

# Scantime Engineering Ltd

Engineering Solutions  
Training, Process Control & Data Acquisition

## Engineer Training

### Course Manual Programming PLC's OLplc01 Part1 Programming with Syswin

**Programmable Logic Controllers (PLC)**

**Human Machine Interface (HMI)**

**Programming & Fault Finding**



**Omron – CJ1 / C200Hx / C1000 / CVM**  
**Mitsubishi – FX / A2n**  
**Siemens S7-300**



**Omron – NT 600 / NT Shell**  
**Mitsubishi – MX4 / E Terminals / GOT**

**Intellution**  
**Wonderware InTouch**

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# PLC Programming OLplc01

By David H Simm

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## Syswin subjects:

### Background to Omron development software, LSS and Syswin

1. **The LSS programming environment**
2. **The Syswin programming environment**
  - Setting up and communications
  - File handling SWP/SWB and loading a program from disk
  - Converting an LSS program from disk
  - Syswin versions and incompatibility
  - The desktop environment
  - Networks and Blocks, inserting and deleting
  - Copy, Paste, and Undo
  - Writing a small program
  - Checking the program for errors
  - Saving the program

### Using Syswin

- 1) **Connecting to a PLC**
  - (i) CIF cable, the danger of leaving a CIF cable connected
  - (ii) RS232 lead and its connections
  - (iii) Communication setup
- 2) **Downloading to a PLC with Syswin**
- 3) **Setting the PLC to Run Mode**
- 4) **Monitoring the program**
- 5) **The Data Set bar**
- 6) **The Data editor**
- 7) **Disconnecting**
- 8) **Re-Connecting and Program Verify**
- 9) **Uploading to a blank Syswin**
- 10) **Comments and the PLC**
- 11) **Importing comments**
- 12) **Finding used addresses**
- 13) **On Line Edit and its dangers with complex programs**
- 14) **The dangers of deleting networks and how they affect network comments**
- 15) **Set and Force and its dangers**
- 16) **Finding active Forces**
- 17) **Turning off rungs**
- 18) **By-Passing sections**
- 19) **Uploading/Downloading Data Memory values and Saving**
- 20) **Omron PLC addressing types**
  - (i) General Bits and Bytes, First Scan, On & Off, 1sec Pulse
  - (ii) HR
  - (iii) DM
  - (iv) Timers and Counters

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## **Background to the Omron Programming Environment:**

### **LSS**

This is a Dos based program, introduced by Omron it replaced the FIT terminal and allowed laptops or desktop PC's to be used to communicate with Omron PLC's.

LSS programming tool is still very popular among engineers due to its straight forward approach to setting up, also its strong use of easily identifiable keystrokes which greatly secure the programming environment against errors, mainly caused through slight mishaps when using a Laptop TouchPad or Mouse in a Windows environment.

Programs written in LSS are saved in what is called a Library file, these files can be just over a megabyte in size and store a number of programs for varying PLC's. The Library file can easily be found as it tends to be stored in the LSS directory or on a floppy disk and has the extension '**.dat**'.

LSS is an old programming tool, written some years ago when Dos still ruled the computer operating systems, it communicated with Omron's older generation of PLC's: C200H, C20, C1000H etc. As Windows gained popularity it was inevitable that Omron would follow or take the lead amongst other PLC manufacturers and develop new software tools along these lines, the expansion of LSS to cater for newer PLC's was not undertaken apart from introducing one final Dos based program called CVSS which had some extra features such as programming memory cards that could be used in the new Omron CV series. CVSS was probably developed as an after thought since PLC development continued at a rapid pace and a development platform was required urgently to aid the customer with the new PLC features, however very soon after this Syswin was born and further support for LSS and CVSS was phased out.

### **Syswin**

Syswin was developed during the early nineties when Windows 3.1 was the computer Operating System. Unfortunately technology raced ahead at such a pace, that when Syswin was released Win95 appeared, and then Win95 was upgraded to Win98, which is now the most used Operating System in the world.

Other PLC manufacturers such as Allen Bradley have developed software tools in line with Win95, so Omron is once again changing the development environment and has recently brought out CX programmer for the latest PLC generation. This software was being evaluated last year by Nissan 'Sunderland', feedback looks favorable but like all new software there will be version changes in the not too distant future which the engineer will need to consider when he has to use it.

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Syswin started life as 3.0 and has progressed over the last 4 years to 3.3 but more recently to moved up to vers3.4 which is claimed and probably will be the last version of Syswin.

It is advisable to ensure that all laptops use a minimum of version 3.2, but 3.3 would be a more reliable environment to work with. Vers 3.0 and 3.1 should not be used.

Being a Windows based environment it naturally not only looks completely different from the Dos based LSS, but also handles totally differently. With drop down menus and pick and place tools it is actually a very good PLC program development tool, however shop floor engineers tend to prefer the LSS style of environment, especially the LSS method of finding a specific coil which can be asked for directly whereas Syswin needs to go through the Cross References Menu. Other LSS benefits is its ability to display several rungs of program each one independent from the other. However LSS is time consuming when writing a program and also large programs are very difficult to follow, whereas Syswin's Block Network Manager allows excellent program structuring more in line with 'Jackson Chart Programming'. These and other features are covered during this course, however greater in depth training will be provided on the more 'Advanced Omron Course' later.

Let us begin with the Syswin environment.....

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## Syswin programming environment:

The screenshot displays the Syswin software interface for PLC programming. The main window shows a ladder logic network with the following components:

- Network 1:** A comment: "If the High Count reaches #10, it then Resets the enable flag. PLC will need to be restarted to make the program work again."
- HR02.00:** A normally open contact labeled "Enable\_Flag".
- Network 2:** A normally open contact labeled "HR01 High\_Count" with a value of "#0010" (0010 hex).
- Network 3:** A normally open contact labeled "HR00 Low\_Count" with a value of "#0000" (0000 hex).
- Network 4:** A normally open contact labeled "HR01 High\_Count" with a value of "#0000" (0000 hex).
- Network 5:** A normally open contact labeled "HR02.00 Enable\_Flag".
- Network 6:** A normally open contact labeled "EQUALS".
- KEEP(11):** A "Keep" coil with a value of "253.14".
- FALSE:** A normally open contact with a value of "255.06".

Annotations and callouts point to various features:

- File (Converts LSS programs)**: Points to the File menu.
- Block network manager and Cross References**: Points to the Block menu.
- Data Editor (Uploading DM) and Address Symbol Editor**: Points to the Data menu.
- Project Setup + Program Check**: Points to the Project menu.
- Window setup**: Points to the Window menu.
- Online (Status)**: Points to the Online menu.
- OnLine Edit**: Points to the Online Edit button.
- Monitor Program**: Points to the Monitor Program button.
- Run/Stop/Monitor PLC**: Points to the Run/Stop/Monitor PLC button.
- Connect to PLC**: Points to the Connect to PLC button.
- Delete network**: Points to the Delete network button.
- Insert network**: Points to the Insert network button.
- Undo**: Points to the Undo button.

The status bar at the bottom shows: "Main 3: Shut Down Network 1: Clean Up If the High Count reaches #10, it then Resets the enable flag. 00012 006:007 Store".

The picture above shows a typical desktop layout. The various toolbars can be re-positioned on the screen by the user to suit their own preferences, this can be done via Window in the Preferences Menu.

The important buttons for general programming use are shown above, all other controls and capabilities of Syswin will be covered in future courses.

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The window is divided into 6 main areas, these are:-

1. **Menu bar** – top of screen, conventional windows menu style, these are drop down menus that provide all of the controls necessary for programming a PLC. The most important menus for general use are:
  - a. **File**
    - i. Convert from – converts LSS programs
  - b. **OnLine**
    - i. Upload – loads a program from the PLC, usually without comments
    - ii. Download – PLC must be stopped, sends the program into PLC, usually without comments.
    - iii. Status – PLC Error, Active Forces
  - c. **Project**
    - i. Project Setup
    - ii. Program Check
  - d. **Block**
    - i. Block Network Manager
    - ii. Cross references
  - e. **Editors**
    - i. Data Editor, allows sections or all of the Data Memory to be: Uploaded, Saved, Loaded and Downloaded.
  - f. **Preferences**
    - i. Window, allows user to configure the working environment layout to their personal preference
    - ii. Options, check box allows **Safety function** so that all operations that affect the PLC will be questioned. This is highly useful for those who are unfamiliar with Syswin, it prevents accidentally doing something to the PLC.
2. **Tool bar** – under the Menu bar, the most frequently used controls are here for quick access
3. **Drawing Tool bar** – left hand side, these are all the drawing tools necessary to allow a program to be written:
  - a. FUN – Function Blocks library and help files
  - b. TIM – Standard Timer function block
  - c. CNT – Standard Counter function block
4. **Work Area** – the programming area that allows networks to be written and displayed with their comments.
5. **Address bar** – under Work Area, shows the current address and Symbol (Name) plus Comment of the contact, coil, or function block clicked on.
6. **Status bar** – this shows the current state the PLC is in eg: Run, Stop, Monitor and OnLine Edit.

**WARNING:** some versions of Syswin were ‘bugged’ and displayed OnLine Edit even when you were not in that mode, always refer to the OnLine Edit button to see if depressed or if screen turns RED when editing.

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There is one other area not shown in the picture because it has been disabled in Window Preferences and that is the **Data Set Bar**. This area allows the user to write in the address, which they wish to monitor. This bar can be displayed as 2 rows or 4 and is always positioned at the bottom of the Work Area (see Monitoring the Program).

## **Activating and De-Activating Syswin:**

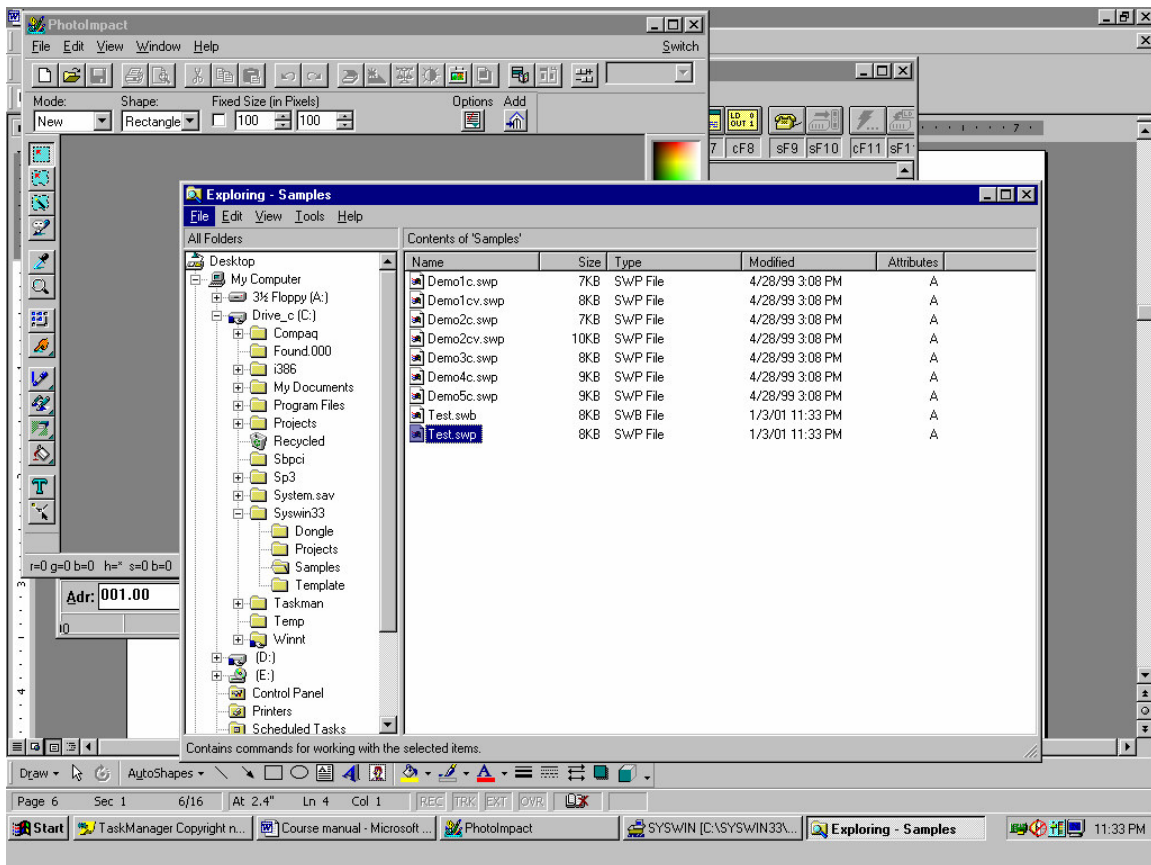
See Appendices A

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## File handling SWP/SWB and loading a program from disk



The picture above shows the Windows Explorer. Unlike LSS where programs are stored in a .dat library file, Syswin programs are stored individually in any directory you wish. As shown above, there are two files in the picture with the same name 'Test.swp and Test.swb'. The important file is the **SWP**, the **SWB** is a backup file which is only created by Syswin when programs are being written. This backup file is not important and is NOT required for the engineers programming, deleting the SWB file has no effect on the program and is of no use to the Engineer. All Syswin needs to program a PLC or allow the Engineer to develop a program is the SWP file. Should you be asked to supply a copy of the PLC program, send them a copy of the SWP file.

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## Converting an LSS program from disk

Because Syswin has to be backwards compatible, it has to be capable of reading and handling any program written over the years for Omron PLC's. Therefore, even though LSS programs are Dos based and saved in a Library file, Syswin has the ability to read the contents of a library file and convert any programs in it to Syswin format.

Provided you know where the LSS program is stored, Select 'Convert from' via the File Menu, a dialogue will appear that will ask you for the location of the .dat library file. Direct it to the correct library file. When the file is opened, another dialogue will show all the programs stored in that library file, select the type of PLC the program is for, then select the file and then load it. It will take several seconds to convert the program and its contents into another Syswin format called a PMF file.

Once loaded if you look in the Block Network Manager via Block Menu, you will see that there are no network comments and that the program is loaded into one block, this is because LSS does not understand blocks and every program line in LSS is actually a network but LSS cannot display networks and therefore offers no comments.

Select Save-As via the File Menu and save the new file to disk, this will now save as a SWP (Syswin Program) file. The PMF version on the screen will be replaced by the standard SWP file. This new file can be used as required and downloaded to a PLC.

## Syswin programs and compatibility

Programs written with earlier versions of Syswin are Backwards compatible with version 3.3 (3.4 is untested at this time but should be no different). Upwards compatibility is not possible with Syswin eg Reading a program written in 3.3 with a 3.1 or later version, unless you save the 3.3 versions as a PMF file and load it into 3.1 or later as a PMF file (PMF files will be discussed on future courses and is not necessary for this course). LSS cannot read Syswin SWP or PMF files. Note: vers3.3 actually saves the file as vers3.2.

However - remember this does not apply with uploading a program from a PLC, the PLC does not distinguish or care which version of Syswin was used, nor in fact is it bothered if the program was written using LSS. Uploads can be accomplished into whichever software environment is being used, Syswin or LSS. Note: a program written in the PLC by Syswin and then Uploaded using LSS may display on the LSS environment a Function Block labeled CMP(DEAD), this rung is not part of the actual working program but a end of Block marker. Remember Syswin writes programs not only in Networks but also Blocks. Since Blocks are new to LSS they are displayed with this special marker – it has no effect on the program.

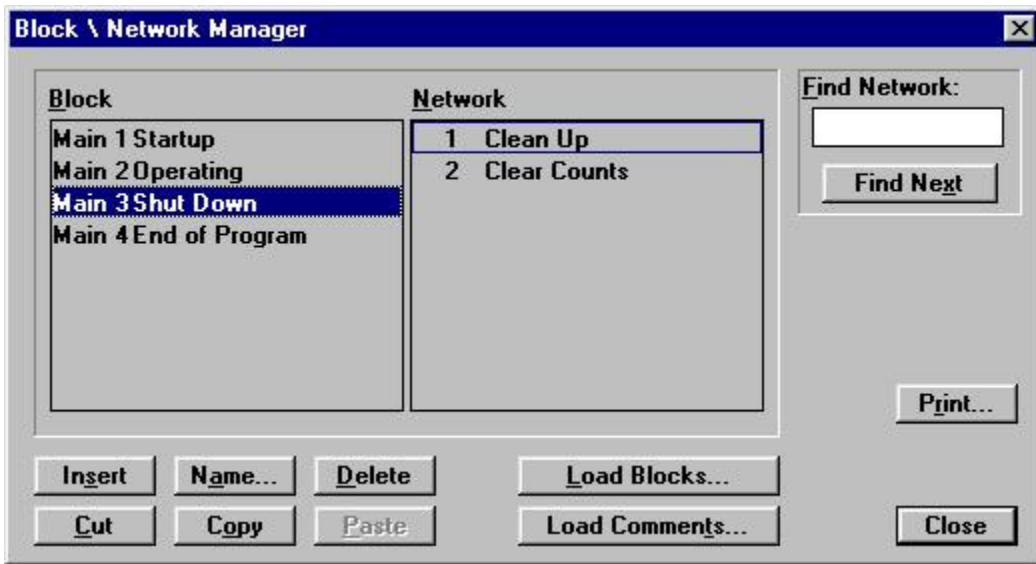
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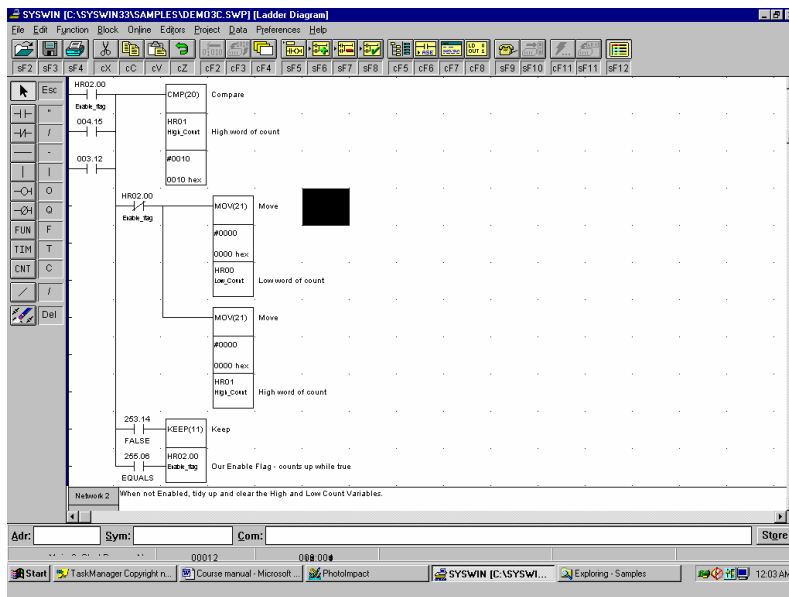
email: support@scantime.co.uk

## Networks and Blocks, inserting and deleting

The overall Block network Manager can be found in the Block Menu, this manager displays the program in its designed layout. A well designed program can save endless hours in fault finding (Programming structure will be covered in the PLC programming Course 1.0). When in OnLine Edit a shortened version of the Block Network Manager is displayed, the ability to Copy and Paste whole blocks is disabled.



Each network shown above can contain up to approx 50 rungs of program provided they are directly connected to each other, the picture below shows an accepted network:

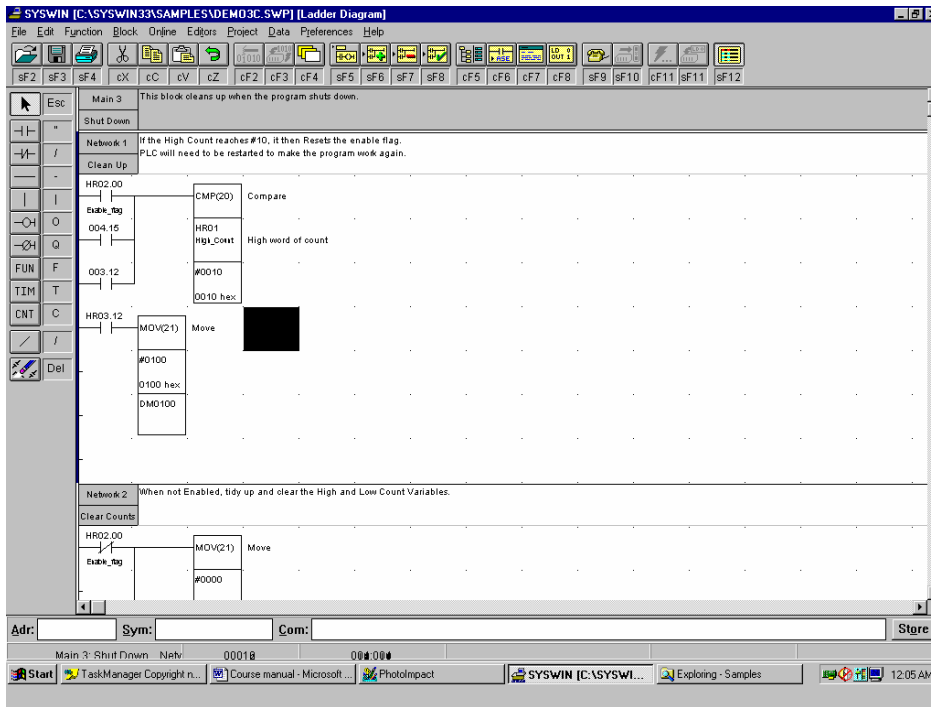


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The following picture shows an invalid network:



The error is that HR3.12 is not connected to the rungs above. Any engineer familiar with LSS, would assume this would be acceptable, however in LSS each rung is actually in its own hidden network and can be misleading because they are not shown on the LSS screen.

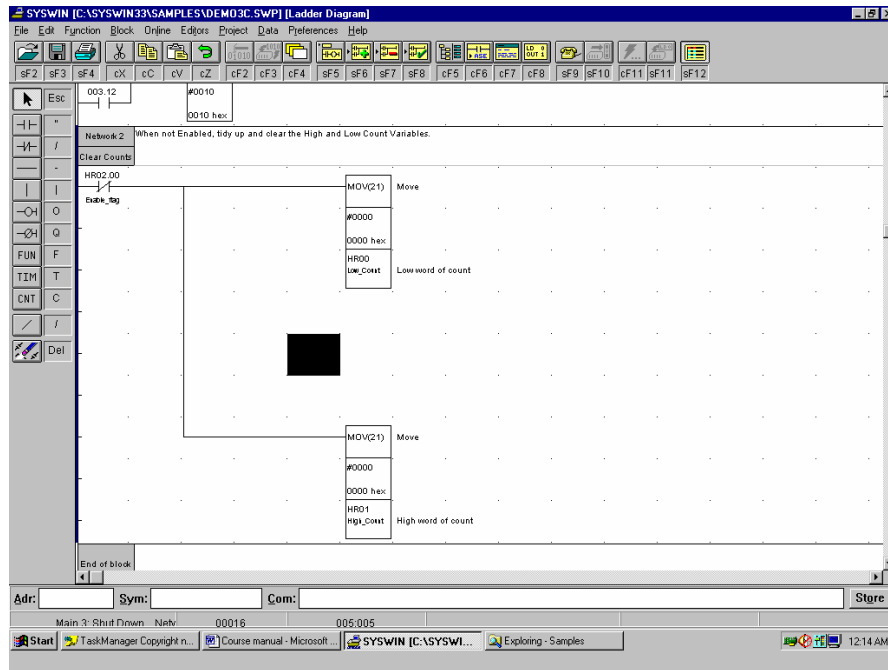
## Expanding Networks and Leaving rungs incomplete

Syswin is fairly demanding in ensuring networks are completed correctly, however if a vertical line is left incomplete Syswin will erase the empty line. However incomplete horizontal lines will not be tolerated and a WARNING message will be given stating that the network is incomplete, the engineer will then need to remove the offending line or complete it if he has forgotten to finish it off.

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If you wish to expand the network, place the cursor on the area to be expanded and press Alt+ arrow Up, Down, Left or Right.

## Copy, Paste, and Undo

Syswin allows sections of program to be copied and pasted at any time. This is most useful during program development, and allows even full networks or blocks to be copied and pasted from other programs into the one being developed. However it is important to know that comments from other programs will not be copied, but addresses will, therefore it is necessary to check that any copied addresses will not conflict with the program under development, otherwise they should be re-addressed after pasting.

Should an error be made while writing a program, you can Undo the errors back to the programs original state just after the last Save command, by pressing the Undo button with the Green arrow on it.

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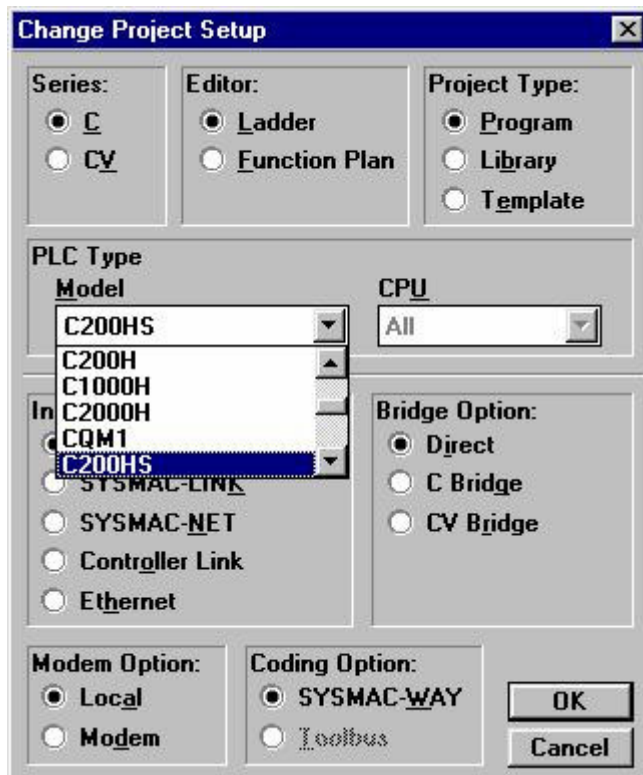
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## Writing a program

Syswin allows programs to be written with a Mouse or TouchPad and also with HotKeys. The HotKey symbols can be found under each menu button or alongside each tool in the Drawing Toolbar. The symbols in the Drawing toolbar can be changed to function keys simply via Window in the Preferences Menu - Select Function keys in place of Alpha Keys.

Before writing a new program be sure to setup Syswin for the type of PLC being used, this is done via Project Setup in the Project Menu. Select the type of PLC being used and ensure the correct CPU is shown unless 'ALL' is displayed.



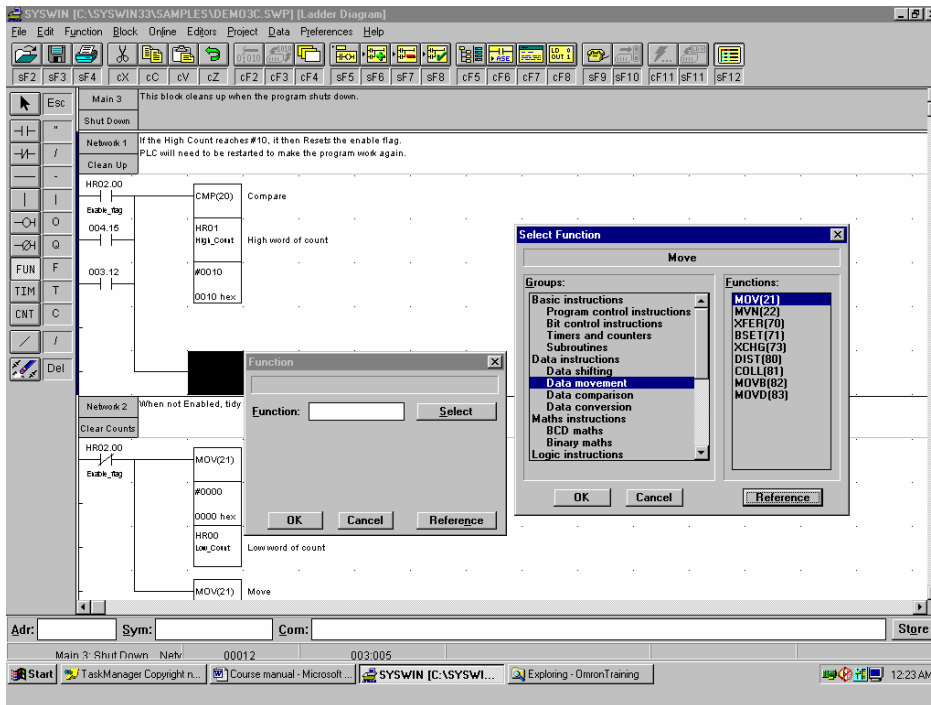
The other settings in Project Setup can be left at their default setting, these defaults tend to be standard for all PLC arrangements, unless you are dealing with complex networked PLC's. Note if you are using a CV series PLC the CV Series option box also needs checking.

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## Omron PLC Function Block Library in Syswin and Help Files

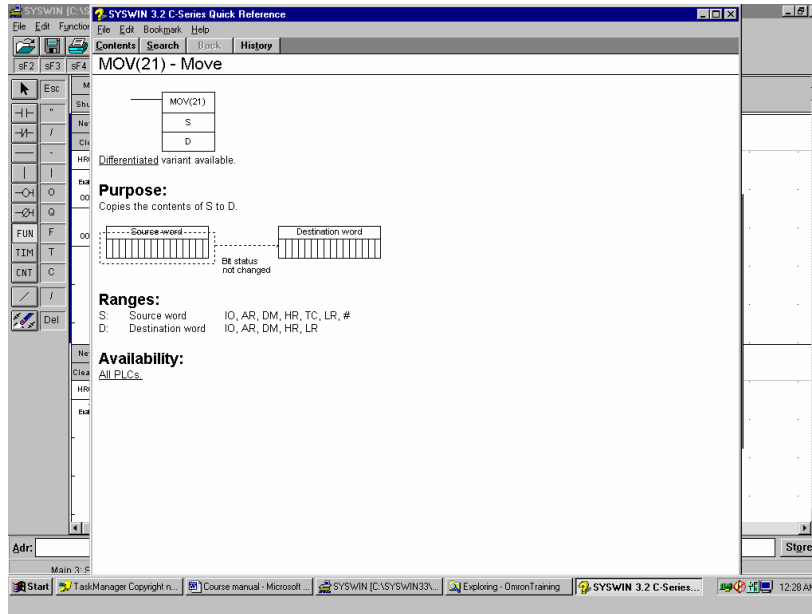


Above the User has tried to insert a function block onto the horizontal line and a popup window has appeared, by pressing select another window appears with a list of all the available function blocks for that PLC, by double clicking the required block name eg: MOV(21), this name will appear in the first window text area and all the user needs to do is then fill in the rest of the MOV address or values .

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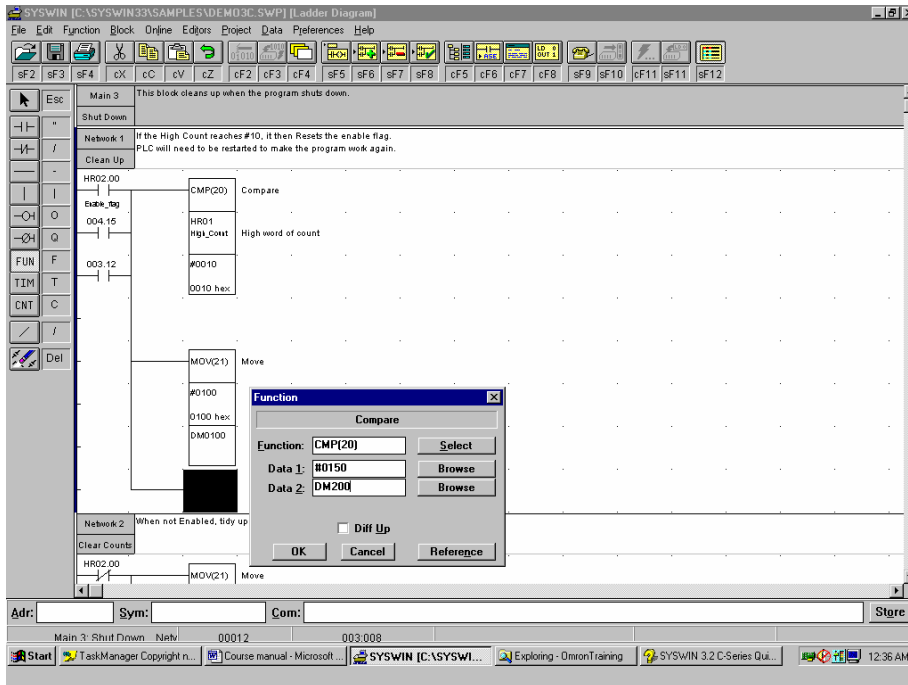
If you do not know how the MOV function block works then you can select 'reference' and a Help File will appear, explaining how it works.

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You can now start writing the ladder program, example:-



The Browse buttons shown above when clicked open a window that displays all the addresses and comments used in the current program, see 'Finding Used addresses' below.

The contacts and coils can simply be dragged and dropped into place from the Drawing Tool bar into the Work Area.

**Note:** that after selecting a Drawing Tool, its button stays depressed allowing you drop another into the work area, however this prevents you from selecting another network or open a previous Function block for addressing purposes, therefore you have to click the Arrow button at the top of the tool bar, this will release any depressed button and allow you to move to a new network.

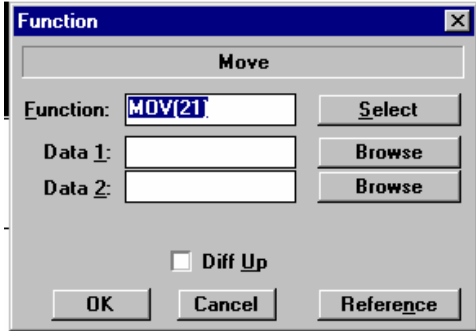
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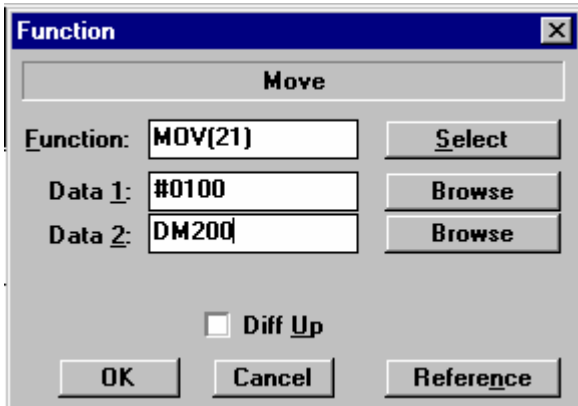
A quick method of inserting a Function Block, can be done by dropping the FUN tool onto a work area and when it asks for the Function type, type into the text area the name followed by the left parenthesis eg: 'MOV( ', or type in the number if you can remember it eg: 21 = MOV(21)



All you need to do now is fill in the Data 1 & 2 details.

Pressing 'Reference' will again open the Help file for that particular function block.

When addressing a contact, coil, Syswin can handle short hand, eg: 100 would be determined by Syswin to be 1.00, this can be useful for rapid design. In a function block remember to use the # sign when writing values eg



The Move function above, moves the value 100 into DM 200.

When you have completed your program, **remember** to include the 'END' statement at the very end of the program in its own network, otherwise an error will be displayed if you try and download the program with it missing.

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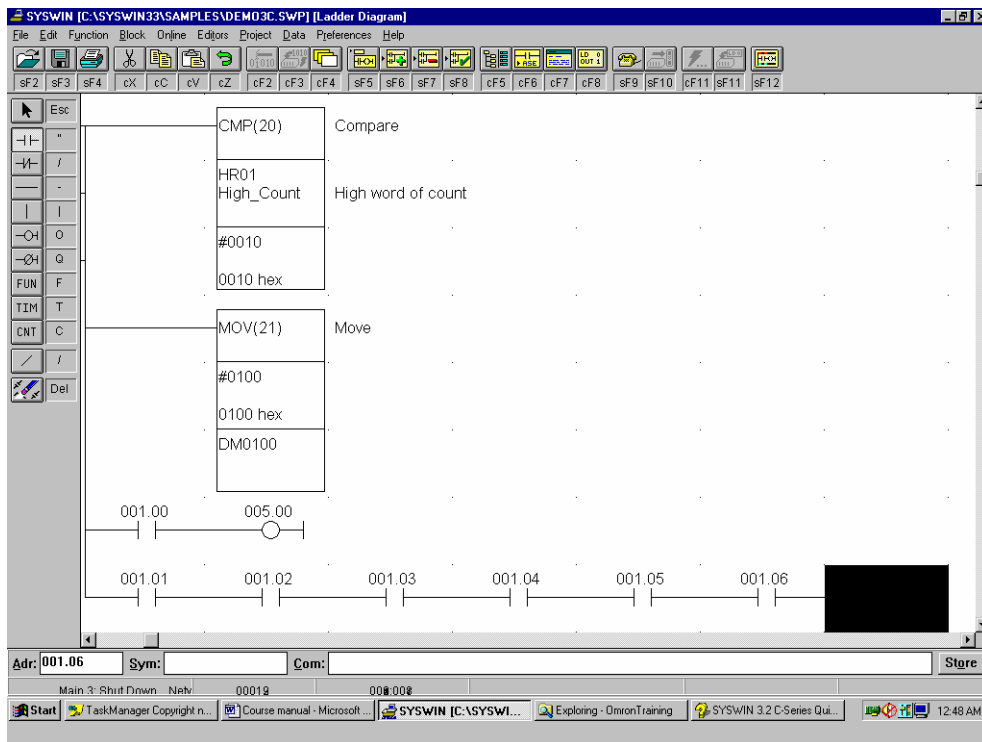
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**WARNING** – remember multiple none connected rungs are not allowed in a Syswin network. Some engineers confuse LSS standard of writing and displaying with that used by Syswin. LSS does not write in Blocks, and each rung in LSS is actually a network, although it is not as clearly shown in LSS as it is in Syswin.

You can branch out a rung once it has started by adding further contacts and function blocks. Also rungs are written left to right and Syswin rungs can also end anywhere in the network. Syswin rungs can be as wide as you like and are not restricted to the right side of the screen as they are in LSS.

Example:



You can see above that the left hand side contacts are not displayed, this is because the bottom rung has extended beyond the window size, but the coil 5.00 has ended midway. This is very unlike LSS which ends all rungs on the Right Hand side.

Also the function blocks above appear larger than previous examples, this is because previously I had the window set to display in Overview mode which is the far right hand button on the top tool bar. When pressed this button shrinks the Work Area so you can show more of the written program. It has no effect on the PLC.

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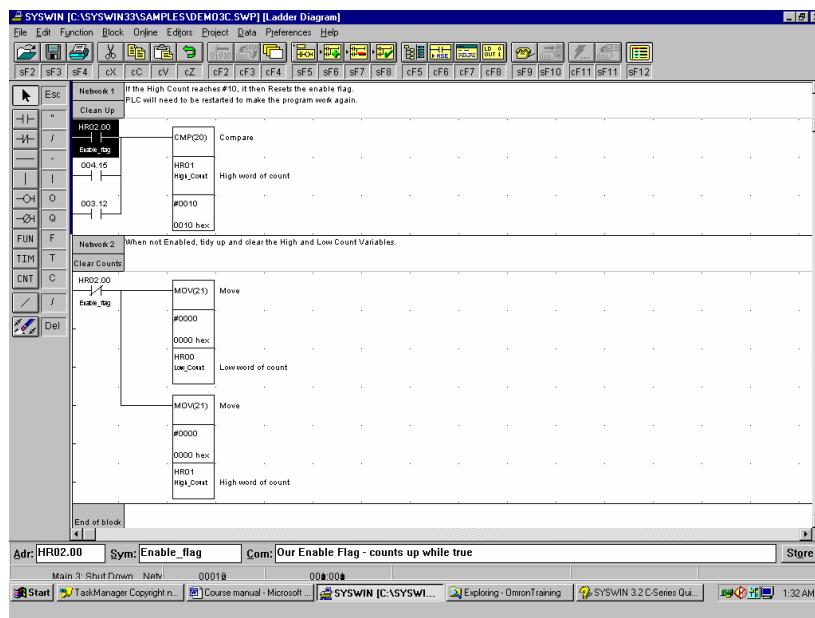
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Branching out a rung can also be done going down the screen, although there is a limit of approx 50 contact rungs. Function blocks take more area and therefore will be far less than 50 rungs in depth.

**WARNING** - when writing multiple rungs within a Syswin network, Syswin will not tell you if you exceed the limit, you will only find this out when you try to download into the PLC and it refuses to accept it, this can be inconvenient, so try and be aware of how long your network has become. Rungs that are over the limit, will need to be removed (Cut) and (Pasted) into a new network, making sure you include the events prior that activate those rungs.

## Symbols and Comments

Every contact, coil and function block requires an address, but a program with only addresses is very confusing to understand. Syswin allows every contact and coil to be given a name referred to as a Symbol.



Above you can see that the selected contact has its address and name shown at the bottom of the screen in the address bar. The name (symbol) is restricted to 15 characters and must not include spaces, therefore if you wish to make the name more readable use an underscore '\_' to separate the words or type with words separated by a Capital letter eg: 'PumpControl' After typing press 'Enter button'. If you type in a name that is already used you will be warned, also if you delete a contact and try to use its name you will still be warned unless you have saved the program or purged the system (see Finding Used addresses section below).

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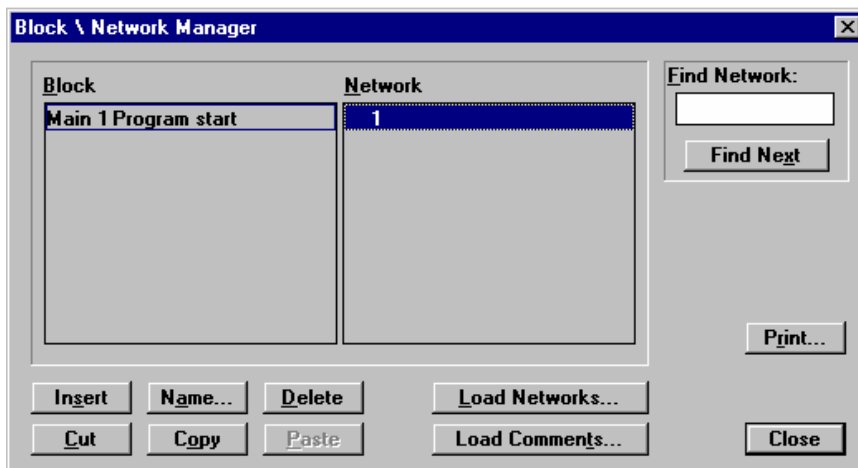
The Comments text area allows you to write with spaces, but if your comment explains what that network does and is attached to a Function Block, then whenever you use the Function Block that is associated with that comment elsewhere in the program, you will have the same comment displayed there, this can be confusing so choose your comment carefully, or leave them out and rely on the Symbol.



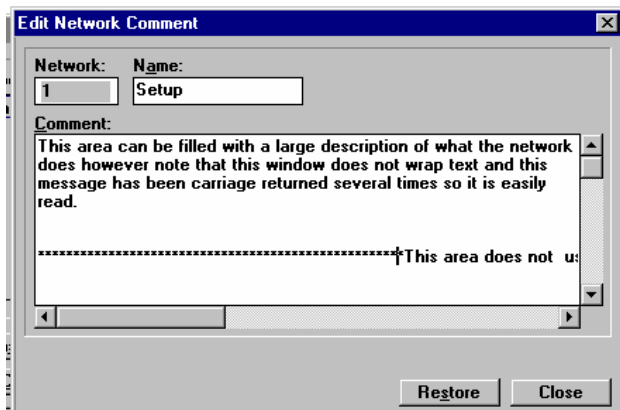
A screenshot of a software interface showing a text input field for a comment. The field is preceded by a colon and the label 'Com:'. To the right of the input field is a button labeled 'Store'.

Be sure to press the 'Store' button when finished to commit the Comment to the work area.

Another area for more extensive descriptions of the network can be done via Block Network Manager.



Double click the Network



You can enter a title for the network and a large description of the how the network operates within the program as a whole. WARNING: the Comment area does not undertake word wrapping, therefore consider this if you want the comment to be read via Block Network Manager.

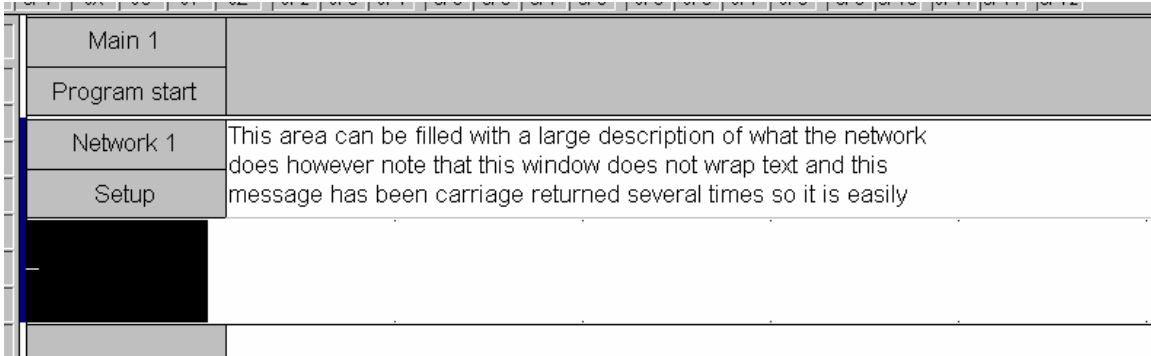
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When you Close the dialogue, your description and title will appear on the work area.



Main 1	
Program start	
Network 1	This area can be filled with a large description of what the network does however note that this window does not wrap text and this message has been carriage returned several times so it is easily
Setup	

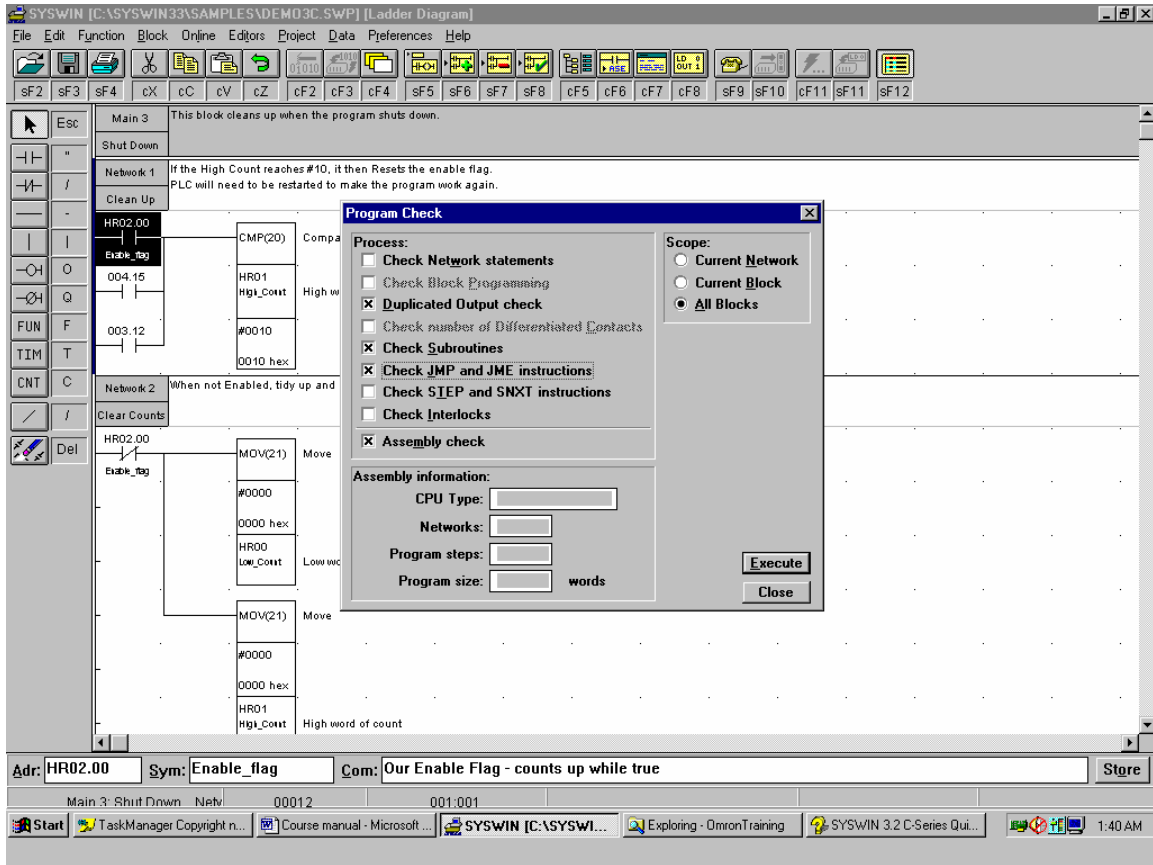
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## Checking the program for errors

When a program has been written, it is advisable to check it not only visually but also by letting Syswin check it via Program Check in Project Menu.



The check boxes checked shown above are the ones advisable, they will check most programs even if sub routines aren't used.

Duplicate Output check is always advisable, since it is very possible to double up an output coil unknowingly when writing a program. (Duplicate Output Coils are bad practice)

Always ensure that the All Blocks option box is checked, so that it will check every line of you program. Press Execute to run the test.

Any errors will be displayed in a popup window along with their location details.

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## Saving the program

Saving can be done at anytime during program development, it is always advisable to do this every few minutes since Windows and PC hardware are notorious for crashing just when you don't want them to. Saving is done by left clicking the floppy disk button top left of screen or via Save in the File Menu. You also have the HotKeys option.

## Connecting to a PLC

There are several ways to communicate with the CPU in the PLC, the most common are via

- The Peripheral Port on the CPU bottom right, using a CIF or CQM lead
- The RS232 port, left side of the Peripheral port using a standard RS232 lead  
RS232 wiring:

### Wiring connections:

<u>PLC</u>	<u>Laptop</u>	
1	1	Shield
2	2	Rx
3	3	Tx
4 link to 5	4 link to 6	Dtr/Dsr
	7 link to 8	Rs/Cs
9	5	Signal Ground

### Com Port settings on the Laptop.

Start Bits	1
Data length	Ascii 7 bits
Stop Bits	2
Parity	Even
Baud Rate	9600 bps

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## Downloading to a PLC with Syswin

Plug the appropriate lead into the PLC port and connect to the Com1 port on the Laptop.  
Boot Syswin on the Laptop (Syswin will try and detect the PLC type and establish a link). If it connects successfully the Telephone icon top right will show its handset lifted.

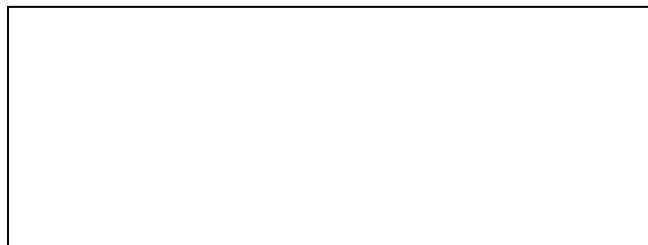


### *If this fails check the following:*

- Go to Project Setup via Project Menu and check the correct PLC is selected.
- Check the Com Port settings via Communications in the Project Menu.
- Change the comms lead for another.
- Change to Com2 on the Laptop and change the Communications settings to Com2.
- Once connected, place the PLC into Stop Mode –  
**WARNING** this will stop the PLC program, ensure that the process being controlled is in a safe condition ie Stopped.

Select Download via the Online Menu. Note a popup dialogue will appear.

### **SETTINGS fill in during Course:-**



The program will now be downloaded, when it has finished a completed message will appear.

You will now need to place the PLC into Run or Monitor mode (both will allow the PLC to work as normal, however Monitor mode is used when doing OnLine edit or Monitoring the program with laptop).



**Note:** if you omit to place the PLC into Stop mode prior to selecting Download, Syswin will automatically do this for you and then automatically place the PLC into Run/Monitor mode after download is complete.

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## Monitoring the program

When connected, ensure the PLC mode is in Monitor mode, do this by pressing the button right of the Telephone handset and checking the Monitor Option.



Then press the button with the Lightning Bolt symbol.



This will turn from RED (Not Monitoring) to GREEN (Monitoring).  
Syswin is now in Monitor mode, any active coils and contacts will be highlighted.

You can monitor DM values by typing in their address preceded with DM eg DM100, into the Data Set bar at the bottom of the screen

DM0100	0000 hex		
000	0000 hex		
001.01	0		
HR01.00	0		

**Data Set bar:**

You can also type in other addresses, IO address 1.01 is shown as a single digit that will either be 1 or 0 depending if the bit address is Set or Unset.

When you are Monitoring a program, these values will change if the program starts altering them, you will also be able to change their display format, so word 0 above is shown as 4 digits, if you click on this cell you can select binary which then shows which Input at this slot is On or Off – this is quite useful for monitoring whole Input or Output cards.

You can also Set and Force Set values in the Data Set Bar, more of that later!

**Note:** If the Data Set Bar is not visible, you can display it via Window in the Preferences Menu. selecting 2 or 4 rows.

**Always ensure the Lightning Bolt is Green when Monitoring**, if not then click the button till it turns green, if it does not turn Green then re-check you are still connected,

## The Data editor

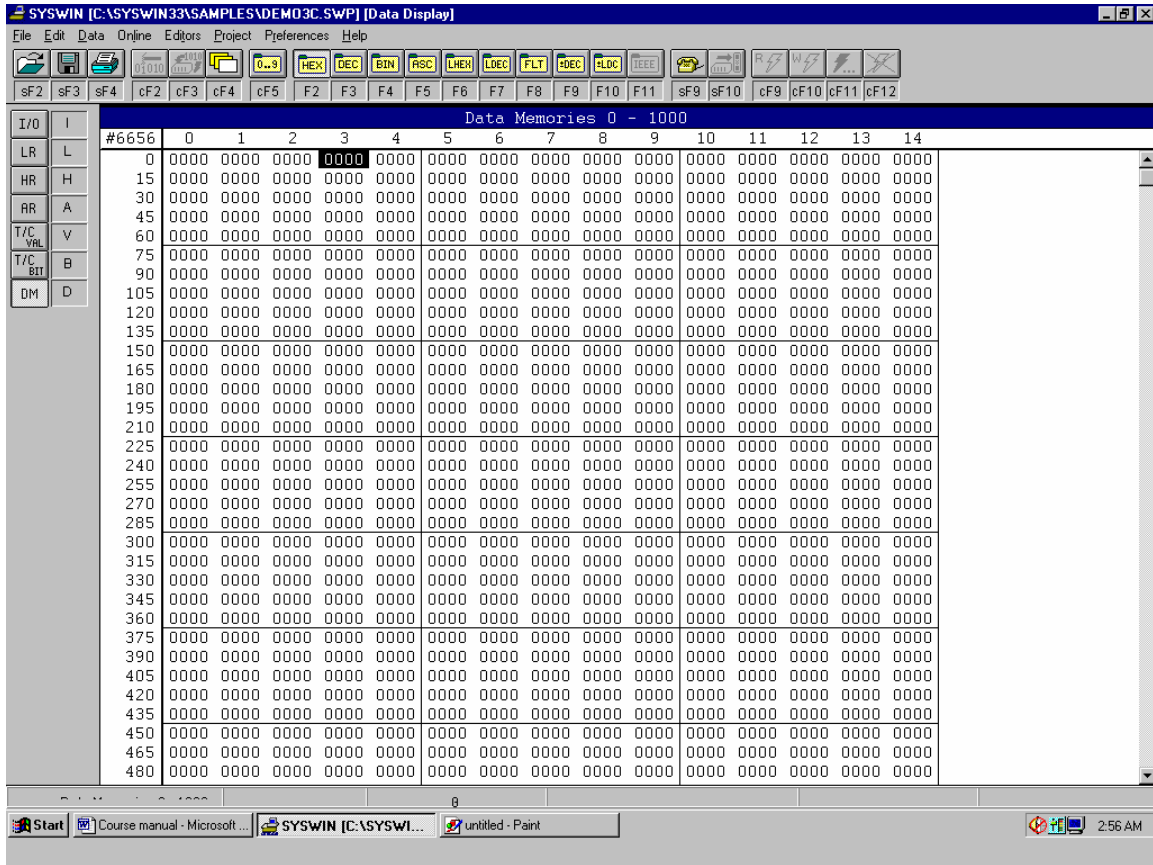
This is primarily used to monitor large blocks of addresses.

It also allows you to Upload all or part of the Data Memory, this is important if you are about to do a test where the values might be change. Once Uploaded and Saved, you can after the test Download the DM values back into the PLC – do this after you have Downloaded the Original program back into the PLC. The PLC will then be back in its original state prior to the test.

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The editor has been set to display Data Memories 0 – 1000.

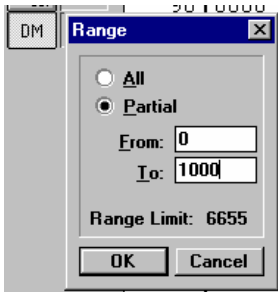
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Note when setting up and you have clicked the DM button on the left, DO NOT write DM0 – DM1000, it already knows it is DM you require so just type 0 and 1000.



## Disconnecting from the PLC

Click on the Telephone Handset button and this will disconnect communications with the PLC, the handset will lower to show it is no longer connected, you can now remove the lead.



The PLC can be left in either Monitor or Run mode during disconnection.

**WARNING:** never leave a CIF lead connected to the peripheral port without a Laptop connected to it, the reason for this is that if the power to the PLC is interrupted, the PLC will not restart. Normally when power is lost to a PLC it will automatically re-start itself into Run mode.

### Never disconnect during:-

1. A Download
2. While an OnLine Edit is being Written to the PLC by Syswin

You can disconnect during an Upload, (although it is bad practice to break any communications midstream) only the Upload will be useless.

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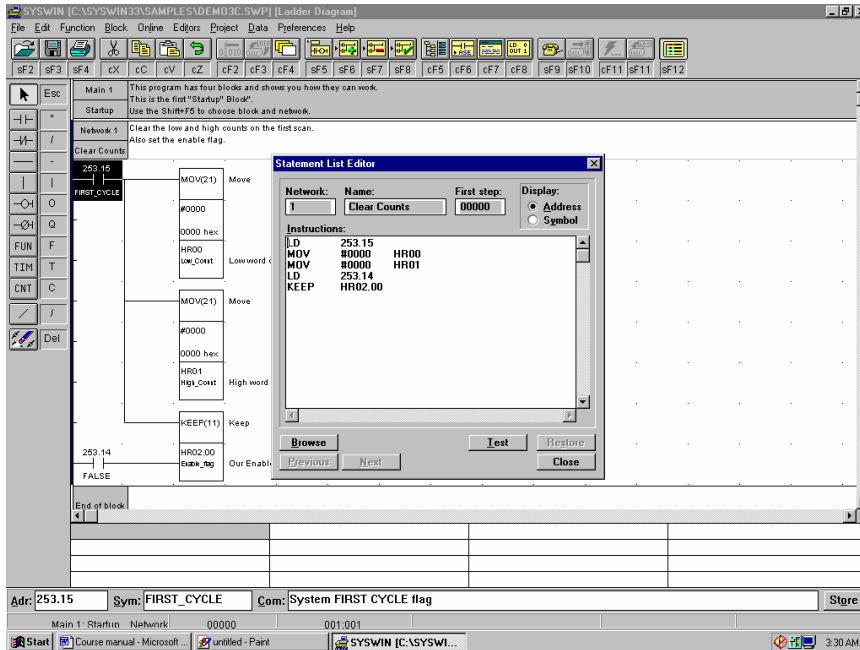
## Re-Connecting and Verify

Boot Syswin and Load the Program from Disk

Once you are connected to the PLC and have established a link via the Handset button.

Select Verify - via the OnLine Menu.

Verifying takes time, depending upon the size of program, should a mismatch be found, Syswin will show



the error in Statement List format, identifying the Block and Network numbers of the location.

**WARNING** - Verifying a program in a PLC that is running can be dangerous if the program undertakes very complex data handling and monitoring of very fast signals. Verification will interrupt these processes and could cause the process to fault. If in doubt – check!

# PLC Programming OLplc01

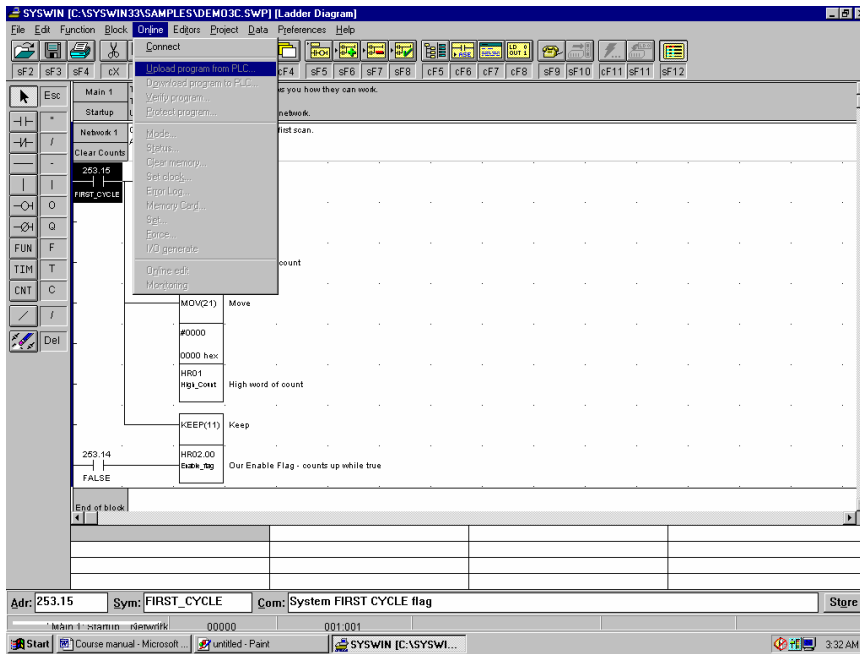
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## Uploading to a blank Syswin

Ensure you have established a connection.

Select Upload via the OnLine Menu



Note some PLC's will not save comments due to memory space, so the program you are likely to see will have no comments attached.

Under some circumstances it is sometimes advisable to ensure that the process is stopped, since an UpLoad could interfere with any High Speed signaling.

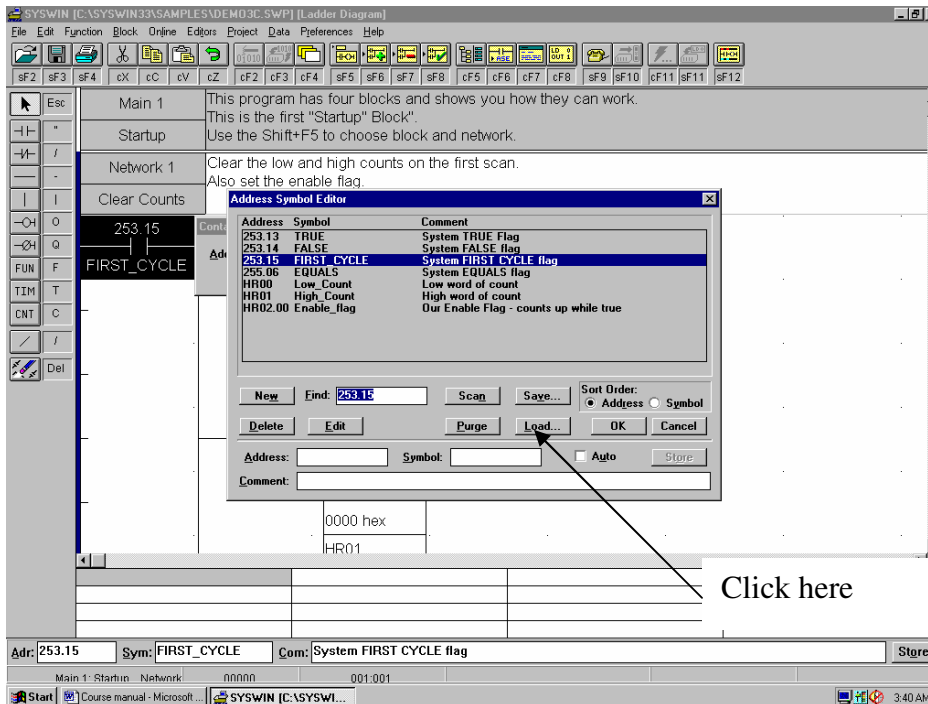
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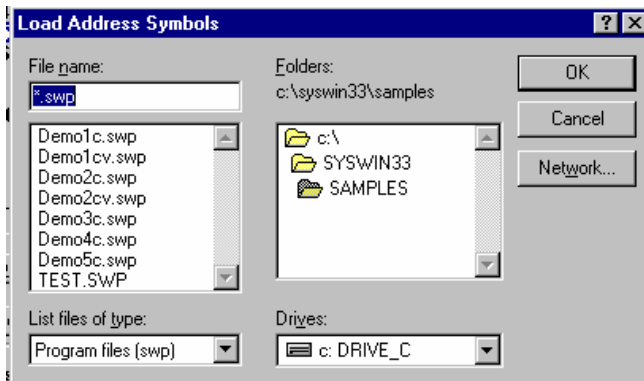
email: support@scantime.co.uk

## Comments and the PLC

As mentioned above the PLC will possibly not store any comments from the developed program. However once you have an upload you can import the comments. This can be done by double clicking any contact or coil which will display a popup address dialogue, select Browse and the Address Symbol Editor will appear.



Click on Load and Syswin will ask for the location of the file with the comments.

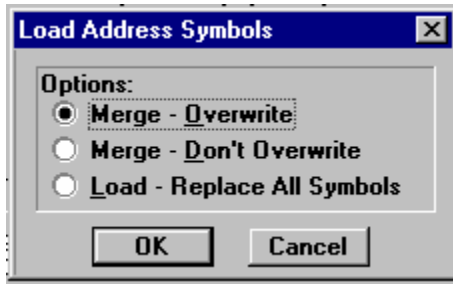


Once the file has been loaded, Syswin will ask if you wish to Merge or Overwrite etc. Merge Overwrite is Fine for a blank program.

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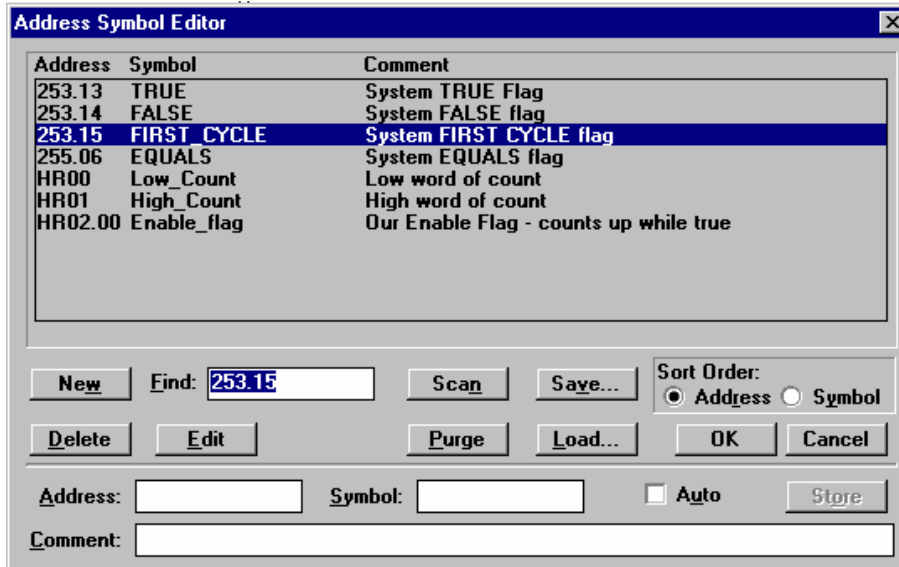
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## Finding used addresses

As above, after double clicking and Browse you will see the Address Symbol Editor.



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Before you scan down the displayed list, Press Purge, this will remove any old addresses that were allocated but no longer used in the existing program.

**WARNING** - do not Purge if you have removed parts of the program and intend to re-write them later, otherwise their comments will be lost and you will need to re-write them.

You can now scroll through the used the addresses, with their comments.

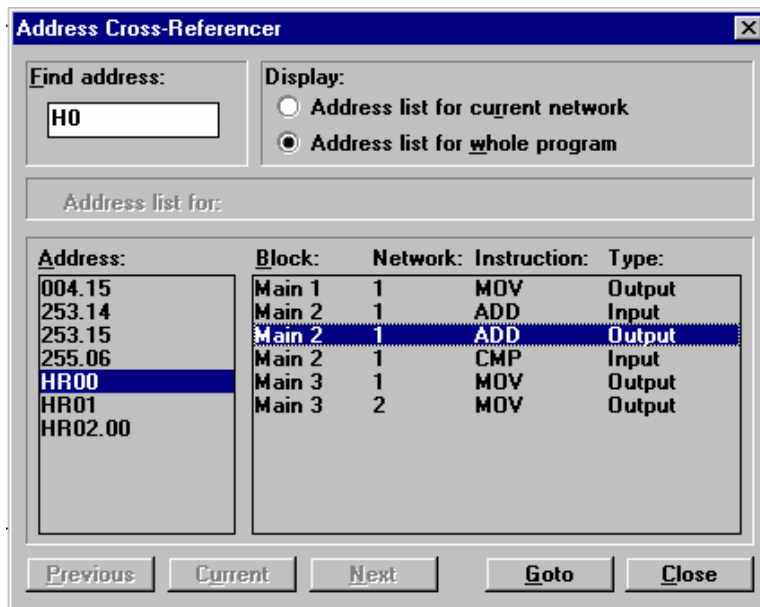
**WARNING** - if you double clicked a coil or contact previously to get to the Browse dialogue, DO NOT double click on any used address, as this will replace the coil/contact etc address previously double clicked in the program. **The Address Symbol Editor can be accessed also via the Editor Menu** or via the following button:



## Searching for specific Coil:

Unlike LSS, Syswin searching does this differently.

Select Cross Reference via the Block Menu, this will cause another dialogue to appear.



You can type in the required address or simply scroll through the list.

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When you click on the required address, a list will appear on the right hand side that shows where that address is used throughout the program. Further clicking on the right hand side will cause the screen in the background to change, moving you throughout the program where the address is used.

If you wish to go to that part of the program press the GoTo button at the bottom of the dialogue.

## On Line Edit and its dangers with complex programs

OnLine Edit allows the engineer to modify any part of the program, even add additional whole networks, while the PLC is running the process.

It is the engineer's responsibility to ensure the modification will not cause any problems to the process.

Before we look at how to do an OnLine Edit, there are some other factors and dangers, which need to be understood.

- While you are editing the program, the modification will not occur in the PLC until the correct buttons are pressed. That means that the modification you are doing is only taking place in Syswin on the Laptop, not the PLC.
- The Danger occurs when Syswin starts to write the modification into the PLC program. This process can cause an interruption to the PLC scan time, and therefore any high speed signals may be lost OR any complex algorithms caused to slow down and the results be applied to the program too late.

*Therefore know your program operation before undertaking an OnLine Edit.*

Finally - if you have loaded a program from disk into Syswin, Verify the program as discussed earlier, this is to ensure that both program match.

Alternatively, carry out an UpLoad and either import the comments or edit the program without any comments.

### *Doing the Edit:*

1. Ensure a connection is established, telephone handset is raised.
2. Locate the area for the Edit.
3. Click the OnLine Edit button usually the 2nd from the right at top of the Syswin Toolbar, a bubble will appear when the cursor is over the button with the buttons name.



OR

You can select OnLine Edit via the OnLine Menu or via HotKeys.

4. A popup will appear asking if you want to verify the program, if you have not already done so say YES.
5. Start doing the edit in the appropriate network.  
**Note:** once you start editing, that part of the rung will turn **RED, if it does not then you are Not in OnLine Edit.**
6. Once you have completed the edit, only the Laptop program is now altered, if you are confident the modification will work, then press Alt+Enter keys on the laptop. Syswin will now start writing

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the modification only into the PLC program. When it is complete the RED areas will return to normal.

**Remember** - if successful Save the modified program to disk and record how and why the program was modified.

Click the OnLine Edit button and Syswin will return to normal.

**WARNING** - if you forgot to Verify and the programs are different, an Error message will appear, you will need to do another UpLoad and start again.

If you edit the program and forgot to press the OnLine Edit, then you should UpLoad the program again or Load from Disk followed by Verify, DO Not bother to Undo, this sometimes does not work and is therefore a waste of time, just UpLoad or Load again from Disk and Verify.

Whole Networks can be deleted during OnLine Edit, this is done by pressing the Delete Network button.



OnLine Editing is dangerous, therefore it is important to plan and check what you intend to do before you go ahead.

## Out of Sync Network Comments

- If you delete a network OnLine without using the correct program loaded into Syswin, then whoever comes along later and does an UpLoad and Imports Network Comments from a file will find the network comments are out of sync with the correct networks.
- The same occurs if someone alters the written Syswin program OnLine using LSS

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## Force, Set and its dangers

This is only available when connected to a PLC. It is usual during program testing to want to Turn ON or OFF a contact or coil. This is called Forcing. The Omron C1000H PLC only allows one Force at a time, however other PLC's eg: C200HS will allow multiple Forces.

### The Problems with Forcing are:-

- It will override the present state of Coil or Contact and the program will react accordingly.
- A Force cannot be overridden by another event eg: Forcing ON a coil will cause all contacts with the same address to also turn ON or OFF if a negated contact. The coil will not turn OFF if the coils previous conditions are OFF.
- A Force will stay ON or OFF until it is reset

**WARNING** - Never do a Force Reset to reset a Force Set, this will Force the coil or contact into the other state. **You must remove any type of FORCE with a normal Reset or Cancel All**

### Setting:

Set only will not work if the address is being controlled by the program eg: a coil cannot be Set if its event contacts are OFF, or a Contact cannot be Set if its address is an IO card. The reason for this is that the PLC scan re-calculates the rung according to the events that make up the rung and sets the coil accordingly, thus over-riding your Set.

Setting is normally associated with contacts not tied to an IO card or not used anywhere else in the program.

## Finding active Forces

This can be done after a connection is established, by selecting Status from the OnLine Menu, any active Forces will have the Force active check box 'checked'

Turning a PLC Off/On will clear any Forces that are active, this is useful if you know a Force is present but do not know where it is.

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## Turning off rungs

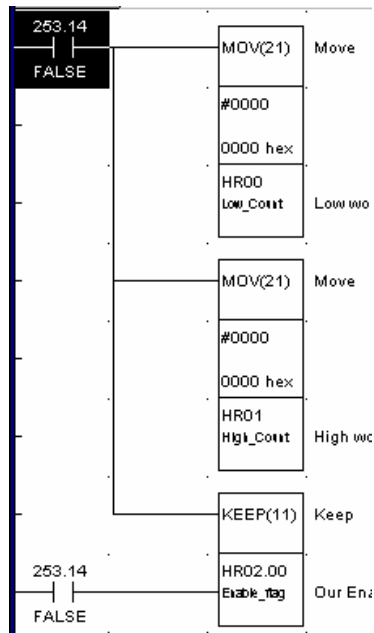
You may find sections in a program fitted with a Normally On or Off contact.

253.13 ON

253.14 OFF

This method is normally used by engineers who do not wish to lose the designed network, but only to disable it for test purposes.

Therefore if you wish to disable a rung, rather than fully delete it, you can do so by placing a 253.14 Normally Off contact in series with the rung. This contact will never turn ON during the program running.

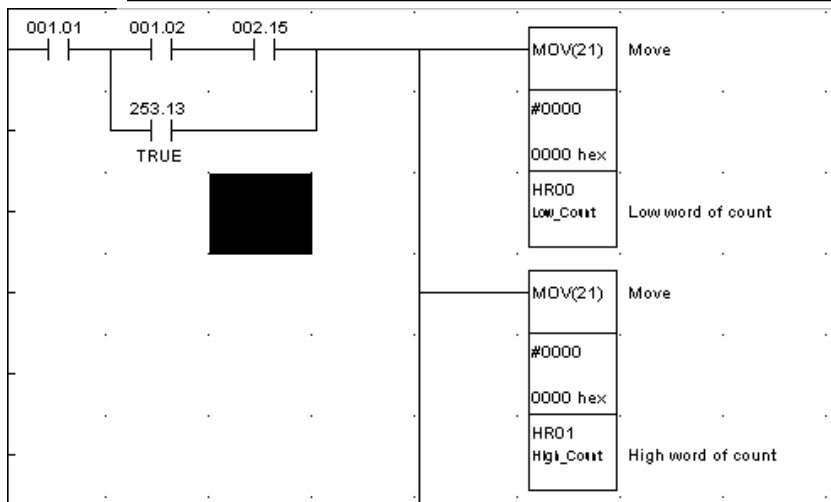


Also if a contact or several contacts in series need to be temporarily overridden but others in the series left intact, then bridge the offending contacts with a 253.13 Normally On contact. Using this contact is similar to linking out contacts with a piece of wire in a real system.

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The benefits of using these methods, is that the networks can be returned to their original state whenever required, and it also shows other engineers what has been done in the program without deleting sections.

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## Omron PLC addressing types

General Bits and Bytes

HR

DM

Timers and Counters

### C200Hx addressing:

Area	Size	Range	Comment
Internal Relay Area 1	3776 bits	IR0 to IR235	Non retentive, some special devices use this area
Special Relay Area 1	312 bits	SR236 to SR255	pre-configured by the PLC
Special Relay Area 2	704 bits	SR256 to SR299	flags set by the PLC
Internal Relay Area 2	3392 bits	IR300 to IR511	Non retentive, some special devices use this area
Temporary Relay Area	8 bits	TR0 to TR07	Used for special instruction use only
Holding Relay Area	1600 bits	HR0 to HR99	Retain their state when power is lost, can be used in the program.
Auxiliary Relays Area	448 bits	AR0 to AR27	Flags and bits for special functions, state is retained after power loss.
Link Relay Area	1024 bits	LR0 to LR63	Used for data links - networking. Can be used generally if no network is present.
Timer/Counter Area	512	TC0 to TC511	Timers and counters share this range, ensure you do not give a timer and counter the same address eg T10 & C10
Data Memory Area 1	1000 words	DM0 to DM999	Used for storing values
Data Memory Area 2	2600 words	DM1000 to DM2599	Special IO Unit area
Data Memory Area 3	3400 words	DM2600 to DM5999	Used for storing values
Data Memory Area 4	656 words	DM6000 to DM6655	PLC use

Useful addresses:

<u>Description</u>	<u>Address</u>
First Scan	253.15
On	253.13
Off	253.14
1sec Pulse	255.02

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## Appendices: A

### Tokens & Dongles:

Syswin version 3.3 can be provided on CD, during installation it asks for a code which is the software license. After installation Syswin will work without having a Token or a Dongle.

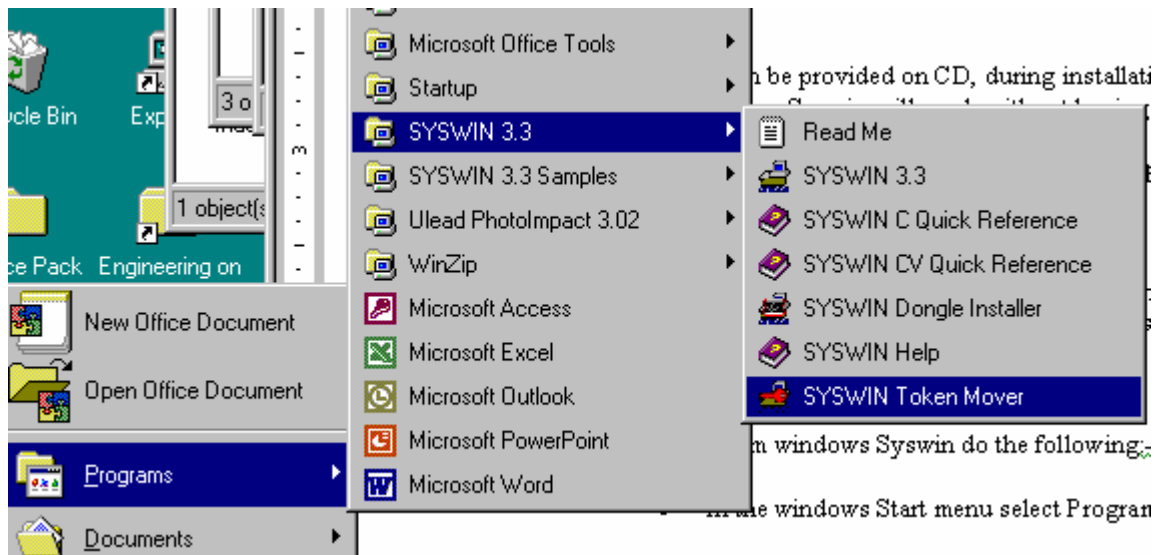
However, Syswin versions 3.0 – 3.2 are installed from floppy disk and require either a Token or a Dongle to be installed on the Laptop.

#### **Token:**

Syswin Tokens are supplied on a Red floppy disk, the token is a piece of software that is installed on the laptop during activation. Every time Syswin is booted it first looks for this software and if present it allows Syswin to fully run, otherwise it runs in Demo mode which will not allow you to connect to a PLC nor save any programs that you may write in Demo mode.

To install a Token from windows Syswin do the following:-

- In the windows Start menu select Programs and then Syswin, and Syswin Token Mover

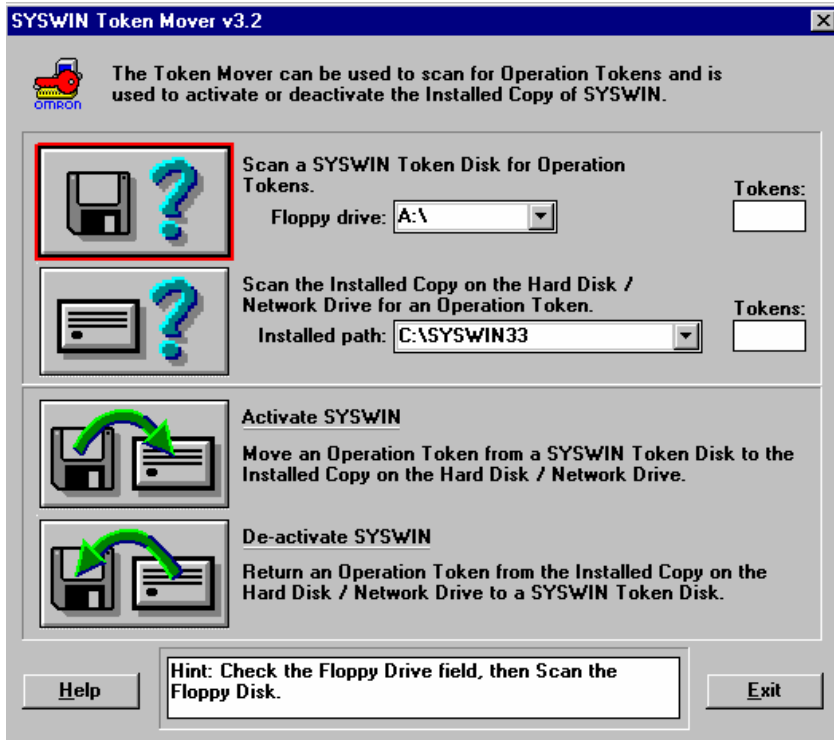


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- Token mover will then appear.



The 4 large buttons on the left hand side will illuminate and guide you through the process of Token installation, ensure the Red Disk is in the Laptop floppy drive and press the top button, this will then check the floppy for any valid tokens, the number of tokens found will be displayed on the right.

The next button will then flash and this will check your hard drive on the Laptop for any installed Tokens, if no tokens are found then press the Activate Syswin button and the Token will be moved from floppy disk to the hard drive. Syswin is then ready for use. Close down Token Mover.

If there is a Token on the Laptop hard drive you can remove it by pressing De-Activate Syswin, and the Token will be moved back to the Red Floppy Disk.

**WARNING:** Tokens can be lost on the Hard drive, if certain disk managers are run and especially if the Laptop fails to load windows and you have to format the hard drive. Tokens can be retrieved via Dos (see Advanced Omron Course).

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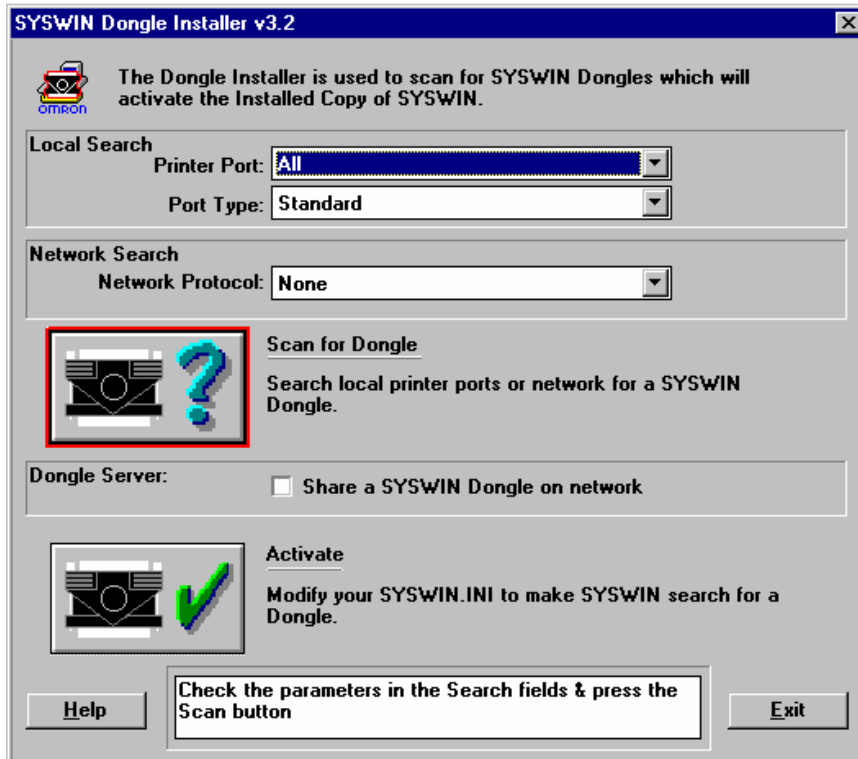
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## Dongle:

Via Start Menu Programs, select Dongle Installer in place of Token Mover



The Dongle is a piece of Hardware that is connected to the parallel port at the rear of the Laptop, the Dongle has a throughput connection that allows it to be inserted between Laptop and Printer, providing a printer has been connected to the Laptop.

Ensure the Dongle is fitted to the port and activate Dongle Installer, click on Scan for dongle, once it has found it, then click Activate. Dongle Installer will then re-write the Autoexec.bat file for next time the Laptop is re-booted. Note: you do not have to have the Dongle fitted every time you boot the laptop, as long as you connect it before you start Syswin.

The Dongle is more reliable than a Token and is safe should the laptop hard drive fail. However it can be mislaid, so keep it safe it is expensive.

-----END