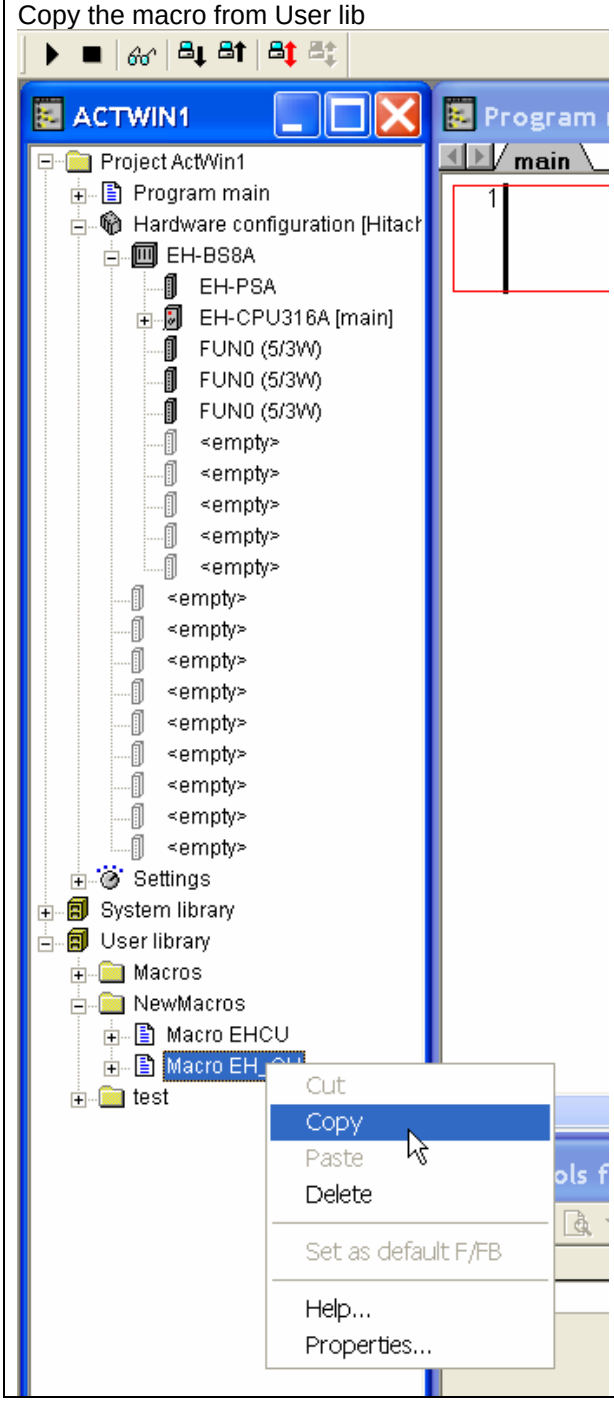
How to use the macro in a project

If you e.g. want 6 counters (3 EH CU slots) then you will use 3 instances of the macro.

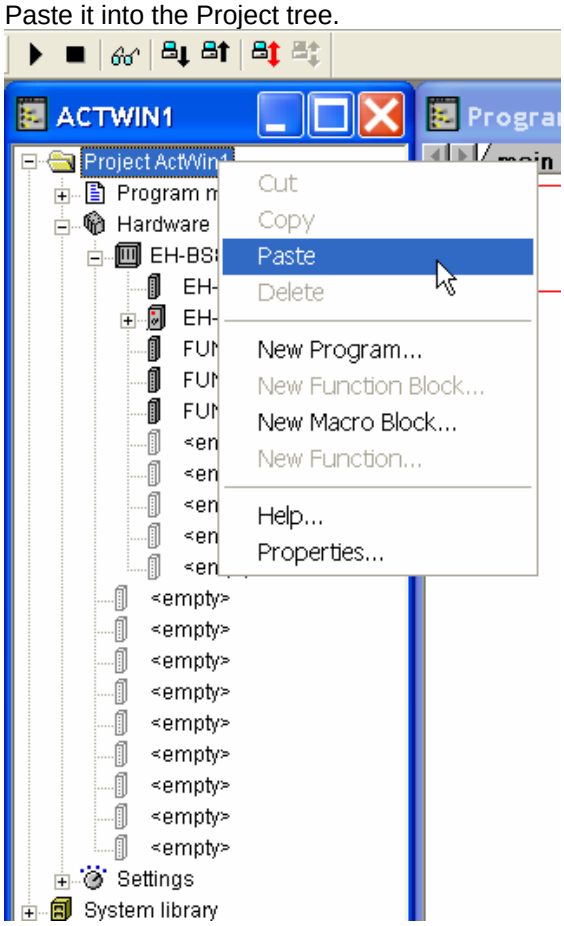
Define the hardware configuration.



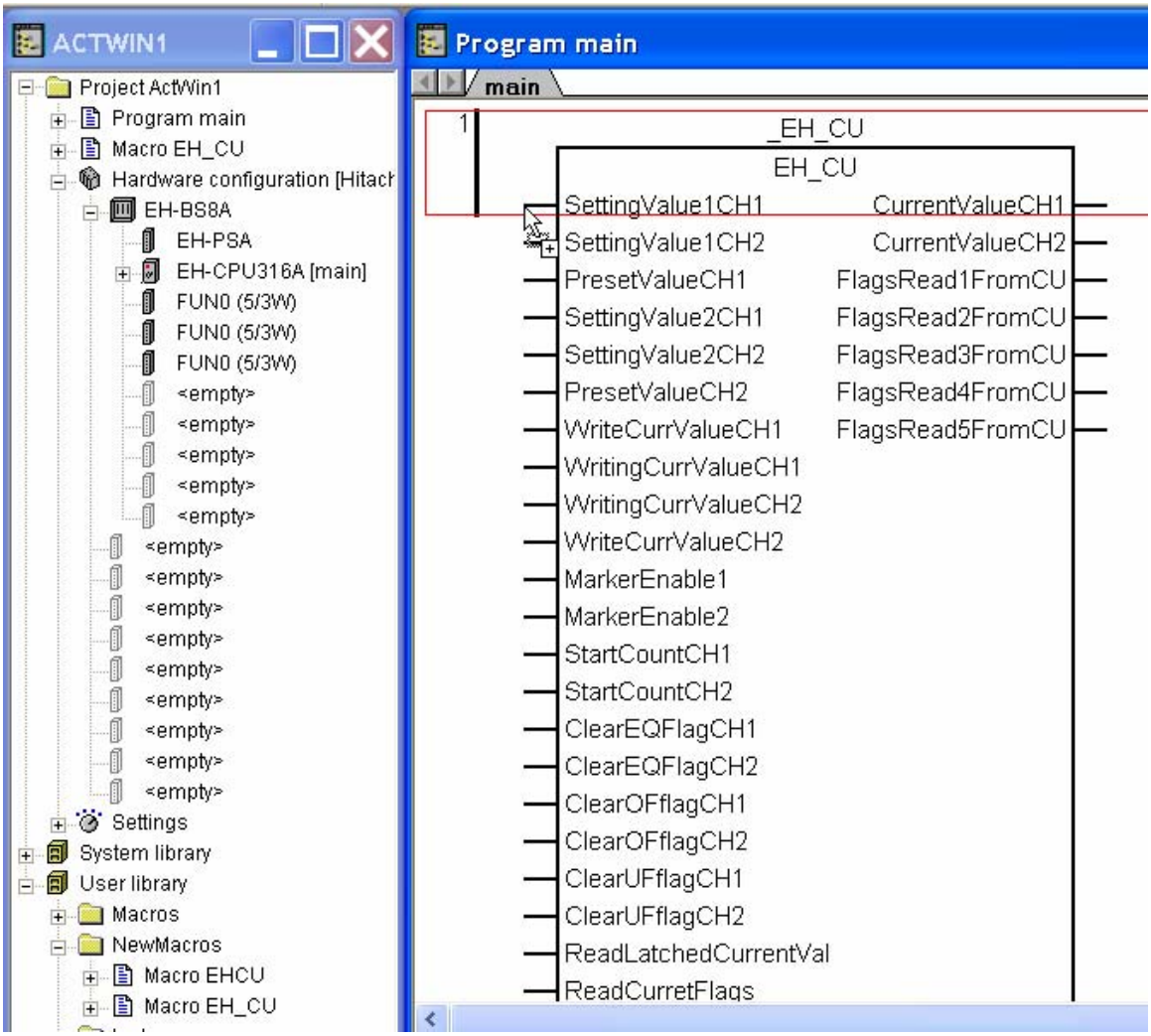
Copy the macro from User lib



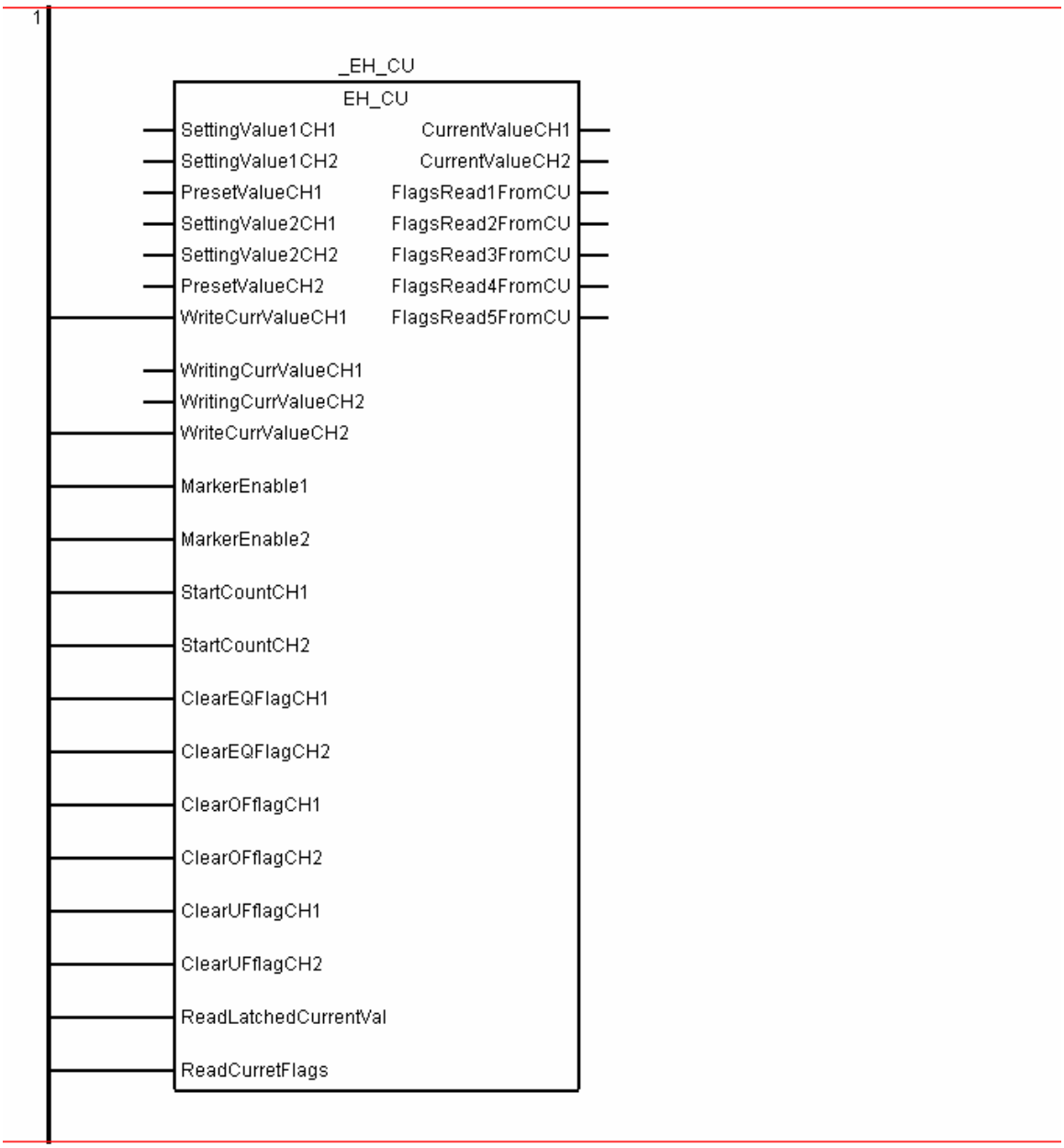
Paste it into the Project tree.



Drag the macro into the program window. ActWin will suggest addresses for the Confirm symbols. You will get an opportunity to modify the address.



The macro will now be a part of your ladder diagram.

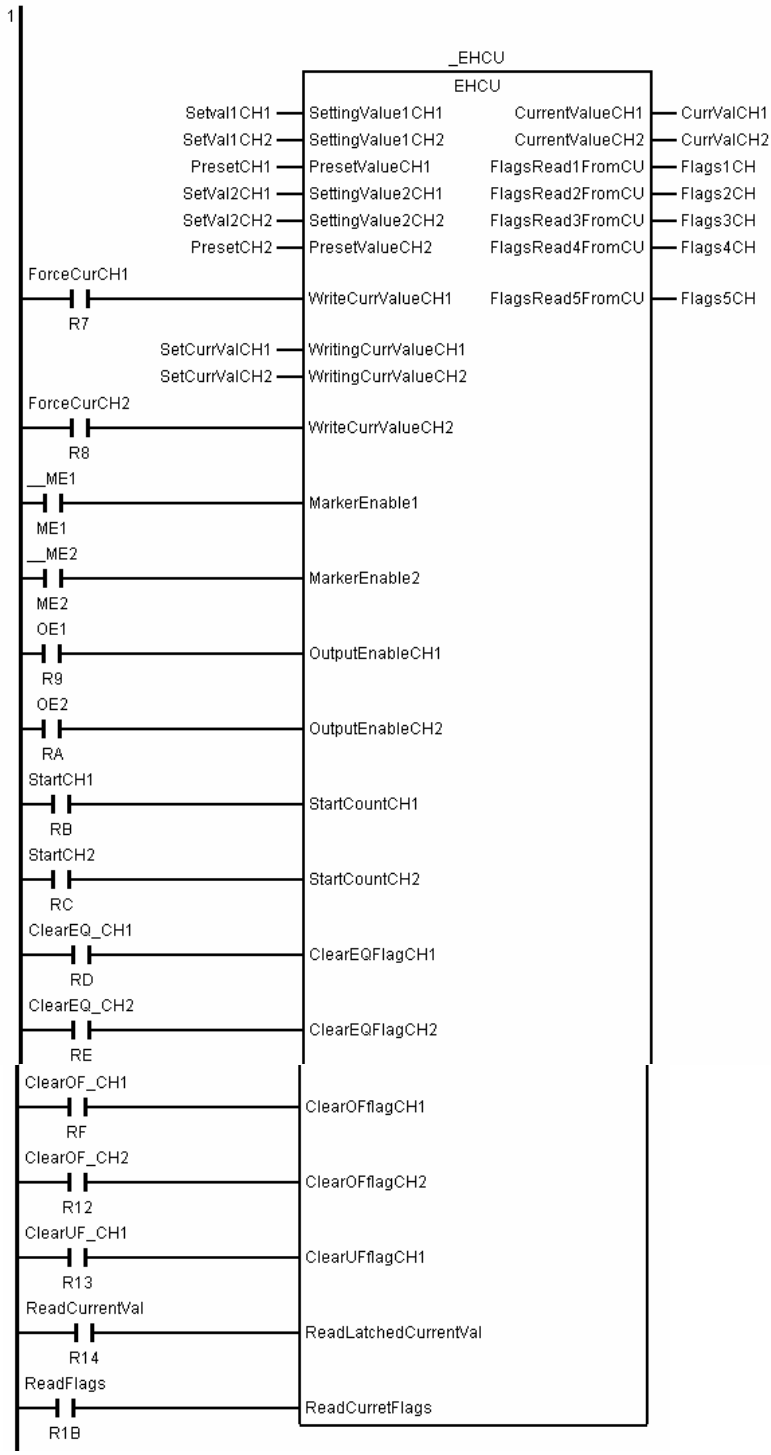


The Input and Output variables will be accessible on the outside of the macro.

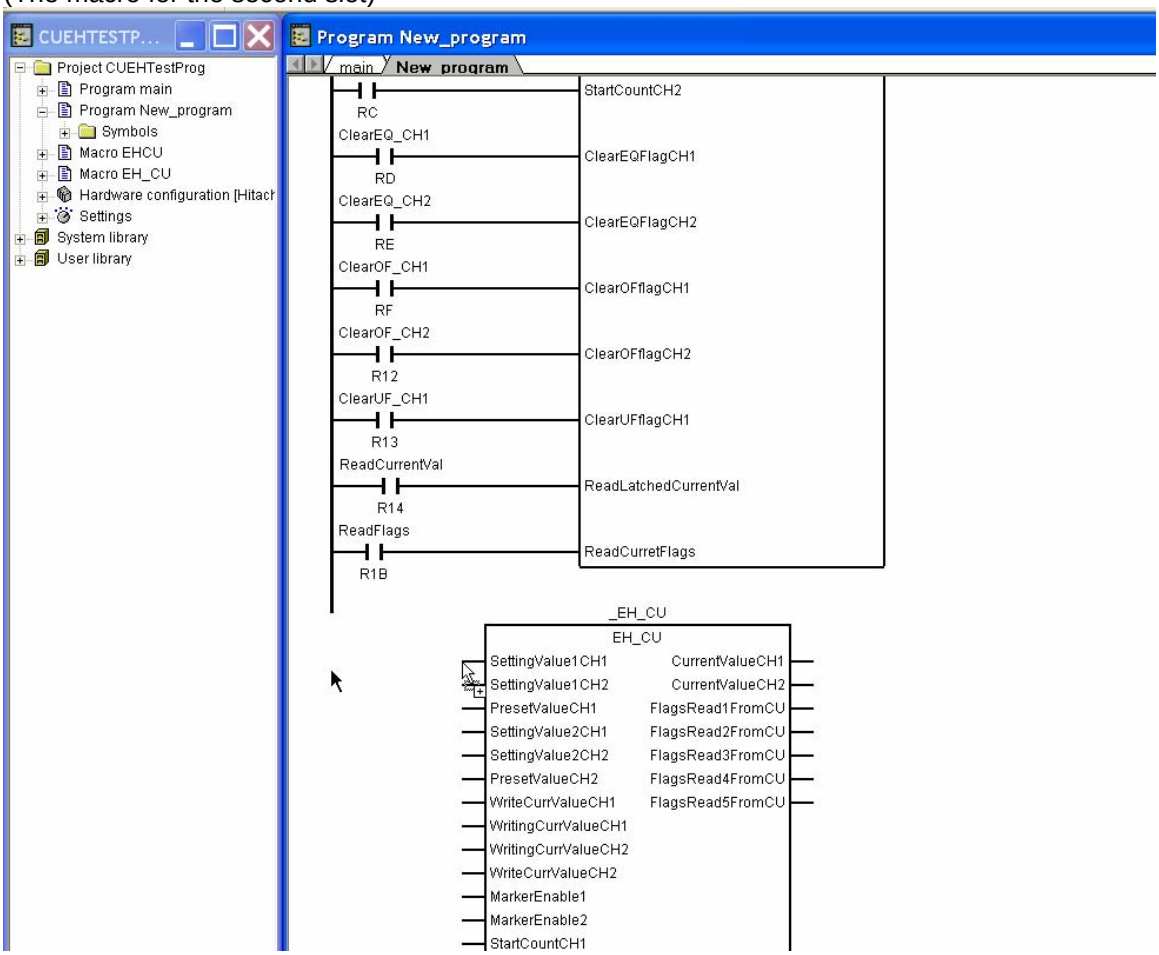
Connect the inputs to the symbols you are using in the application program.

Booleans can be connected as contacts and coils and the other symbols as well as booleans can be directly connected. Just double click on the line.

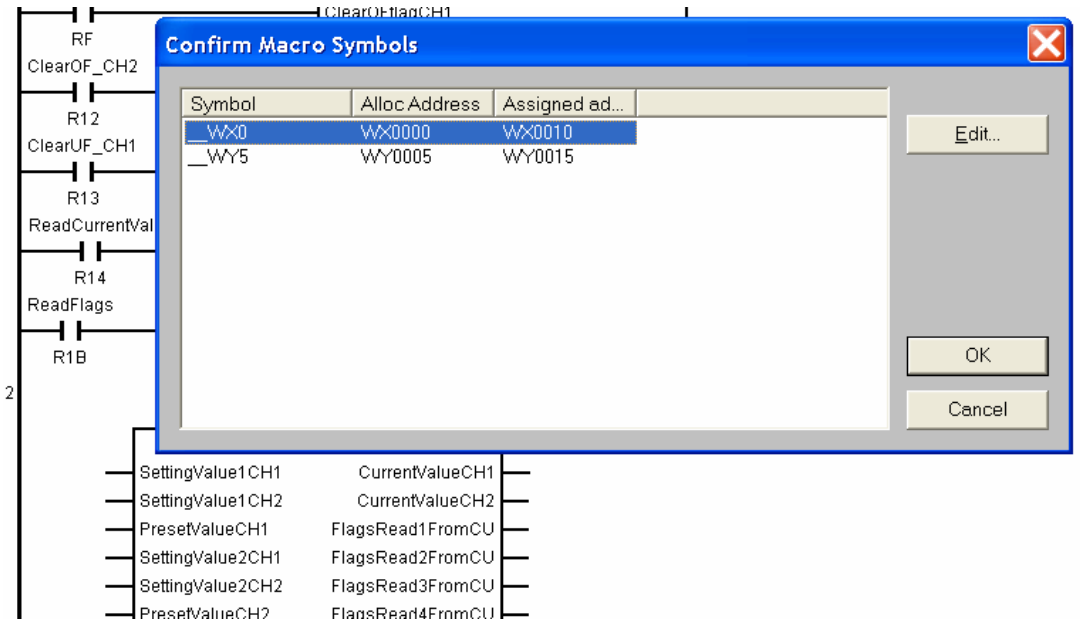
For reference, all macro symbols (including Locals) will be listed in the Symbol window.


1
_EHCU
EHCU
Setval1CH1
SettingValue1CH1
CurrentValueCH1
CurrValCH1
SetVal1CH2
SettingValue1CH2
CurrentValueCH2
CurrValCH2
PresetCH1
PresetValueCH1
FlagsRead1FromCU
Flags1CH
SetVal2CH1
SettingValue2CH1
FlagsRead2FromCU
Flags2CH
SetVal2CH2
SettingValue2CH2
FlagsRead3FromCU
Flags3CH
PresetCH2
PresetValueCH2
FlagsRead4FromCU
Flags4CH
ForceCurCH1
R7
WriteCurrValueCH1
FlagsRead5FromCU
Flags5CH
SetCurrValCH1
WritingCurrValueCH1
SetCurrValCH2
WritingCurrValueCH2
ForceCurCH2
R8
WriteCurrValueCH2
__ME1
ME1
MarkerEnable1
__ME2
ME2
MarkerEnable2
OE1
R9
OutputEnableCH1
OE2
RA
OutputEnableCH2
StartCH1
RB
StartCountCH1
StartCH2
RC
StartCountCH2
ClearEQ_CH1
RD
ClearEQFlagCH1
ClearEQ_CH2
RE
ClearEQFlagCH2
ClearOF_CH1
RF
ClearOFflagCH1
ClearOF_CH2
R12
ClearOFflagCH2
ClearUF_CH1
R13
ClearUFflagCH1
ReadCurrentVal
R14
ReadLatchedCurrentVal
ReadFlags
R1B
ReadCurretFlags

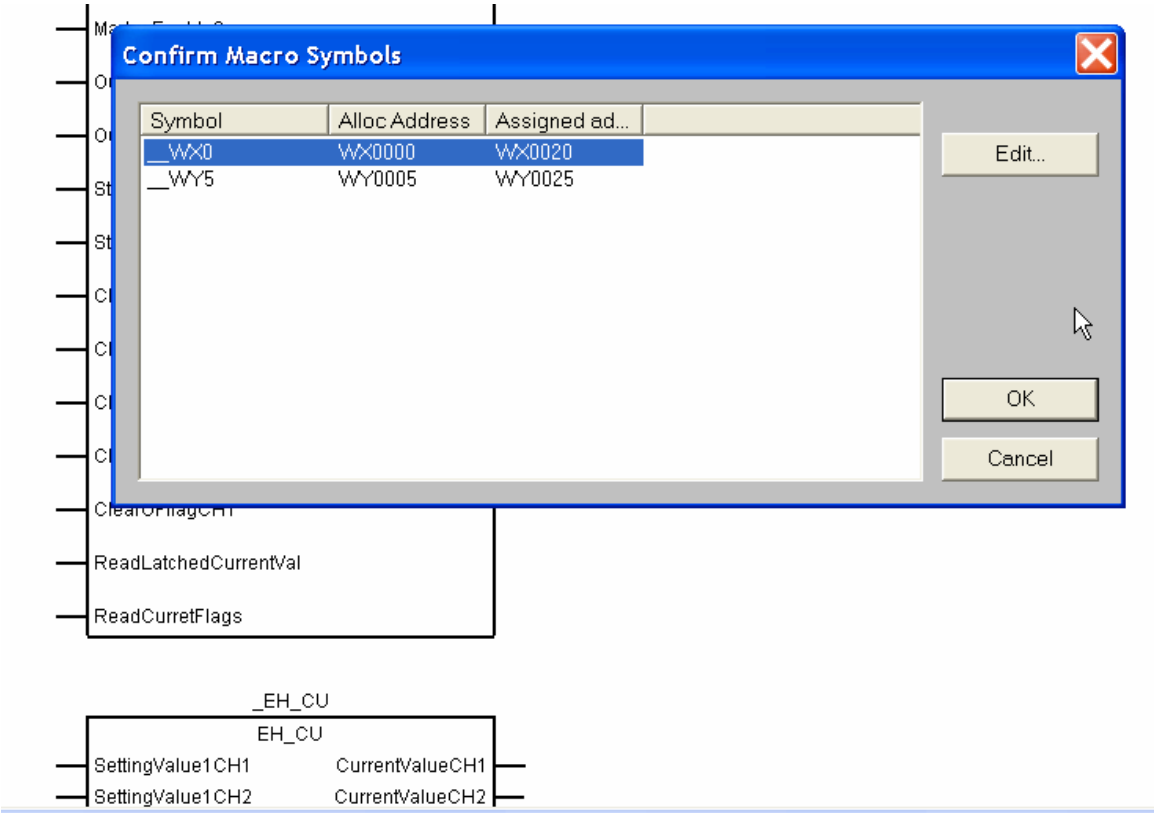
When you have connected the first macro, you can insert the second instance.
(The macro for the second slot)

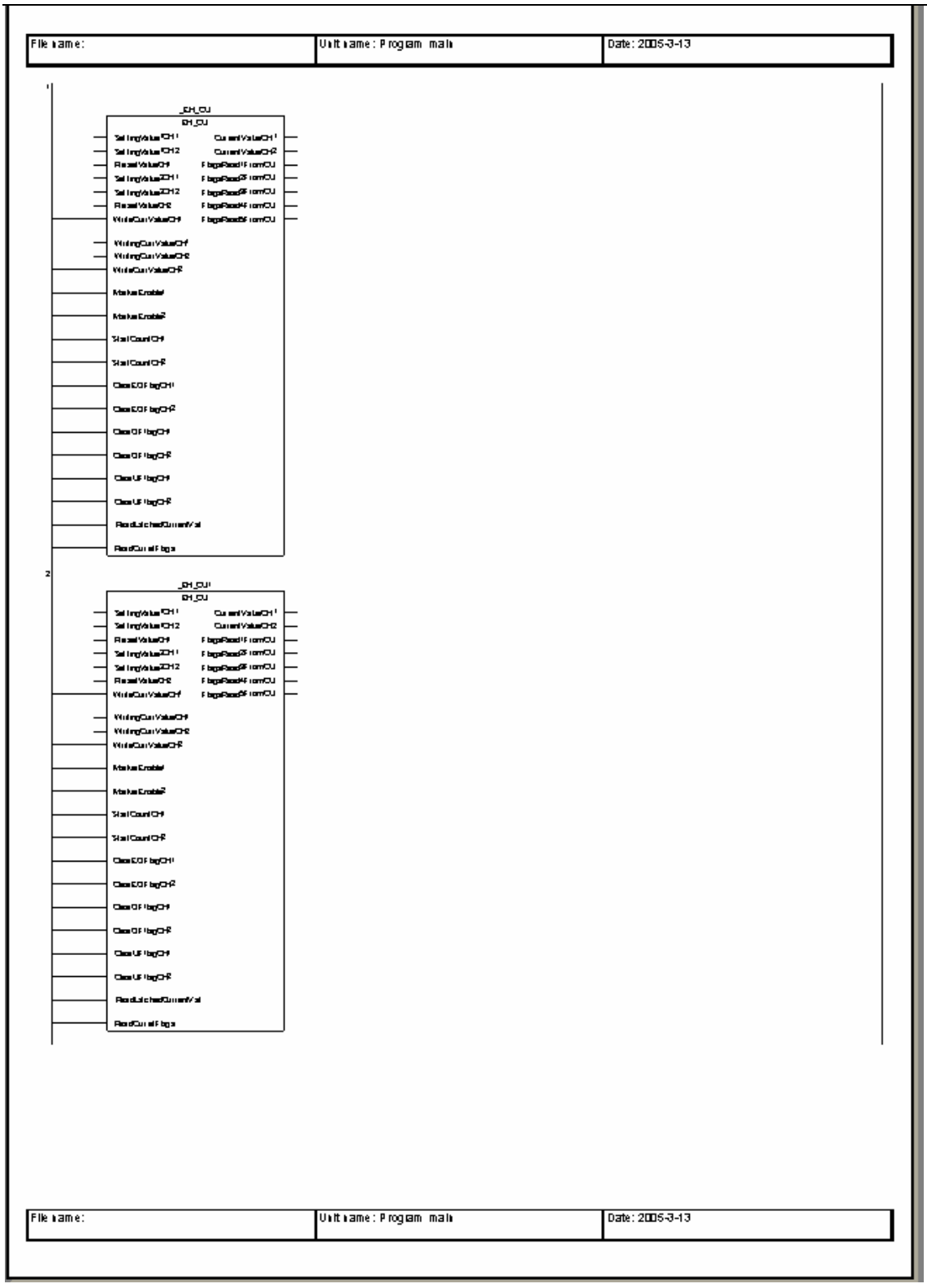


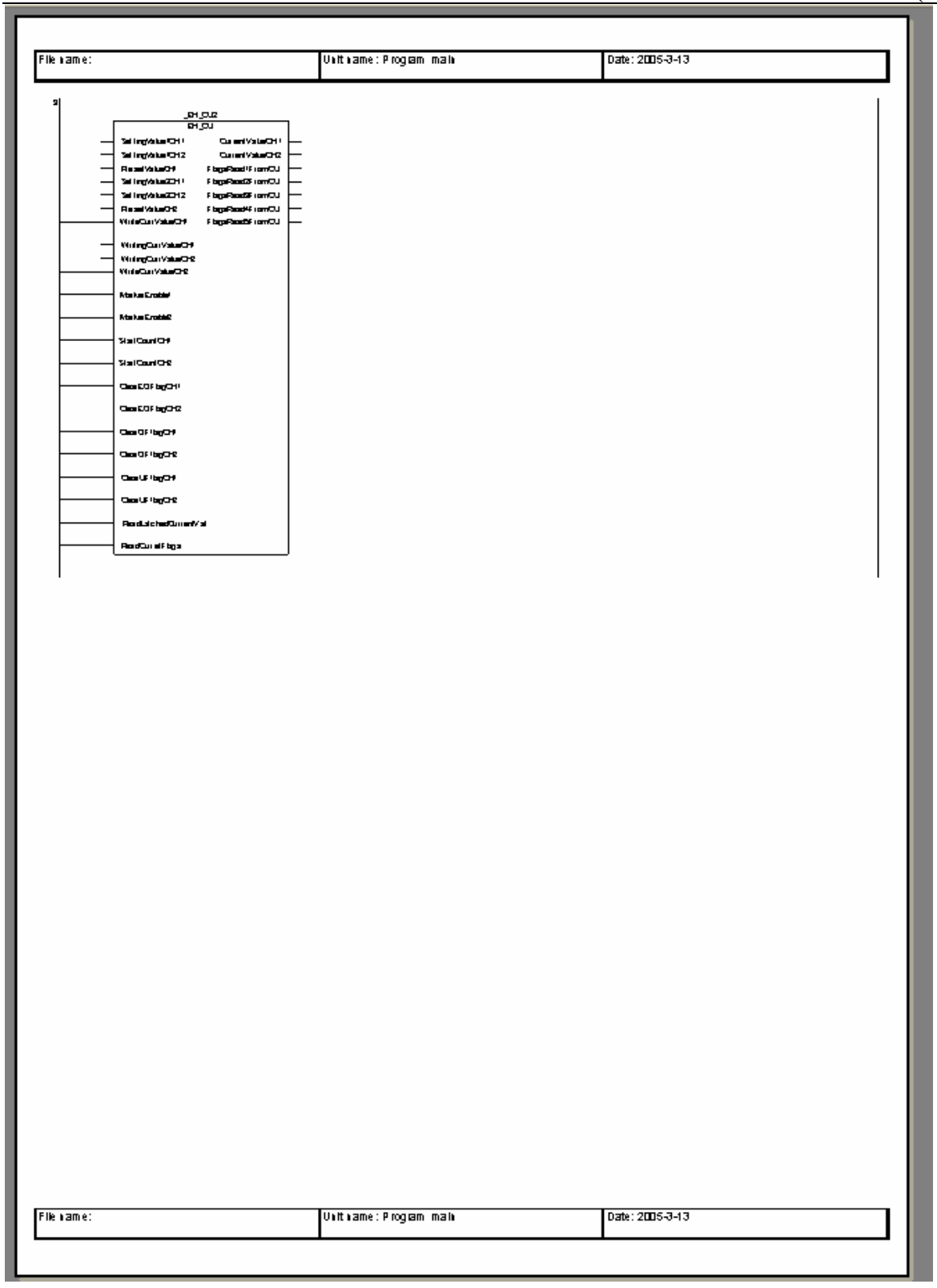
Again, ActWin will suggest addresses for the Confirm symbols. You will get an opportunity to modify the address.



Insert the 3rd instance and allocate it to the 3rd slot and so on.

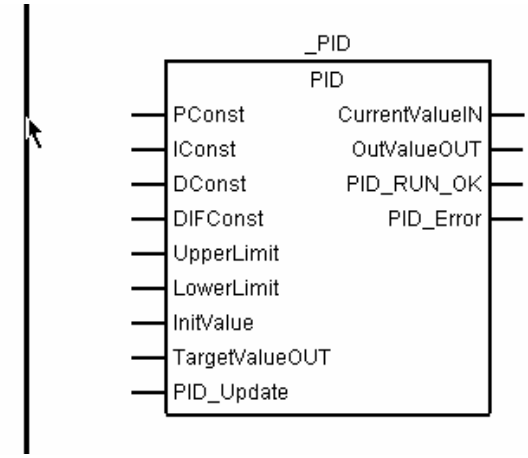



File name:
Unit name: Program main
Date: 2005-3-13
_CH_CU
CH_CU
_CH_CU1
CH_CU
File name:
Unit name: Program main
Date: 2005-3-13

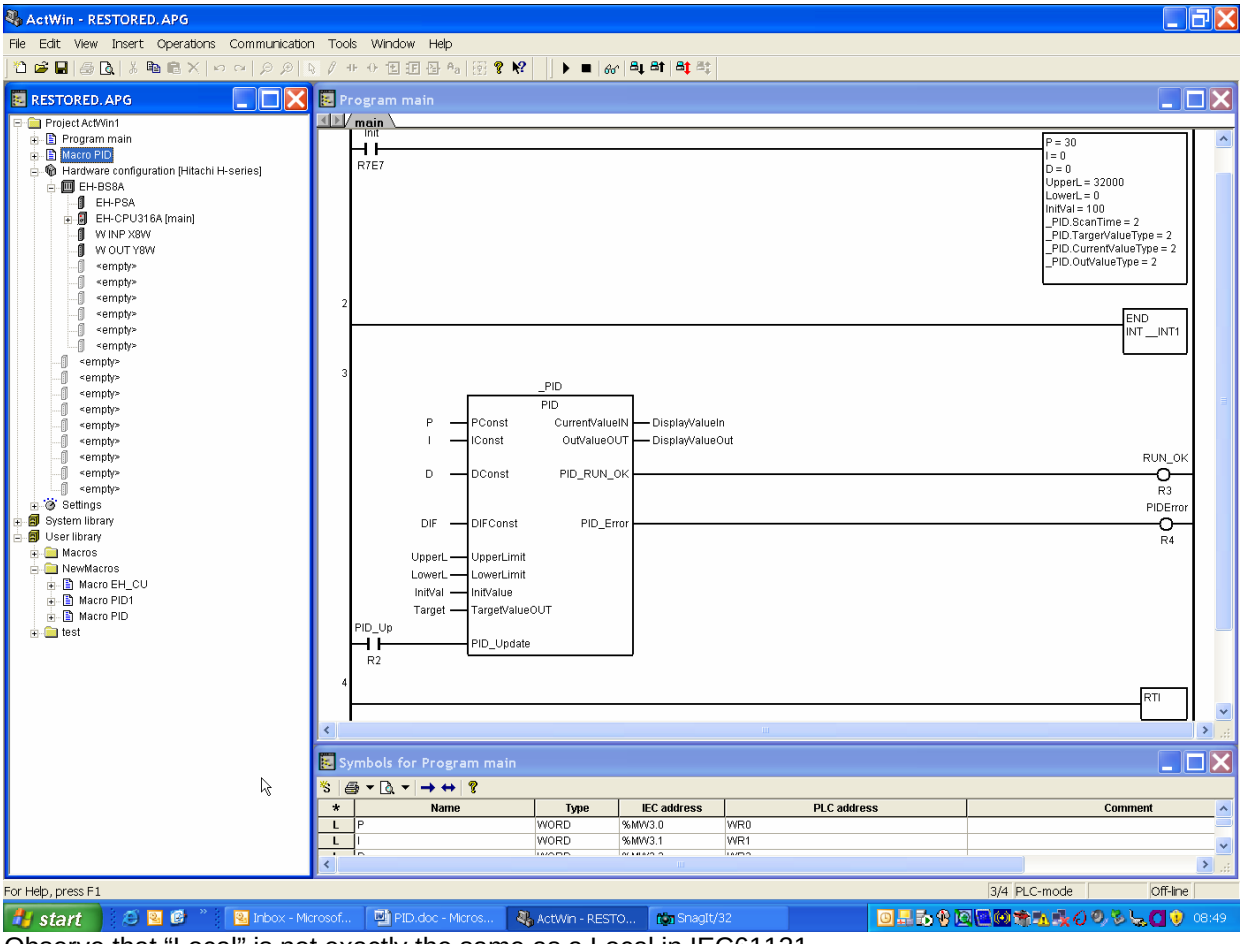


Complete the user program.

Other examples: Macro for PID-loop:



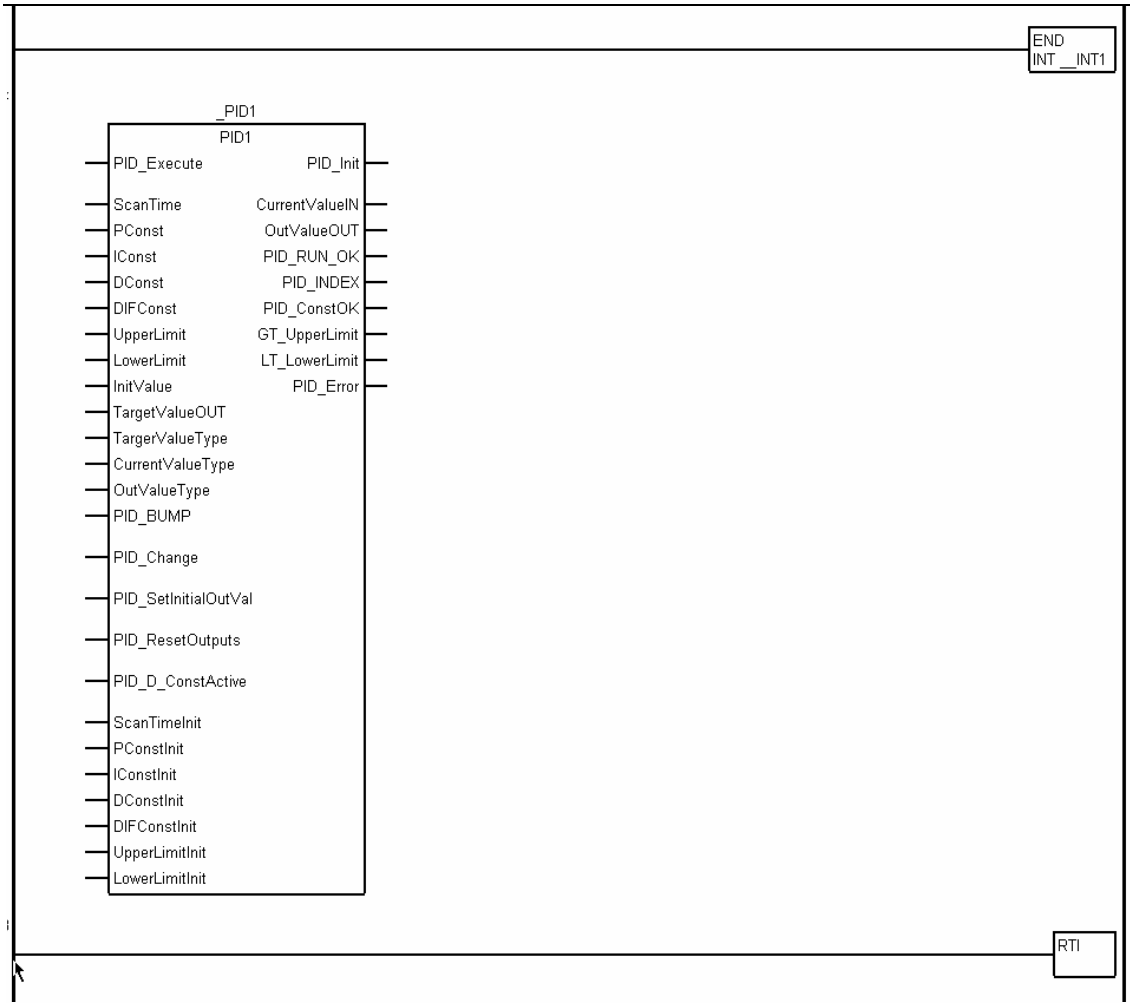
Connect the Inputs and outputs and Place it inside the interrupt INT1
Give the initial values in the main program and set PID_Update



Observe that “Local” is not exactly the same as a Local in IEC61131.
A local can be used in the main program.

In such case the symbol name used will be <macro name>.<Symbol of the Local>.
E.g. “OutvalueType” can be referred as “_PID. OutvalueType” in the program.

Macro for 1 PID (More extended macro)



Similar macros can be available for more than 1 PID

Note:
The programs in this tutorial are meant as examples only and may not be fully featured or completely tested for usage in an actual application.