
OMRON **SYSWIN**

Software Programming Tool for
OMRON Programmable Logic Controllers

VERSION 3.4

For use with IBM compatible 486 and Pentium computers
with Microsoft Windows

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1 GETTING STARTED WITH SYSWIN

Welcome to SYSWIN

The OMRON SYSWIN software is designed for use with SYSMAC C and CV series Programmable Logic Controllers (PLCs). It provides a straightforward method of creating and maintaining programs and testing their operation, either offline or connected to a PLC.

SYSWIN offers a comprehensive range of facilities for the PLC programmer, from program editing to full symbolic and network debugging, including:

- New program creation
- Program storage and editing
- Uploading and downloading code to a PLC
- Program status during execution by PLC
- Commenting programs:
 - Symbolic addresses
 - Symbolic block and network names
 - Comments
- Maintenance of library files
- Printing program and documentation
- Conversion from other packages

SYSWIN runs in the Microsoft Windows environment (version 3.1 or greater) on standard IBM and compatible 486 and Pentium-based desktop computers. SYSWIN is intuitive to use, and allows the programmer to rapidly configure a specific project and enter network and program data. PLC programs can be constructed in either ladder or function plan format, and previously tested networks can be recalled from libraries. A special statement list editor allows PLC programs to be viewed and checked in their mnemonic format.

These features are designed to enable users to easily adapt PLC programs to changing requirements. Additional features allow the testing of new networks in a supportive and safe environment.

The SYSWIN software can communicate with both C and CV series PLC. Serial communications with the PLC can be through RS-232C or RS-422 serial interfaces with or without a modem. Network Service Boards can be used in the PC to attach to the PLCs using SYSMAC-LINK or SYSMAC-NET networking.

Communications are handled transparently, leaving the programmer free to focus on the coding aspects of a particular PLC project.



NOTE!

It is very important that you register your copy of the SYSWIN software with your local OMRON Sales Office, in order to qualify for technical support. OMRON is not able to help you unless you have registered.

1 GETTING STARTED WITH SYSWIN

Contacting Technical Support

If you follow the installation instructions for the copy protection system in this chapter and in the Advanced Installations chapter you should not encounter any difficulties. However, if you have a problem, then contact Customer Services.

If you have a problem, it is important that you check that it does not relate to a fault outside SYSWIN. It is essential that you check the following:

- The PC is working correctly
- The PLC is working correctly
- The communications system is set up correctly
- The errors are cleared in the PLC

When you need to contact Customer Services, fill in the details in the form below. A clear and concise description of the problem is required, together with the exact text of any error messages.

Version number of SYSWIN	
Licence Number of software	
Registration Number of software	
Operating system and version number	
PLC type, model and CPU details	
Type of communications in use	
Serial	
SYSMAC-LINK	
SYSMAC-NET	
Controller Link	
Ethernet	

Licence Registration Information

SYSWIN V3.4 takes advantage of a different method of Licence Registration, which replaces the Software Token and Hardlock (Dongle), which were used on previous versions.

On the back of the CD-ROM box, and incorporated in the label of Diskette 1, is a **“Licence Number”**.

e.g. 11111-22222-33333-44444-55555

You will be asked to enter this during installation of the software. The number must be entered exactly as it is printed.

After installation of the software, a **“Registration Number”** is displayed in the software information under the **“Help”** dropdown menu.

e.g. aaa-bbb-ccc-ddd-eee

When the **“Software Registration Card”** is filled in, both the **“Licence Number”** and the **“Registration Number”** are required. Support for your software may not be available if it is not registered.

If an existing Token or Hardlock are present on a PC, and SYSWIN is installed over a previous version, you will not be asked to enter the licence number. After installation a **“Licence Number”** can be entered by selecting **“Activate SYSWIN”** from the **“Help”** dropdown menu.

About this Manual

This User Manual will help you to get started with SYSWIN, by describing the software installation and computer configuration, and by leading you through the basics of SYSWIN programming. It also provides a detailed reference for all of the on-screen SYSWIN functions.

Separate OMRON manuals describe the PLC programming structure and instruction set in detail. Some small example programs are included with the SYSWIN software, to demonstrate some of the most commonly used features, and if you are new to PLC programming, you can work through these to familiarise yourself with the software.

SYSWIN comes with a comprehensive context-sensitive online help system, which is designed to complement this manual, and provide a quick reference at any point in the SYSWIN application when the manual is not to hand. This general help system allows you to obtain progressively more information about any topic by selecting keywords within the descriptive text. In addition, quick help is provided for all PLC instructions.

Throughout this manual, it is assumed that you have a working knowledge of Microsoft Windows, and know how to:

- Use the keyboard and mouse
- Select options from Windows menus
- Operate dialog boxes
- Locate, open and save data files
- Edit, cut and paste text
- Use the Program Manager or taskbar

If you have not used Windows before, it is recommended that you spend some time working with it using the Microsoft documentation, before using SYSWIN.

This introductory section deals with several important aspects of installing and setting up SYSWIN. We recommend that you read the entire section, especially the notes on copy protection, before installing the software.

Manual Conventions

For quick reference on how to do certain tasks, instruction sequences are in bold type and arrowed (for example **▶ Click on the OK button**).

Words in bold capitals (for example: **File|Open**) refer to commands in the SYSWIN menus.

Words in italics (for example: *Save Program*) are used for options such as check boxes and buttons in dialogs.

Keyboard combinations are indicated by the key names to be pressed together, for example **Shift+F6**.

Special Symbols

The **▶** character points to an instruction

 Special instructions for C series PLCs

 Special instructions for CV series PLCs

1 GETTING STARTED WITH SYSWIN

SYSWIN Features

This new version of SYSWIN V3.4 offers increased functionality for the creation and testing of PLC programs and increases the range of PLCs it supports.

Features in SYSWIN V3.4

- Support for the SYSMAC ALPHA PLCs with 3 digit Expansion Functions
- Controller Link Protocol Support
- Communications with C-series PLCs using Ethernet via the PCMCIA interface
- Communications with a CV-series PLC using Ethernet
- Communications with a PLC via a C200H[®] Bridge using SYSLINK
- Import and export of data between SYSMAC-CDM and SYSMAC-SCS
- CV Memory Card support
- Error history log
- Project password protection
- Program Password protection
- Unit Setup
- Advanced Installations
- Support for updates to C200HX(CPU65 and CPU85)
- Additional PLC set up for C Series PLCs
- Additional CV I/O Table support
- C Series I/O Table support
- Memory Card Support for CV Series PLCs to allow for partial download

New features in SYSWIN V3.4:

- Support for the CQM1H PLC type
- Additional PLC setup support: High Speed Counter Settings for CPM1, CPM1A, CQM1, and CPM2 PLC types; Analogue settings for CQM1 (CPU45 only).

Introduction to Controller Link

SYSWIN additionally supports the Controller Link network. The Controller Link is an FA network that can send and receive large data packets flexibly and easily among the OMRON C200HX/HG/HE PLCs, CV series PLCs and IBM PC/AT or compatible computers.

The Controller Link supports data links that enable data sharing and a message service that enables sending and receiving data when required. Data link areas can be freely set to create a flexible data link system and effectively use data areas.

The network is connected using shielded twisted-pair cable, and high-volume data transmissions at high speed enable construction of a wide range of networks, from low level systems to high.

System Requirements

SYSWIN operates on IBM and compatible personal computers with 80486 or better central processors, including Pentiums. It should be possible to fully install SYSWIN on any computer that can run Windows 3.1 software.

The following configuration is recommended as a minimum system for running SYSWIN effectively:

- 50 MHz 80486 or better CPU, running in enhanced mode (90 MHz Pentium Processor is recommended)
- At least 8 Mbytes RAM (16 Mbytes RAM recommended or 32 Mbytes for Microsoft Windows NT users)
- Hard disk storage with at least 10 Mbytes of free space
- VGA or better display system (800 x 600 SVGA or higher resolution is recommended)
- Microsoft Windows 3.1 or higher (Microsoft Windows 3.11 for Workgroups is recommended)
- Mouse

It is possible to run SYSWIN in CPM1 or Demonstration mode on any machine that can run Windows software.

If you intend to connect a PLC to the computer for executing program code and testing, you will require:

- RS-232C connection via a standard serial port on the computer (COM1 etc.), or
- RS-422 connection, or
- SYSMAC-LINK Network Service Board, or
- SYSMAC-NET Network Service Board, or
- Controller Link Service Board, or
- Ethernet

Refer to the appropriate hardware system manuals for full information about connecting and configuring these devices for your environment. The Advanced Communications chapter in this manual provides detailed guidance on how to use SYSWIN for setting up communications. General information about cabling requirements is given in Appendix E.

NOTE!	Windows 3.1 is not compatible with Ethernet connections unless this service is provided by a third party package
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1 GETTING STARTED WITH SYSWIN

Token Copy Protection

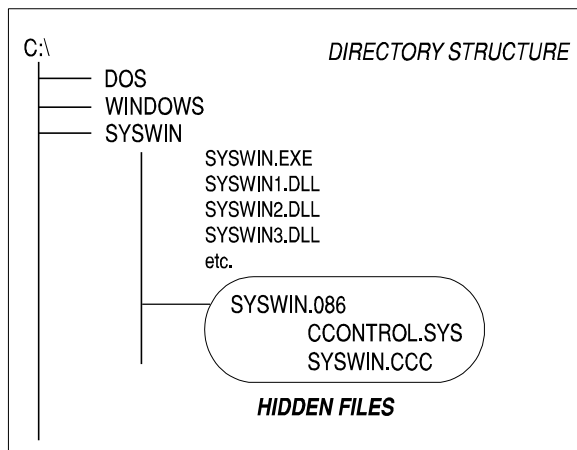
A copy protection mechanism within SYSWIN prevents illegal use of the software by locking it to a specific hard disk. The mechanism consists of an operation token, which must be installed on your system before you use the software. When SYSWIN is running, it looks for an operation token, and runs in demonstration mode if it is not found.

PLEASE READ THIS SECTION CAREFULLY! There are some important points to note about this copy protection system and how it might affect your computer.

Installation

If you are installing on a non-standard configuration, that is, not using either Windows 3.1, Windows 3.11, Windows 95, Windows 98 or Windows NT, you should read the Advanced Installations chapter before attempting to install the operation token.

When you install the operation token that protects your software, certain files are created on your system that are not normally visible. It is important that these hidden files are not moved or deleted. If they are, the operation token will be damaged, and SYSWIN will not work.



If you ever see the names of the hidden files on your screen, be careful: you may be about to invalidate your valuable SYSWIN software!

Restrictions

Your operation token must be transferred back to the master diskette, for example, if you need to move SYSWIN to a different computer, or in certain other situations. The token can only be transferred to or from an operation token diskette. You cannot install the token to a RAM disk.

System Backup

Most backup utilities do not touch the hidden files created by the protection mechanism. However, some utilities allow you to backup and restore hidden files. This option should not normally be used, because it would cause the protection mechanism to consider the token invalid. The hidden files used by the protection mechanism do not have the Archive file attribute set, so it may be possible to restrict a backup to files with this attribute set.

File Maintenance

Some file management utilities (for example: Xtree, and Norton Utilities) list hidden files, and can move them to other directories, or remove them from the system. Using this type of software, you may delete the SYSWIN copy protection files accidentally. If any software mentions these files during a maintenance operation that removes files, immediately STOP what you are doing, and move the token back to the SYSWIN master token diskette, using the Token Mover. Re-install the token after all maintenance has been done.

Disk Cache Operation

Certain disk caching software interferes with the installation of SYSWIN, and should be disabled temporarily during the installation process. The /d option of Multisoft Corporation's PC-Kwik utility should be disabled, for example. HyperCache has a non-standard option for accessing diskettes, which should also be disabled during installation.

Disk Compression

The copy protection mechanism is compatible with disks that have been compressed with programs such as *SuperStor*, *Stacker*, *DoubleSpace* and *DriveSpace*. However, SYSWIN must be moved back to the master diskette when installing any of these compression systems, as mentioned in their manuals. Failure to do so can cause the protection mechanism to consider the token invalid.

Disk Defragmenters

SYSWIN's copy protection mechanism is compatible with and not affected by disk defragmenters such as Central Point's *Compress*, Digital Research's *Diskopt*, Stac's *Sdefrag* and Microsoft's *Defrag*.

Backing Up SYSWIN Token Diskettes

The token diskettes each contain a 'fingerprint,' which is written to a non-standard track. This prevents them from being copied, even by advanced disk copying programs. You cannot, therefore, copy these diskettes for backup purposes. If the masters become damaged or lost, you must contact Customer Services for a replacement.

The SYSWIN program diskettes can be backed up, however, to allow the masters to be stored in a safe place.

NOTE!	If you are in any doubt about whether any of the actions you may perform could cause you to lose tokens, move the token back to the token disk.
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1 GETTING STARTED WITH SYSWIN

Installation

Installing the SYSWIN Software

This section deals with the installation of SYSWIN on a standard workstation. For installations related non-standard workstations please refer to Chapter 11.

The SYSWIN software is supplied on CD-ROM or on high-density 3.5" diskettes, and is installed easily from within Windows.

Installing from CD-ROM

Start Windows and insert the SYSWIN CD-ROM in the CD drive. If Autorun is enabled (Microsoft Windows 95, Windows 98 or Windows NT only), the setup program starts automatically. The setup program can be started manually, by following the instructions in the README.TXT in the root directory of the CD.

Installing from Floppy Disk

Start Windows and insert SYSWIN Program Diskette #1 in a suitable diskette drive (our example uses Drive A:). To install SYSWIN:

◆ **Launch the Run dialog**

Choose Run... from the Start button from the taskbar (Windows 95, Windows 98 or Windows NT only) or from the Program Manager File menu (Windows 3.1 or Windows 3.11 for Workgroups only). The Run dialog appears.

◆ **Enter the installation command line**

Type the diskette drive letter and the SYSWIN Setup program (for example: A:\SETUP).

◆ **Start the Setup program**

Click on the OK button. The installation begins.

Further dialogs appear during the installation:

- Select your desired language for SYSWIN operation.
- Enter a path name under which to store the SYSWIN program files.
- Select the operation mode as instructed. To fully activate SYSWIN type in the Licence Number exactly as shown on the CD-ROM or Diskette. This dialog is not shown if SYSWIN has already been fully activated with a token or valid Licence Number.

Once these are completed, the appropriate files are copied to your hard drive or the network drive. If necessary, you are prompted to insert other Program Diskettes when the software requires it.

SYSWIN V3.4 is fully activated by entering the Licence Number shown on the CD-ROM or Diskette. SYSWIN V3.4 can also be fully activated using a token or dongle from previous version of SYSWIN. For details on using tokens and dongles, consult the original documentation shipped with the previous version, and chapter 11 of this manual.

Starting SYSWIN

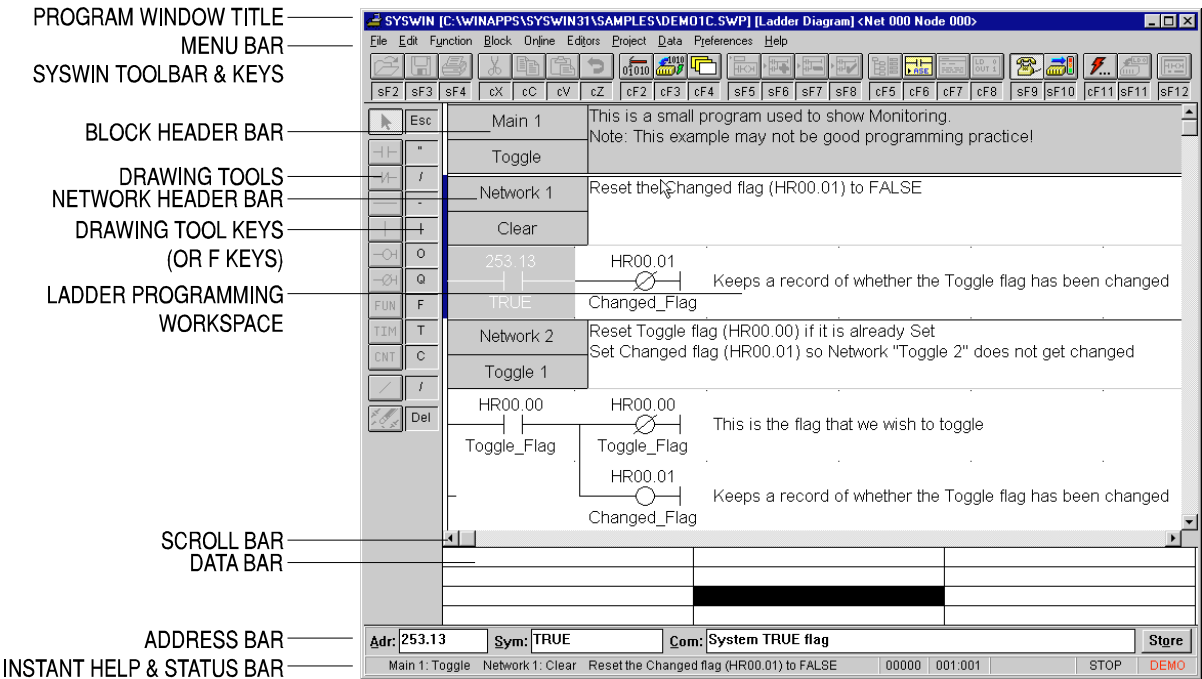
Initial Screen

After the software installation, a new group window for SYSWIN is created. The software is ready to run, and can be started by double-clicking on the SYSWIN icon.

If the default preferences have been used, the *Automatically connect to the PLC* facility will be set and SYSWIN starts by checking that the selected communications port is available. It then attempts to connect to the PLC. If the port is not available it displays an error message but still continues.

When SYSWIN first starts up, it displays a window similar to the one shown below. The SYSWIN window offers many features to ease the process of programming, using the mouse or keyboard or both. You can configure the display for any size monitor so that you have as much or as little information as you need, using options from the **Preferences** menu (see Chapter 10). Any changes you make are saved in the SYSWIN.INI file and are restored next time you run SYSWIN.

Use this section to familiarise yourself with the layout of the SYSWIN display, and to set it up as you desire for programming.



1 GETTING STARTED WITH SYSWIN

Configuring the SYSWIN Environment

SYSWIN is supplied with default settings that are suitable for the first time user and there is no requirement for these to be changed when starting the system. These are global settings and apply to all projects. These settings, for the Drawing, Window, Editing and Options, are listed in Configuring the Environment chapter where all the options are described. All settings may be viewed by selecting **Preferences** from the Menu Bar and selecting the appropriate item.

Project Preferences, which are local settings for each project, are discussed in the Working with PLC Projects chapter and are detailed in the Advanced Projects chapter.

SYSWIN Help System

SYSWIN comes with a detailed context-sensitive help system. At any time while using the software, you can get help on the particular point at which you are working, or on general aspects of SYSWIN. This system is intended to complement the manual, by providing online reference to specific functions of the software and how to use them. The manual is designed to provide more tutorial information and discuss the various facilities offered by SYSWIN.

Three levels of help are provided in the software: General Help, for dialogs, messages and menus; Quick Reference, for programming reference; Instant Help, providing brief descriptions of commonly used commands.

 = GENERAL HELP

General help is obtained by pressing the **F1** key or by selecting an option from the **Help** menu. This provides descriptive help on SYSWIN menus and dialogs, as well as guidance on messages. It can be used at any point in the software, to take you straight to the topic on which you need help. The Help menu can be accessed from the main screen editors, and is best used when you are browsing for help on the use of SYSWIN.

 +  = QUICK REFERENCE

Detailed help on programming elements - functions, timers and counters, editing and function selection dialogs - can be obtained by pressing **Ctrl+F1** while the desired element is highlighted. This is termed Quick Reference, since it displays a summary of the necessary programming information for any specific item.

If there is not a valid instruction highlighted then Quick Reference starts up on the contents page and allows you to click on any item to have help information displayed.

In the Statement List Editor **Ctrl+F1** can also be used in the same way if you place the cursor over an instruction.

When the bubble help facility (see the Configuring the Environment chapter) is switched on, a brief description of each button is displayed when the cursor is positioned over it for a few seconds.

Status Bar

There is a general status bar at the bottom of the SYSWIN screen. This provides several helpful pieces of information while programming:

<i>Instant Help</i>	A brief message appears in the Status Bar as menu commands and buttons are selected. This field normally shows the current block and network information.
<i>Step Number</i>	This is the step number of the first instruction in the network.
<i>Cursor position</i>	The point in the ladder program where the cursor is currently located.
<i>Online Edit status</i>	The online status.
<i>PLC mode</i>	When connected to a PLC, this shows the current PLC mode. Connection errors are also displayed here.
<i>PLC scan time</i>	This field is only shown when the PLC monitoring is active, and indicates the scan time for the currently executing program.

The SYSWIN status bar can be enabled and disabled with the **Preferences|Window** dialog.

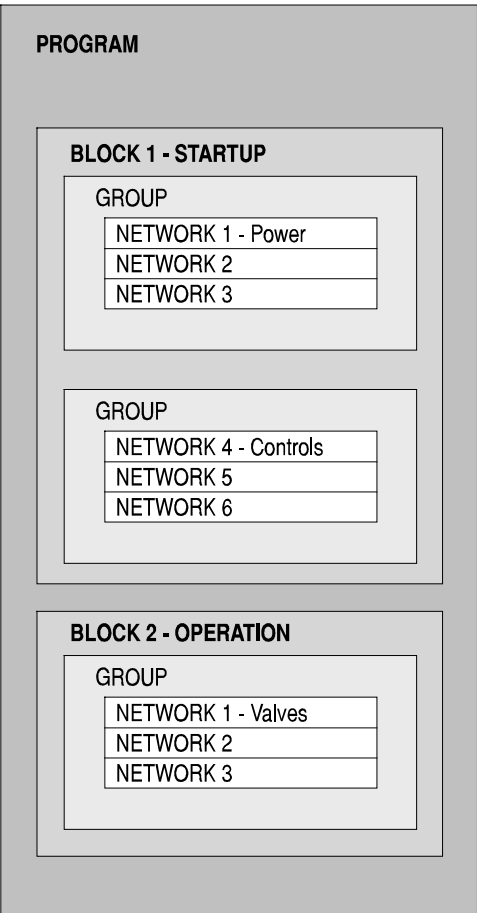
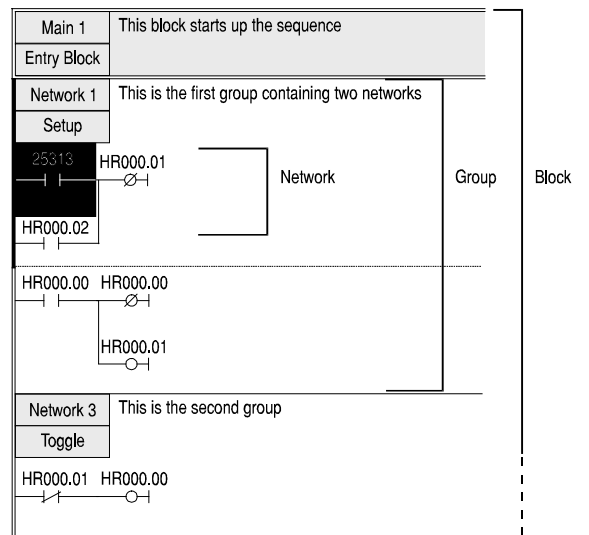
2 WORKING WITH PLC PROJECTS

Program Structure

Although it is possible to create a program that consists of a simple series of networks, SYSWIN encourages you to break down a program into groups of networks, which form functional blocks.

The concept of programming in blocks is designed not only to make it easier for you to work through a program, by splitting it into manageable chunks, but also to maintain the program after it has been in use for a while. Programming in blocks also eases the process of creating library modules that can be incorporated into future programs.

SYSWIN encourages the creation of groups of networks within blocks, again promoting the concept of working in a structured manner, as shown in this example:



Typical SYSWIN program hierarchy

2 WORKING WITH PLC PROJECTS

With CV series PLCs, interrupt routines are held in separate blocks, and main blocks are sequential and joined together. For both C and CV series, the last block in the main program must contain the END instruction, as normal.

Way of Working

Normally you would not be connected to the PLC when preparing the main structure of a program. After programming you would check the program carefully before connecting and downloading it to the PLC. Checking of program syntax and validity of functions is done by SYSWIN at various times as a protective mechanism, but any logical checking that you do speeds up the debugging process.

The use of the **Project|Program Check** feature described later in this chapter should be noted to ensure that the program you are creating is compatible with the PLC you propose to use.

However, SYSWIN's editing features make it very practical for you to program more interactively while connected, especially if the PLC has no critical outputs connected. This way, your program is verified as each new network is entered, and the project is kept constantly up to date as a working system.

Setting Up a Project

When planning a PLC programming project, various items need to be considered and set up within SYSWIN before beginning to lay down program instructions. For example, it is important for SYSWIN to know the model and configuration of the PLC you wish to program, so that it can establish the correct program checking and communications for that PLC. Programming should, wherever possible, be done for the PLC that is to be used. Once set for a project, it is not advisable to change the PLC, and preparation of an initial specification for the program is therefore recommended.

Project Checklist

Before programming, it is recommended that you make up a checklist of the important program aspects, including its structure and PLC parameters. To start a new project in SYSWIN, you should follow these steps in addition to the basic procedure outlined in your PLC programming manual:

◆ **Determine essential parameters of the PLC**

The SYSWIN project setup needs to know:

- PLC series (C or CV)
- PLC type (C200H, CQM1, etc.)
- CPU (where applicable)
- Type of communications interface
- Your choice of editor and project type.

◆ **Assign specific project information**


Text information should be provided at least for:

- Company name or originator
- Project and version number.

◆ **Check the project preferences**

Determine how you want the project to be displayed, and how the statement list code is to be generated.

◆ **Allocate PLC memory (where applicable)**

-  Work out the balance required between program memory and expansion data memory.

◆ Establish the PLC setup parameters

Configure the parameters necessary for the desired way of running the PLC. Some C Series PLCs do not support this function.

◆ Create the appropriate I/O table

List all I/O devices and addresses related to them. Some C Series PLCs do not support this function.

◆ Create a basic structure for the program

Note how you plan to group functional networks to make up program blocks (for example: startup, control, shutdown).

◆ Decide how to input and edit the program

SYSWIN offers two main methods of working on a program: ladder diagram and function plan. The Statement List Editor allows you to view and check programs at the instruction level, once a diagram has been created.

Project Setup

This dialog, accessed with the **Project|Project Setup** command, establishes the PLC type, so that SYSWIN can perform proper checks while you work. It also appears automatically when you select the **File|New** command.

There are no defaults for the Project Setup, however, features are preselected by SYSWIN to give you a starting point for a project. The Advanced Projects chapter gives details of all settings that can be selected for the project, but the following are the initial settings made by SYSWIN.

Series:	C
Editor:	Ladder
Project Type:	Program
PLC Type:	Model CPM1/CPM1A
	CPU All
Interface:	Serial Communications
Bridge Option:	Direct
Modem Option:	Local
Coding Option:	SYSMAC-WAY

Accepting these settings allows you to start a project, but it is important to ensure that they match with the PLC and the Communications method that will be used.

Further information on the options is available in the Advanced Projects and the Advanced Communications chapters.

NOTE!	While you can switch between ladder and function plan editing as you work, it is strongly recommended that you choose one method and continue with it for best progress.
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2 WORKING WITH PLC PROJECTS

Project Information

Though not essential when starting, it is good practice to set up the project front page information before programming. This information is printed when the front page option is selected at printing time, and can be viewed any time to verify that you are working on the correct project. It can be changed at any time without affecting the program.

Company

Insert your company or organisation name here.

Plant

The site where the program is to operate, or the equipment with which the PLC is to be attached.

Project

A name for the overall project. This could include the PLC type and model number for completeness.

Version

Current version of the software. This should be updated every time the program is changed after it has been first released. Until the program has been tested and debugged, it should be clearly indicated as unfinished.

Promotion













This field can contain a release number or date, indicating when the program was issued and went live, or be used as a comment field.

Creating Ladder Programs

This section describes in a tutorial style the process of preparing ladder programs with SYSWIN, and how to use the various tools to improve your productivity. SYSWIN offers many methods of working with its tools: you can use either the mouse or the keyboard to prepare a program, and experimentation with both is worthwhile if you are new to this software. In general, instructions here are given for keyboard usage.

Use the **File|New project** command to start up a new project. The Project Setup dialog appears, to enable you to set up the basic parameters as described in the previous section. You are then returned to the programming workspace, ready to input instructions into the first network.

The example program that is used in this section is for a C200H PLC. If you wish to work through the example, select this PLC type and model in the Project Setup dialog.

	KEY	FKEY	DRAWING TOOL
	Escape		Selection Tool
	"(quote)	F2	Draw Open Contact
	/(slash)	F3	Draw Closed Contact
	-(hyphen)	F4	Draw Horizontal
	(bar)	F5	Draw Vertical Short
	O	F6	Draw Output
	Q	F7	Draw Negated Output
	F	F8	Draw Function
	T	F9	Timer
	C	F10	Draw Counter
	/(slash)		Negate Existing Element/ Differentiate Existing Function
	Del		Delete Element

About the Keyboard

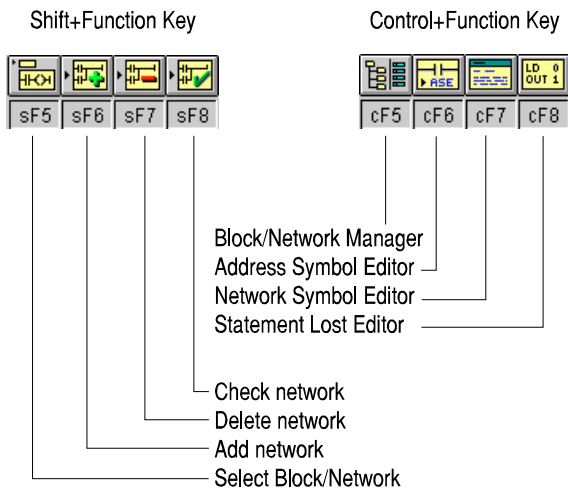
Navigating through the SYSWIN screen is straightforward with the keyboard, using function and editing keys as appropriate. The function keys select SYSWIN operations from the toolbar at the top of the screen. For the drawing tools, you use keys that look like the symbol they draw, for example - the '-' key for a horizontal short.

SYSWIN dialogs work in the same way as in other Windows applications: you can use the mouse to select a field or button, and to make selections from list boxes.

The keyboard can be faster, however, especially if you are in the habit of using it during your general programming work.

Selecting options and fields is done by holding down the **Alt** key while pressing the letter that is underlined in the field name, or by using the **Tab** key to move from field to field in sequence. **Shift+Tab** moves backwards through each one.

Toolbar Programming Functions



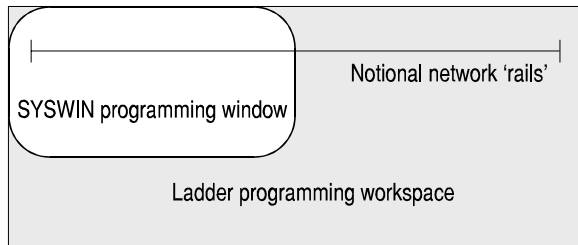
The **Enter** key normally accepts the dialog. The **Escape** key closes the dialog if there is a *Close* button on the dialog, or cancels if there is a *Cancel* button displayed.

2 WORKING WITH PLC PROJECTS

Ladder Programming Workspace

The main area of the SYSWIN screen is devoted to the ladder program display, as a window covering part of the total programming workspace. To view a larger portion of the workspace, you can use **Preferences|Overview Mode** command - selecting this same command again switches back to normal mode.

When first running SYSWIN, or opening a program, you will always see the lefthand 'rail', from which ladder program networks always begin. A righthand rail exists in the workspace, at its extreme right, but this is normally off the screen. When you complete a network, outputs are drawn showing a small vertical bar to indicate the right rail. This saves having to scroll the display to see the righthand side of your networks.



NOTE! Within a network it is possible to create more space at the bottom of the network by pressing the space bar as many times as necessary.

Navigating Networks

The currently selected network is generally displayed at the top left of the workspace window. The lefthand side of the power rail is highlighted and the program scrolls as you move up and down between networks. SYSWIN has a keyboard interface that allows the **Up** and **Down** arrow keys to roll up and down between networks. **PageUp** and **PageDown** keys scroll the screen by full pages. The **Block|Insert network** command (**Alt+Insert**) enables you to create a new network, above or below the selected one. Using the mouse, double-clicking on the left side of the current network bar, if visible, inserts a new network above it.

Within a network, the current position is indicated by a highlighted rectangular block, called the cursor. As you move around a network, using the arrow keys, the cursor moves with you. You can go directly to any point in the program by clicking the mouse on the desired location. The cursor is actually highlighting the element or space at that point, and if you enter an element, it *replaces* the one displayed. To insert elements between others, you must first use the **Edit|Insert row** or **Edit|Insert column** command (**Alt+Down** and **Alt+Right**) to create a space into which the new element can be entered.

You can place elements anywhere within the workspace of a network, but the network is not considered complete until you link elements together. If a network check is satisfactory, the network is automatically redrawn and tidied up, bringing everything to the left rail, with the minimum distance between each element. A network is checked when you move to or insert a network after an edit, when you change any of the PLC parameters, when you select the Statement List Editor, and at other times when SYSWIN requires a network to be complete before continuing. To force a check at any time, press **Alt+Enter** or **Shift+F8**.

The maximum network size in SYSWIN is 100 rows by 25 columns.

Creating a Network

Bearing in mind that individual networks should be kept as simple as is practical, they can be entered rapidly. In the simple example below, there are three elements in the first network. The elements are placed in sequence, working from left to right, following these keystrokes (the function key equivalents can be used if preferred):

- ◆ **Press the “” (double quote) key to place an open contact**



The Contact Dialog appears, to allow you to enter more information.

- ◆ **Enter ‘253.13’ as the address, then press Enter**
The address identification is displayed above the symbol in the program.

- ◆ **Press the “” (double quote) key again to place another contact**



The Contact Dialog appears again.

- ◆ **Enter ‘HR1’ as the address, then press Enter**
The address is displayed as before. Notice that it is expanded into its full bit format - HR00.01.

- ◆ **Press ‘-’ two or three times**



The connecting horizontal line moves to the right.

- ◆ **Press ‘O’ to place an output**



The Output Dialog appears.

- ◆ **Enter ‘200’ as the address, then press Enter**

The symbol is displayed with its expanded address shown as 2.00. Since it is an output, it has a righthand ‘rail’ attached. This network is now complete.

- ◆ **Press Alt+S, to move to the address Symbol field**
Enter a symbolic name for this output, then press **Enter**. The cursor returns to the network and shows the name below the output.

- ◆ **Press Alt+Enter to check the network**



The network is redrawn. Notice how it has been compacted to eliminate the redundant horizontal lines that were entered.

NOTE!	Keys used together with Alt and Ctrl keys may be different for implementations in different languages.
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The key points to note from this small exercise are:

- Simple keystrokes are used to place elements
- Addresses can be entered in abbreviated form
- Redundancy is automatically removed on check
- Symbolic names can be entered later if desired, although it is good practice to create them as the program is entered.

About Addresses

It is important to use the standard form of addresses in SYSWIN. Addresses may have two components - a channel number and a bit number - and these should be separated by a dot. In the example above, the address ‘200’ has been interpreted by SYSWIN as ‘2.00’. If we had meant to use bit zero at address 200, it would have been necessary to enter it as ‘20000’ or (preferably) ‘200.00’. Note that in the second step of the example, we used ‘253.13’ to illustrate this, where we mean bit 13 in channel 253.

2 WORKING WITH PLC PROJECTS

Adding to a Network

Any network can be expanded with simple editing functions. For example, to create a simple OR instruction at the start of the network just entered:

✦ **Position the cursor on the leftmost element**

Use the arrow keys to move it there.

✦ **Press the space bar to create a new element line**

The network expands downward, and the cursor is at the left rail. Press the down arrow and you are ready to insert a new element.

✦ **Press the “” (double quote) key to place an open contact**



The Contact Dialog appears as before.

✦ **Enter ‘HR0’ as the address, then press Enter**

The window closes and the address is expanded to HR00.00 above the drawn symbol.

✦ **Press the Up arrow to move up to the top line**

The cursor is positioned ready to insert a new vertical connecting line. Note that the line is inserted on the left side of the cursor.

✦ **Press ‘|’ or ‘!’ to insert a vertical connecting line**



The first and second lines are now connected.

The network is now complete as everything is connected. Press **Alt+Enter** to check it is valid and to redraw the network.



To view the actual instructions generated by this network, use the Statement List Editor. Select the editor via the **Editors** menu, or by clicking on its button on the toolbar (**Ctrl+F8**). The instructions are listed in mnemonic format, and can be edited in the normal way. If everything is correct, then the ladder is redrawn; if errors are detected, then you are warned. The Statement List Editor is described in detail later in this chapter.

Adding Comments to a Network



It is recommended that you add comments to networks as they are written, so that it is easier to understand their functions when reviewing the program later. You use the Network Symbol Editor to name a network and add suitable comments. Start the editor by selecting it from the **Editors** menu, by selecting the *Network Symbol Editor* button on the toolbar (**Ctrl+F7**), or by simply double-clicking the mouse on the network comment bar (if it is visible).

In the Network Symbol Editor, a network can be given a name up to 15 characters long, and up to 30,000 characters of text as a description or comment. Note that text can be wrapped to fit onto the display screen.

The Network Symbol Editor is described in more detail later in this chapter.

Adding More Networks



After the initial entry of a program, you usually need to add further networks. Use the **Block|Insert network** command to open a new network (the preferred shortcut is **Alt+Insert**). Alternatively, select the button on the toolbar (**Shift+F6**). You are asked to specify whether you want the new network to be above or below the currently selected one.

A new network area appears in the workspace, and you can begin entering the new network immediately.

NOTE! Individual networks must be entered separately, and all elements must be joined together in a network.

Blocks and Networks

At the top of the program that you have entered, there is a block header above the first network. This is automatically created by SYSWIN when a new program is started. Although a program can be produced within a single block, it is strongly recommended that you break up the program into small manageable groups of networks within separate blocks.

You use the Block/Network Manager to form groups of networks, and to provide names and comments for the blocks you have created. The Block Symbol Editor is started through the **Editors** menu, or through the **Block|Block / network manager**, which has its own toolbar button (**Ctrl+F5**). Double-clicking on the block header bar also opens the Block Symbol editor.

Block information is entered in the same way as with the Network Symbol Editor, and once accepted, it is displayed on the block header in the ladder workspace.



You are always working within a single block, and while in that block you have access only to the networks it contains. To move to another block of networks, you must use the **Block|Select block / network** command, accessible with a toolbar button (**Shift+F5**). This dialog allows you to go directly to a specific block or network anywhere in the program - it also provides a search-by-name facility for networks.

NOTE! You can also switch between blocks by using the **Ctrl+Shift+PageUp** and **Ctrl+Shift+PageDown** keys.

A detailed description of the Block/Network Manager is provided later in this section.

Entering Functions, Timers and Counters

All ladder programs use functions in addition to the basic instructions, and most use timers and counters. These are entered in much the same way as symbols, but because most of them require data parameters on which to operate, the process involves different dialogs.

Functions

SYSWIN uses your setting of the PLC type, together with your function mapping parameters (where they apply) to determine which functions are available to use. When a function is selected, a dialog box is displayed requesting the necessary data.

If you know which function you wish to insert in a network, the easiest way to enter it is to use the 'F' key. This displays the function dialog box, and you can type in the name or number of the function.

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SYSWIN follows your typing, and as soon as it identifies a valid function, its complete name is displayed for you, and the parameter fields are displayed. When entering a function that may be ambiguous, enter a space after the last character (for example: **MOV<space>** to force identification of a MOV(21) function, and not a MOVD).

When you are unsure about a function name, press the *Select* button. This displays the function group list box and the functions in the highlighted group. Move the cursor to the group you require and select the appropriate function from the list. Exit the selection dialog, and complete the function parameters. Pressing the *Reference* button or **Ctrl+F1** displays Quick Reference on any specific function that is highlighted.

Enter the appropriate values in each data field, using the **Tab** key to move between them. SYSWIN validates the data that you have entered when you accept the dialog. If you have entered an incorrect parameter, an error message appears, telling you which one is incorrect, and why.

When a function is drawn, its inputs (and occasionally output) are indicated by unterminated lines. These need to be connected to other parts of the network before the network is complete.

Differentiated Functions

Most functions are available in differentiated and non-differentiated forms. They are identified by special symbols in front of the name. When a function can have more than one form, the dialog provides extra check boxes. Alternatively, you can use special characters when typing a function name, and SYSWIN converts the function as appropriate:

@	Differentiate UP
%	Differentiate DOWN
!	Immediate refresh

The availability of differentiated functions, contacts and outputs depends on the PLC type, as shown in the table here.

PLC Type		Diff Up	Diff Down	Refresh
<div>C</div>	Functions	✓		
<div>CV</div>	Functions	✓	(SET/RSET only)	✓
	Outputs			
	Contacts	✓	✓	✓

Timers and Counters

Use the 'T' key to place a timer, and the 'C' key for a counter. In both cases, a small dialog will request a value parameter, as well as the necessary timer or counter number.

On the ladder diagram, a timer requires one input execution condition, while a counter requires two inputs - the execution condition and a reset.

Using the Function Menu

An alternative way of selecting functions and other ladder instructions is to use the **Function** menu. This groups together similar types of instructions, and for each menu command, a dialog is displayed which allows you to select the appropriate item from a list.

This menu is useful in helping to choose the correct instruction for a network, especially when the detailed PLC programming manuals are not available. In addition, while you are in one of these dialogs, selecting an instruction and pressing **Ctrl+F1** brings up Quick Reference on the syntax and usage of the instruction.

NOTE!	You can use Ctrl+N to Negate, Ctrl+U to differentiate Up, Ctrl+D to differentiate Down and Ctrl+I to Immediate Refresh the selected element.
--------------	--

Editing Networks

Networks can be edited at any time, even while connected to a PLC, and each edit is verified by SYSWIN as it is entered. Some of the editing controls can be used to speed up programming, for example by cutting and pasting between networks.

Once a function, timer or counter has been drawn, its parameters can be changed. To do this, select the instruction by moving the cursor onto it and press **Enter**, or double-click on the instruction with the mouse. If you double-click on one of the parameters in the ladder diagram, that one is highlighted in the editing dialog when it opens.

Using the Address Bar

The addresses, symbol names and comments assigned to each symbol can be changed easily. The quickest way to add symbolic information is to use **Alt+S** to move to the Symbol field in the address bar at the bottom of the screen. After entering a name, use the **Tab** key to move to the Comment field. After entering a comment, the **Enter** key stores the symbol and takes you back into the ladder diagram.

NOTE!	Keys used with Alt and Ctrl keys may be different in implementations in other languages.
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Alternatively, you can use the **Tab** key to move the editing cursor out of the diagram to the address bar. Then you can just tab through each of the fields back into the diagram. You can use **Shift+Tab** to move in the opposite direction. While the editing cursor is outside the ladder diagram, the cursor over the element turns grey. It returns to black when you move the cursor back into the ladder diagram.

For global editing and manipulation of symbol information, use the Address Symbol Editor as described later in this chapter.

Manipulation of elements and networks is done with a wide range of editing commands. These allow you to select, copy, move and delete elements.

Selecting Network Elements

To select an element anywhere in the program, use the page keys or scroll bars to locate the network, and move to the element with the arrow keys, or just click on it.

Once the editing cursor is positioned over an element, a block of elements can be selected by holding down the **Shift** key while using the arrow keys to move around and add to the block - the highlighted area grows as you do so. Having selected an area with the **Shift** key still held down, if you move back into it with an arrow key, the appropriate elements are de-selected. With the mouse, it is necessary only to click and drag from a start point to select and de-select elements. In all cases, the selection remains active until you move the editing cursor with the mouse or the keyboard arrow keys.

If you wish to select a specific path through a network, and not a simple block, hold down the **Control** key while clicking on the items you require. To deselect a path, release the **Control** key and click on any of the elements in the same network.

Deleting Network Elements

A single selected element in a network can be deleted with the **Backspace** or **Del** key, but to delete group selections you must use the **Del** key. Note that the **Del** key deletes without moving the cursor, while **Backspace** moves the cursor to the next element to the left. If you use these controls to delete the entire contents of a network, the network is still open (keeping its name and comments), and you can re-program it.



To delete a network completely, removing it from its parent block, use the **Block|Delete Network** command (**Alt+Delete**), or click the delete button on the Toolbar (**Shift+F7**). Note that once deleted, a network cannot be restored, using Undo.

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Copying Network Elements

Elements and networks can be copied to other parts of a program, or to another program, with the normal Windows cut-and-paste facility. For example, to copy part of a network from one place to another in a program, first select the section to be copied.



Use the **Edit|Copy** command (**Ctrl+C**), or click on the copy button on the Toolbar. The selected elements are copied into the internal clipboard. Now you can move to another part of the program, or even open a different program, before pasting the copied elements.



To paste the elements, position the editing cursor at the point where the elements are to be pasted. If you are copying an entire network, you need to insert a new network ready to receive the elements. Use the **Edit|Paste** command (**Ctrl+V**), or click on the paste button on the Toolbar.

Moving Network Elements

The procedure to move an element or group to another location in the program is the same as for copying, described above, except that the **Cut** command from the **Edit** menu (**Ctrl+X**) is used in place of the Copy command.



The **Cut** command, and its button equivalent in the Toolbar, deletes the selected elements from the current network after making a copy in the internal clipboard. To insert the selection elsewhere in the program, use the **Paste** command (**Ctrl+V**).

Restoring Networks

A networks can be restored to its earlier state, regardless of the number of changes made in the ladder workspace. There are two types of restore command in SYSWIN:



The **Edit|Undo** command (**Ctrl+Z**), or its toolbar button equivalent, restores the current network to the state it was before the most recent operation.

The undo command can be used repeatedly to step back through a sequence of operations. Only those operations that can be reversed are undone.

The **Block|Restore network** command restores the network to its most recent state, that is, either when last tested by SYSWIN, or last opened.

Saving and Loading Projects

Maintaining project files on disk is done in the same way as in other Windows applications. The *File* menu provides the necessary options for working with files, and some of these are also available as buttons on the SYSWIN toolbar for convenience.

SYSWIN project files are stored in a dedicated format, and can be read only by the SYSWIN software. Several types of file are used, according to the method of programming used to create a project, and the version of SYSWIN that was used to create them. Project files are identified by a filename extension added to the project name, as follows:

Project.SWP	SYSWIN 2.x/3.x Program
Project.SWL	SYSWIN 2.x/3.x Library
Project.SWT	SYSWIN 3.x Template
Project.SWB	SYSWIN 2.x/3.x Backup File
Project.SWN	SYSWIN 1.x Program
Project.PRG	PMD Program

You can save the project at any time. During testing, and especially when working while connected, it is recommended that you create copies as the project proceeds, which allow you to restore a previous version more easily. However, when a project is saved, the previous version of the file is renamed to become a backup file (.SWB), so that you can easily move back one version by copying the backup into the current file.

Whenever you make changes to a project, SYSWIN reminds you to save your project if you wish to open another project, or if you exit from the application.

Saving a Project to Disk



The **File|Save project** command stores a project on disk, and if it has already been saved once, overwrites the file with the latest version. You can use the toolbar button (**Shift+F3**) as an alternative to the menu selection. With a saved project, this option simply updates the files on disk, with no further prompting.

When you first save a new project, a standard Windows file save dialog appears, allowing you to locate and name the file. Follow these steps to save the project:

- ◆ **Locate the directory in which to create the file**
Use the *Directories* and *Drives* fields to navigate to the desired location. Any existing files in the directory you choose are listed, but greyed out.
- ◆ **Enter a name for the project**
Select the *File Name* field, and enter a suitable project name (up to 8 characters long).
- ◆ **Check the format in which the file is to be saved**
The program is saved either as a project file (.SWP), a library file (.SWL) or as a template file (.SWT) depending on how it is defined in the *Project Setup* dialog.
- ◆ **Click on OK to save the file**

Saving a Copy of a Project

The **Save project as** command, enables you to save the current project in a new file. It can be used the first time a project is to be saved or when you want to change the file name or its location. When selected, it displays the standard save dialog box, as described above, and you should follow the same steps to create the new file.

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Loading a Project From Disk



A saved project can be opened for further work with the **File|Open project** command (or you can use the toolbar button - **Shift+F2**). If a project is already open when you select this command, you are asked if you wish to save the current project before proceeding. The Open Project dialog is similar to the Save Project dialog. Follow these steps to open the project:

- ✦ **Locate the directory in which the project resides**
Use the *Directories* and *Drives* fields to navigate to the desired location. All existing files in the directory you choose are listed.
- ✦ **Select the formats you wish to have listed**
The *List Files of Type* field provides a list box showing formats available for viewing.
- ✦ **Select and open the desired project**
Double-click on the name of the file you wish to open, or click once on it, then click on *OK*.

Alternatively, if you know the name and location of the project you wish to open, you can enter its complete pathname in the *File Name* field.

When you accept the dialog, the project file is opened and displayed in the programming workspace. All of the parameters relating to the project are set automatically.

Editors

Editors are supplied in SYSWIN to perform functions additional to the basic Ladder Editing. The following sections in this Chapter describe those editing functions that are provided in the Statement List Editor, the Address Symbol Editor, the Network Symbol Editor, the Block Network Manager and the Block Symbol Editor.

Statement List Editor

The actual PLC instruction code which underlies any ladder program can be viewed and edited with the Statement List Editor. It allows you to verify the contents of networks in instruction format, and make changes as necessary. You can use the Statement List Editor to create an entire program, though the features of SYSWIN encourage a more intuitive programming method using ladder diagrams. This editor is intended to enable the viewing and modification of networks when the need arises.



The Statement List Editor is opened with a command from the **Editors** menu, or by clicking on the Statement List Editing button on the Toolbar (**Ctrl+F8**). This dialog operates with the ladder display, so that when you move between networks, the ladder display moves too, and always shows the same network as selected in the editor. Use the *Previous* and *Next* buttons to step from one network to the next.

The *Network* and *Name* fields from the current network header are displayed - the name field can be changed with the Network Symbol Editor.

Statement List Display

The instruction list can be displayed in either address or symbolic format, depending on your selection for the *Display* option. If you have used the other editors to create symbol names for addresses, the information displayed here in Symbol mode makes it easier to follow the instruction listing. You can only change between display modes when the instructions are valid.

Editing a Statement List

Instructions are entered as normal text, similar to Notepad. You can use the Windows cut, copy and paste tools (**Ctrl+X**, **Ctrl+C** and **Ctrl+V**) in the usual way to edit the list, and the mouse to select items for copying or deleting. **Ctrl+Z** can also be used to undo the last change.

When entering instructions, you can use upper or lower case characters. SYSWIN automatically converts to upper case when the network is next tested. You should separate instructions from operands with a space or a tab (entered as **Ctrl+Tab**), and allow the editor to correctly format the list.

While normal instructions can be edited within the ladder diagram, block programming statements must always be edited using the Statement List Editor.

Verifying a Statement List

Several instructions can be entered in sequence - no checking of syntax or network completeness is done until requested. The *Test* button allows you to verify the list while staying within the current network. The *Next* and *Previous* buttons at the bottom of the dialog also force a check, as SYSWIN does not allow you to close the editor or move to another network without checking the current one.

If an instruction cannot be understood by SYSWIN, that instruction is highlighted in the list, and you must correct it before leaving the editor.



Some sequences of instructions may result in SYSWIN being unable to draw the network. In this case, you are able to leave the editor, but the ladder diagram shows a special symbol, replacing the network display, to show that it cannot be drawn. This situation should be avoided wherever possible.

There are two situations that cause this to happen: instructions that cannot be sequenced properly and block programming instructions. Block programming instructions cannot be drawn in the ladder diagram, because they represent sequences of instructions rather than a powerflow network.

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Restore

Use this button to return the list to its original state when you entered the editor, or to the last tested version. The complete list is restored, regardless of the number of changes you have made.

Browse

This button allows you to choose a symbol or address from the Address Symbol Editor without leaving the Statement List Editor.

Close

The *Close* button forces a network check, and you are returned to the ladder display, with the network redrawn to reflect the changed situation.

As described above, any inconsistencies in the network cause an error to be generated, and although you can continue and ignore it, it is recommended that it is thoroughly checked before closing the dialog.

Address Symbol Editor

The addresses used within the program can be given symbol names to make it easier to read and understand a program. These names can be entered and edited directly with the Address Bar at the bottom of the screen at the time when elements are placed in the network. The Address Symbol Editor provides a straightforward way of entering this information as a separate task, allowing you to assign symbol names to any address.



The Address Symbol Editor is accessed through the **Editors** menu, or by clicking on the Address Symbol Editor button on the Toolbar (**Ctrl+F6**). The dialog displays all addresses and symbols that have been created in the project, and offers several editing facilities. Symbolic information is displayed at the bottom of the dialog, in the editing fields.

When you enter the dialog, the *Find* field is highlighted, so that you can immediately enter part of an address or symbol name that you wish to search for.

The list of addresses is given in numeric or symbolic sequence. You can use the *Sort Order* options to switch between them. The page and arrow keys can be used to locate any address. You can also use the mouse to directly select an address by clicking on it.

If the editor has been started as a Browser from another editor, then *OK* enters the selected address back into the previous editor.

Store

After editing each address symbol, use the *Store* button to save it into the project. When you are editing address symbols in the bottom section of the dialog, the **Enter** key will store the information.

New

Use the *New* button to add an address and symbol name to the table. The cursor moves into the *Address* field, so that you can enter the number of the address you wish to add.

Find

The *Find* field allows you to enter a partial or complete address or symbol name to be found. As you type, addresses matching that name are searched for in the list and the first name that matches is highlighted. Then, to edit the name and comment, just press **Enter** or click on the *Edit* button.

Edit

Having highlighted an address, either by searching or by direct selection, the *Edit* button takes you into the *Symbol* field ready to change the symbol. Alternatively, you can use the **Enter** or **Tab** keys to move to the *Symbol* field.

Delete

This button deletes the selected entry from the symbol list. Deleting an entry does not affect the program itself, just the information associated with an address.

Load

Address Symbol information can be imported from another SYSWIN project. Use the *Load* option to open a file and have the address information automatically brought into the current program. When the file to load is selected, SYSWIN gives you three options. The first option is to Merge the file with the present one overwriting ones with the same name. The second option Merges the file but does not overwrite Address Symbols and the third option Loads the file and replaces all Address Symbols currently loaded.

Purge

After intensive editing operations, the program may contain symbolic information which is not attached to any element of the program. The *Purge* option scans the program for unattached symbols, and deletes them from the symbol table.

The current network must have been tested before any unused addresses are purged from the list.

Scan

This option scans through the program for addresses that have been used, but which have not had symbols assigned to them. These are then listed, and you can select each address in turn to enter the appropriate information in the *Symbol* and *Comment* fields. Note that this option is available only when the display is sorted by Address.

The current network must have been tested before any new addresses appear in the list.

Auto

SYSWIN provides the *Auto* option for adding comments to sequential addresses. When this is enabled, typing an address such as HR1, starts the auto-numbering. After you have entered a symbol and comment, pressing **Enter** causes the next unallocated address (for example, HR2) to appear automatically, ready to be given a symbol.

Save

This button saves the Address Symbol information in .PMF format via a standard save dialog.

Close

This button closes the dialog - alternatively you can press the **Escape** key. Any changes not saved with the *Store* button are lost.

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Network Symbol Editor

To add comments to networks, you use the Network Symbol Editor. With this editor, networks can be located and given a name, and comments can be added. The information is displayed in the network header, and can be used in place of the network number during searching operations.



The Network Symbol Editor is accessed through the **Editors** menu, or by clicking on the *Network Symbol Editor* button on the SYSWIN Toolbar (**Ctrl+F7**). A useful shortcut is to double-click on the comment in the network header bar. This displays the dialog to enter and change information.

The dialog operates in conjunction with the display. As you move between networks with the *Previous* and *Next* buttons, the appropriate network is displayed in the programming workspace, so that you can see which network you are working on.

The Network Symbol Editor can be started from within the Block/Network Manager by pressing the *Name* button.

Restore

Use this button to restore the *Name* and *Comment* fields. All changes done to the current network will be discarded.

Insert and Remove

The *Insert* and *Remove* buttons are normally used to realign comments after a program has been uploaded from a PLC.

The *Insert* button pushes all the following comments down by one network. It allows you to open a gap in the network list to accept a new name and comment. All network names and comments after the insertion point are shifted down. The comments on the last network will be pushed off the end and lost.

The *Remove* button removes the current Name and Comment and pulls those below up by one network. The last network therefore does not have a name and comment.

Making Network Groups

When the *Show Network Groups* option is switched on (using the Project Preferences), the Network Header display appears on a ladder workspace only if the network has been given a name. If the networks below the current one are not given names, then the networks appear to form a group.

Block / Network Manager

Using the Block / Network Manager, you can structure and add comments to PLC programs. The Manager consists of a main dialog which is used to gather networks into blocks, and provide access to general block and network maintenance such as selection, insert, modify and comment.



The Manager is started from the **Block** menu, or with its toolbar button (**Ctrl+F5**). Blocks and networks are displayed as lists of numbers and names. Note that the list of networks are only shown for the currently selected block.

As you move up and down with the arrow keys or the mouse, the workspace behind changes so that the selected network is at the top of the window. You can then check that you are at the correct point in the program. The *Name* button then starts either the Block or the Network Symbol Editor as appropriate. Double-clicking on an item in a list also starts the editor.

The buttons at the bottom of the dialog perform standard editing functions on a block or network. They provide a convenient way of doing globally many of the tasks that can also be done as you program.

Find

The *Find* field allows you to enter a partial or complete network name for searching. As you type, networks matching that name are looked up in the list and the first name that matches are highlighted. Then, to edit the name and comment, press the *Name* button.

Find Next

This option searches for the next item that matches the name entered in the *Find* field.

Insert

A new block or network can be inserted in the program, above the current position in either list. Either the Block or Network Symbol editing dialog appears, and you can add comments to it before entering networks into the program.

Name

Allows any block or network name and comment to be displayed and modified, again by displaying the necessary dialog.

Delete

This option removes the currently selected block(s) or network(s) from the program. A warning message is given before the selection will be deleted. The **Del** keystroke can be used as a shortcut for this operation.

Cut, Copy, Paste

These options operate like the standard Windows editing commands from the **Edit** menu, and provide a shortcut mechanism for copying items, moving them, and changing the sequence of blocks and networks within a program. For these operations, you can also use the standard keyboard shortcuts: **Ctrl+X** (Cut), **Ctrl+C** (Copy) and **Ctrl+V** (Paste).

Load Blocks / Networks

Blocks and networks can be imported from SYSWIN libraries and other programs. Use the *Load* option to open a library file. If the Block side of the dialog box is highlighted then *Load Blocks* will appear and if the Network side of the dialog is highlighted then the *Load Networks* button is displayed.

Select this option and the Import Blocks / Networks dialog is displayed. This gives you the opportunity to select from the displayed list of blocks or networks. You can change to another library if necessary by using the *Select* button. The selected project blocks or networks are automatically loaded into the current project.

When the project is opened, the blocks it contains are listed in the *Blocks* area of the dialog. To select blocks for insertion, use the mouse to click on single items, **Ctrl**+click to select several, or **Shift**+click to insert a range or **Shift+End** to insert the entire project.

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When inserting networks, you need to press the *Load Networks* button. You can then use the same methods as for blocks to select networks for insertion.

Note that insertion in the project takes place above the current selection point, and that to add an item to the end, it is necessary to select the blank line that follows the last item in a list.

Load Comments

Program comments can be loaded from an existing project or library file with this button. The standard file open dialog is displayed, which allows you to locate and open the appropriate file. Only block and network comments are imported, and these are added to the current program in the same sequence as they were originally saved.

If you need to realign the block or network comments use the *Insert* or *Remove* button in the Network Symbol Editor.

Print

The currently selected block(s) or network(s) can be printed from within this dialog.

Close

This button closes the Block / Network Manager. Pressing the **Escape** or **Enter** keys also closes it.

Block Symbol Editor

While working in the Block / Network Manager, this editor is started by using the *Insert* and *Name* options. When you are in the ladder workspace, it is selected from the **Editors** menu, or double-click on the block header bar.

The Block Symbol Editor displays the current block number and any information that has been already entered. Use the **Tab** key to move between the *Name* and *Comment* fields, and edit them as necessary. The *Restore* button loses any changes that have been made.

The *Block Type* menu is used only with CV series PLCs. It lists the fixed block types that are used with this series.

The *Block Type* also serves to avoid possible duplication of interrupt routines. Note that it is only through using this dialog that interrupt routines can be changed.

When you accept the dialog, the block name and comments are displayed in the block header above the first network in the programming workspace.

Checking the Program

The **Project|Program check** option allows you to ensure, at any stage, that your program is valid. The dialog which is displayed has several options that can be selected before executing the check. These may include Subroutines, Instructions and Interlocks and an Assembly check.

By using the *Scope* feature you can choose to check the current network, the current block or all blocks.

When the options are chosen, press the *Execute* button and a report may be displayed. This report contains any errors which have been found in the program and warnings to be checked. You can step through the list of errors by moving the highlight bar in the list box. If you press the *Go to Network* button, the Statement List Editor opens and the line in error will be highlighted. The error can then be corrected and another error chosen from the report dialog.

If this information needs to be kept, then the *Copy* button copies the report to the Windows clipboard to be used by other programs.

The *Close* button closes the dialog.

Global Editing - Find and Replace

SYSWIN gives you powerful global searching and editing facilities with the **Edit|Find** and **Edit|Replace** commands. These allow you to scan a program for all occurrences of any label, address, bit, channel, register or instruction and to change them globally.

Searching for Data

If you wish to look at a program, or part of it, without making any changes, use the **Edit|Find** command. The dialog allows you to narrow the search in several ways. Similar options exist in the **Edit|Replace** dialog.

Type

You can search by *Address* or its symbol name (for example: 'AR5.05' or 'SwitchOn'), *Label* (for example: '23') or *Instruction* (for example: 'MOV'). The type you select affects the validity of the information you enter into the *Find* fields.

Direction

For searching purposes, the starting point is taken from the cursor in the current network, and from here you can begin a search *Up* or *Down* the program.

Scope

You can choose to search just the current block or all blocks. When the *Scope* is set to *All Blocks*, *Go To Top* moves the start position to the top of the program and searches *Down*. When the *Scope* is set to *Current Block*, *Go To Top* moves to the start of the current block and searches *Down*.

Find From / To

Use these fields to specify the range of items that you are searching for. Enter address symbol names in full for a successful match. Other data can be partially entered, such as searching for generic addresses. If you are looking for only one item, it is not necessary to enter anything in the *Find To* field. Neither field is case-sensitive.

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Exact Match

In a complex program, you often want to be very specific about both the name and type of item that you are searching for. The *Exact Match* option forces a search only for the items you have entered in the *Find* fields. This is particularly relevant when you wish to replace items, as it is possible without exact matching to change something unintentionally.

To help with specifying items to match, the table below gives examples and notes for each type of item.

Item type	Items searched	Examples	
Bit	Bits	0.00	AR5.05
Channel	Channels & Bits [†]	0	AR5
Indirect	Channels	*DM0	*EM9
Const16	Channels	#0000	#9999
Const32	Channels	#00000000	#99999999
Indexed	Channels & Bits	IR0, IR1+(+) -(.), IR2 +/-1234, IR0 DR1, IR1	
Data Register	Channels	DR0	DR2
Index Register	Channels	IR0	IR2
Label	Labels ^{††}	0	99
Notes:			
		[†] When Exact Matching is NOT used, the channel part of a bit address would be replaced with the new channel address: for example, changing AR2 to AR4 would also change AR2.05 to AR4.05.	
		^{††} A label is the number of a subroutine, as used in JMP, JME, SBS, and SBM instructions.	
1.		Searching for a channel will match channels, bits and indirect channels: Exact Match will match only channels, for example, AR2 will only match AR2, and not AR2.05.	
2.		Searching Const16 will match Const16 and Const32, if Const32 values are only 4 digits long, for example, #5555 will match #5555 and #00005555.	

Examples of matching possibilities

Replacing Data

The dialog for the **Edit|Replace** command is similar to that for **Edit|Find**, but there are some additional options.

Replace Options

Use the *Find Next* button to locate the next matching item from your specification. The appropriate element is highlighted in the ladder workspace. The *Replace* button changes just that element, and you must then use the *Find Next* button again to move on. If you are satisfied that the correct element has been located, and you then want to make a global change, pressing *Replace All* changes all occurrences of that address, from that point to the end of the *Scope*.

Prompt Replace

When you select the *Replace All* option, you can choose to be prompted each time the specified symbol is found. This is a safer way of doing global replacements, especially with complex searches.

Prompt Replace is forced on automatically if you request *Replace All* while working connected to the PLC in Online Edit.

NOTE! Bit addresses in the Find/Replace dialog must be entered in the SYSWIN format, using a dot to separate the channel and bit address. For example: use '253.13' instead of '25313'.

Move Symbols

When you select the *Move Symbols* option, the address symbol information is moved when the address is first found and then replaced. For example, if HR05 has an address symbol 'Relay1' and you replace HR05 with HR07 with the Move Symbols option selected, then the 'Relay1' address symbol is assigned to HR07.

Find	Replace with	Replaces
NON-EXACT MATCH		
AR2	AR4	AR2 → AR4, AR2.05 → AR4.05
HR5	LR7	HR5 → LR7, HR5.09 → LR7.09
DM0	DM2	DM0 → DM2, *DM0 → *DM2
HR5-6 [†]	HR7	HR5 → HR7, HR6 → HR8 HR6.05 → HR8.05
EXACT MATCH		
AR2	AR4	AR2 → AR4
HR5	LR7	HR5 → LR7
DM0	DM2	DM0 → DM2
HR5-6 [†]	HR7	HR5 → HR7, HR6 → HR8
Notes:	[†] This is called 'calculated replacement', where an offset is calculated from the Find item, and applied to all items that fit the specified range. In this case, it is only necessary to specify the start of the range of items to be replaced.	

Examples of address replacement

On-Screen Cross Reference

Select **Block|Cross reference** command to display the Address Cross-referencer dialog. Using the *Display* options, you can choose to display the list of addresses used within the current network (**Alt+F7**) or you can display the complete list of addresses used within the whole program (**Alt+F8**). When you are editing the program in the ladder editor, you can press **Alt+F6** to quickly show the cross-references for the current address at the cursor.

When an address is highlighted in the *Address* list, the list of cross-references is displayed for the selected address. If you click on a cross-reference, the ladder editor display moves to the network containing the reference.

Find Address

You can quickly find the references for any address by typing in the *Find Address* field. As you type, SYSWIN highlights the closest matching address in the address list. When an address is highlighted, the list of references for that address is displayed.

Previous / Current / Next

If you chose to display the address list for the current network, you can use the *Next* and *Previous* buttons to change the current network. The *Address* list is updated for the new network. If you have changed the current network by clicking on cross-references, you can update the *Address* list by clicking the *Current* button.

Go To

If you have a cross-reference entry highlighted, you can close the Address Cross-Referencer and edit the current network using the ladder editor by pressing the *Go To* button. A quicker way to edit the current network is to double-click on the highlighted cross-referencer entry.

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Close

This button closes the Address Cross-Referencer and return you to the original network that you were editing before you started the Address Cross-Referencer.

NOTE!	SYSWIN detects multiple addresses used within <i>fixed-length</i> parameters. For example: addresses 100 and 101 are detected in a CMPL #12345678 100 instruction. SYSWIN does <u>not</u> detect multiple addresses used within <i>calculated</i> parameters. For example: addresses 101 and 102 are <u>not</u> detected in a BSET #1234 100 103 instruction.
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Printing the Project

Periodic hard copy printing may be necessary during project development, and the print options provided by SYSWIN are designed to make this easy and flexible. Projects can be printed in a range of formats, with as much or as little additional information as you require, giving you assistance with debugging and testing, as well as providing a permanent file record.



Use the **File|Print** command to select sections and print the current project, or click on the toolbar print button (**Shift+F4**). This displays a dialog with several print options, which allow you to build up the layout of your report. Unless you need a full listing for delivery or archive purposes, it is best to select only the briefer listings that are necessary.

Print Sections

Front Page

The front page information for the project is printed if this option is selected. The date and time of the printout are included.

Block Overview

This allows you to print an overview of the structure of the program by printing the block and network names. Network comments can be optionally included.

Ladder Diagram / Function Plan

The network may be printed in ladder form or function plan form depending on the editor that was selected with Project Setup. Options are available to allow you to choose to display only those features you require.

Network comments may be included between networks and each network or group may be separated as required.

Step numbers may be printed in the margins, and the Statement List and the Address List for the current network may be also printed.

The printout can include the Cross References of the instructions and either a Full or Compact format may be chosen.

In order to structure your output to suit yourself, page breaks may be forced before every network, group or block.

Statement List

The Statement list can be printed out without the ladder diagram/function plan being printed. The options are similar to the ladder diagram/function plan options described above.


Symbol Lists

Symbol table listings can form part of the printout and can be sorted by alphabetical name and numeric address. The *Purge* option causes only those symbols that are actually used in the program to be printed.

Cross References

This option provides listings which detail all symbols and addresses, showing where they are used in the program. The listing can be sorted alphabetically and numerically. Symbols assigned to outputs will have an asterisk '*' printed beside them. If the *Outputs* option is selected, all addresses used as outputs are listed in address sequence. The cross reference listing is most useful during debugging.

Expansion Functions

 The list of expansion function mappings as used in the project can be printed. The printout shows the function number that have been allocated to each expansion slot.

PLC Setup

The settings in the PLC Setup area can be printed. Some C Series PLCs do not support this function.

I/O Table

The I/O slots and Special I/O units assignments in the I/O Table can also be printed. Some C Series PLCs do not support this function.

Selecting a Range of Networks

You can select specific blocks and networks for printing by pressing the *Range* button. This helps to reduce the amount of printing time when you wish to focus on particular areas of a program.

The *Address I/O* field allows you to request that every network containing a specified address is printed. You can print named networks by specifying the name in the *Network Name* field.

You may find it easier to print selected networks by using the Block manager, marking the blocks or networks and then pressing the *Print* button.

Setting Up SYSWIN's Printing

SYSWIN can print to the current printer using several different methods. You can press the *Setup* button to review the settings and change them if necessary.

Output Options

If you are using a laser printer, select *Graphics Mode*, otherwise *Text Mode* may be more appropriate. If you choose text mode you must specify the number of rows and columns available on a page (the defaults assume A4-size paper). If you do not wish to print the report immediately, it can be saved to a file using the *Text to File* option; in this case, you need to specify the path and name for the file.

Text Mode printing is designed for faster printing to dot-matrix and other slow types of printer. It is not suitable for output to PostScript or GDI printers. This mode bypasses most of the Windows Print Setup settings, except for the selected printer port.

Note also that in *Text Mode*, accented characters are not displayed correctly in a basic DOS editor because the character sets in DOS and Windows are different. This difference also affects printing, although it may be possible to select an appropriate character set on the printer itself.

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Text Options

When either *Text Mode* or *Text to File* is selected, these options specify how to draw lines in the text. The *ASCII/DOS Characters* option uses standard ASCII characters, such as the escape bar '[' and minus sign '-'. The *Box Characters* option uses the extended ASCII/DOS characters to provide an improved appearance.

Font

This allows you to choose which Font type, size and style to use for the output for graphics mode printing. It displays a standard Windows Font setup dialog box including a sample box so that you can preview the type of text you have selected.

Setting Up the Printer

You can check the settings of the printer by pressing the *Printer Setup* button. This starts the standard Windows Print Setup dialog and is the same as selecting the **File|Print setup** command. It allows you to select the printer to be used, the paper size and its orientation. Your Windows manuals describe in detail the various options for your particular printing environment.

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Working While Connected



When working connected to a PLC, you have control over all aspects of transferring programs and data between the PLC and computer. You are able to monitor the operation of a program, including the memory data areas being modified by it, and interactively change instructions and data while the program is running or stopped. These features of SYSWIN significantly speed up the commissioning of new equipment and the updating of existing projects.

There are six elements of programming while connected which are covered in this section:

- Connection setup, including communications
- Program downloading and execution
- Program monitoring
- Online program editing
- Editing the PLC memory areas
- Data trace and time chart monitoring

To ensure the most productive use of your time, you should have a clear plan for setting up the environment and working with the intended device before you connect to the PLC.

Checklist for Connected Operation

This checklist will help you create a plan for a connection session with the PLC:

- ◆ **Determine essential parameters of the PLC**
Check that the project is appropriate for the PLC with which you will be working. Note any important characteristics of the PLC which may affect the connected environment (for example - memory, I/O setup).
- ◆ **Establish the type of communications to be used**
Make sure that your computer is correctly configured to communicate with the PLC, and that you have the necessary cables to make the connection.
- ◆ **Check the project for accuracy and completeness**
Use the program check feature for verifying your project and the networks it contains, and make a safe copy of it, before making any changes while connected.
- ◆ **Make a note of the appropriate I/O assignments**
List all I/O devices and assignments to be made to them, including the PLC I/O bit allocated to each.
- ◆ **Establish PLC parameters**
Use the **Project|PLC Setup** command to set the appropriate environment in the PLC.
- ◆ **Create a map for PLC memory area usage**
Note the variables that your program uses, and where these can be found in PLC memory for monitoring.

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Checking Project Parameters

When you create a project, you have to specify the type and model of PLC for which the project is intended. Other parameters, such as I/O mapping, PLC Setup and communications, are optional at that stage. These must be specified, however, before connecting to the PLC and running a program.

The **Project|Project Setup** dialog should be reviewed to ensure that it is correct and that it matches the PLC actually being used. You should also select the appropriate interface type for the connected session.

Setting Up PLC Communications

Communicating with the PLC requires the appropriate hardware and software setup. You should switch on the PLC only after it has been physically connected to the computer. Detailed information about the types of connecting cable for your computer, and the advanced software setup, are provided in the reference manuals for your PLC and its associated communications hardware.

This section is concerned with establishing communications for a SYSMAC-WAY local connection. If you are connecting to a remote PLC using a modem or bridge, using SYSMAC-LINK or SYSMAC-NET, or using ethernet C bridge, there are sections in Chapter 8 which describe in detail how to set up the communications parameters.

Having made the necessary cabling connection, you can switch on the PLC, and use the **Project|Communications** command to set up the parameters and test the connection. In this dialog, use the list boxes to select each parameter.

Port

Select the name of the port to which you have attached the PLC communications cable.

Unit

Enter the unit number of the PLC receiver.

Baud

Select the desired communications speed (bits per second) which must match the speed set up in the PLC.

Protocol

Select the desired type of communications protocol, again matching that set up in the PLC.

Testing the Link

After setting these parameters, click on the *Test PLC* button to see if the link operates. If the link is working, the *Status* field will display “Connected”, and you are ready to begin other online operations.

If the *Status* field displays “Not Connected”, check the parameters again, and try different speed and protocol settings, each time clicking on *Test PLC* to check the interface. In most situations, it is not difficult to achieve a connection, but if nothing seems to work, use the *Protocols* button to access a more detailed setup of communications.

You should remember that when programming libraries, you are not able to connect to the PLC. If the **Project|Communications** command is greyed out, check the Project Setup dialog to make sure that you are not working on a library or a template.

C The PLC’s on-board RS232C/RS422 Hostlink interface settings can be changed with the **Project|Hostlink Settings** command, which is described in the Advanced Communications chapter.

PLC Modes of Operation



Before proceeding with downloading and execution, it is important to note the modes in which the PLC can be set when working online, because some software operations are possible only in certain modes. The current mode can be set and altered with the **Online|Mode** command, or with the toolbar button (**Shift+F10**).

Selecting a new mode changes the PLC's state immediately you accept the dialog. To ensure that you do not change the PLC's mode by accident, you should switch on the *Confirm all operations that affect the PLC* option from the **Preferences|Options** menu. SYSWIN then prompts you before any operation which changes the PLC's state can take place.

Monitor Mode

Allows a running program to be edited and monitored while connected during development. *This is the most usual mode when working connected to a PLC.*

Run Mode

Sets the PLC to execute the current program, as a live operation. This mode is generally used for final testing, after a program has been thoroughly tested and debugged. SYSWIN cannot write to the PLC while it is in this mode.

Debug Mode



This option is available on CV series PLCs, but is not used by SYSWIN in ladder editing.

Stop / Program Mode

Selecting this mode simply stops the PLC running, and is used to download a program and data to the PLC.

Downloading PLC Programs

To transfer a program from the computer to the PLC, use the **Online|Download** command. The PLC must be in *Stop/Program* mode to enable the download, but the software automatically switches from *Monitor* mode into *Stop/Program* mode before downloading, and returns to the original mode afterwards. You are reminded that the PLC will be stopped for the download, and asked to confirm that you wish to continue.

The Download dialog provides options according to the type of PLC in use - not all options may be available at one time. All items that you check in the dialog are downloaded to the PLC. The setting up of these items is described in detail in the *Configuring PLC Specific Features* chapter.

Expansion Functions



The current mapping of the expansion function is downloaded. This is configured by using the **Project|Function mapping** command.

Memory Allocation



The PLC's Expansion DM areas is set up in accordance with the allocation chosen with the **Project|Allocate memory** command.

Clear Program Memory (Default ON)

This option clears the PLC's program memory area before downloading. If you intend to use the online edit facility, this option should be set on.

I/O Table

This option downloads the table set up with the **Project|Edit I/O table** command. Some C Series PLCs do not support this function.

PLC Setup

The parameters established with the **Project|PLC setup** command are downloaded. Some C Series PLCs do not support this function.

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Accepting the Download dialog initiates the transfer of code and data to the PLC. A status window then indicates progress, showing the percentage completed as the transfer proceeds, and a success or failure message. You must close this window by pressing **Enter** before continuing.

Block Markers

In order to preserve the block structure of a program, SYSWIN can download special marker instructions, which separate blocks within the PLC. These markers are recognised during the upload process, so that uploaded programs are separated into blocks. You can select block markers using the **Project|Preferences** command - see Advanced Projects in Chapter 7.

A block marker appears as a **CMP #DEAD #DEAD**, which is a valid instruction, and this of course is visible on a programming console if one is used. Markers appear only between blocks, so there is not one at the start or end of the program.

Verifying PLC Programs

You will sometimes want to check that a program in the PLC is the same as the one currently open in SYSWIN. The **Online|Verify program** command compares the two programs and if they are the same, a message is displayed, and you can continue.

If there are differences between the program in the PLC and the program in SYSWIN, the Statement List Editor is displayed, showing the first instruction where a difference has been found.

Another command that can be used to examine the overall program status is the **Project|Program check** command. See the Advanced Projects chapter for details of this command.


Uploading PLC Programs

To test or modify a program that is already resident in the PLC, use the **Online|Upload program** command. This transfers the program and parameters from the PLC to the computer, and displays the ladder diagram in the programming workspace, as though it had been loaded from disk. You can upload at any time, regardless of the PLC mode.


A program is always uploaded into an *existing* project, even if the project is empty. The program symbols are then available in the SYSWIN workspace, ready to be matched against the code uploaded from the PLC. Although it may be necessary to realign the network names and comments (using the *Insert* and *Remove* buttons in the Network Symbol Editor), the general program structure is there to use.

The Upload dialog allows you to select which parameters are to be transferred. The range of options depends on the PLC type. The setting up and maintenance of these parameters are described in detail in the Advanced Projects chapter of this manual.


Expansion Functions

 The current mapping of the expansion functions will be uploaded. These settings can then be edited with the **Project|Function mapping** command.

Memory Allocation

 The PLC's Expansion DM area is set up in the software, and can be edited with the **Project|Allocate memory** command.

Detect NOPs (default ON)

 This option causes SYSWIN to stop uploading when a block of NOP instructions (normally at the end of a program) is detected.

I/O Table

This option uploads the table normally set up with the **Project|Edit I/O table** command. Some C Series PLCs do not support this function.

PLC Setup

The PLC parameters that can be edited with the **Project|PLC setup** command are uploaded. Some C Series PLCs do not support this function.

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PLC Status

At any time while the program is executing, the PLC can be interrogated for its current status. The information dialog is displayed using the **Online|Status** command. It tells you the characteristics of the PLC, and the current execution status, including a list of any error messages generated by the PLC.

The *Clear Errors* button attempts to clear errors within the PLC that are listed in the dialog. Not all errors can be cleared without operator attention. A reset or a regeneration of the I/O table may be required (see opposite).

CV For CV series PLCs it may be necessary to reset the PLC setup to the defaults and regenerate the I/O table. Power down and restart the PLC in order to ensure that the errors are cleared.

Mode

While viewing the current status, you can change the PLC operating mode with this button.

Close

Selecting this button closes the dialog box.

I/O Generate

The I/O table can be created with the **Project|Edit I/O table** command. The setting up and maintenance of the I/O table is described in detail in the Configuring PLC Specific Features chapter. Some C Series PLCs do not support this function.

NOTE!	This command may not be available for the particular PLC with which you are working.
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C Certain C series PLCs require the I/O table to be set up within the PLC before executing programs. The **Online|I/O generate** command is used for this purpose, and copies the actual I/O allocations to the PLC's registered set.

Executing and Monitoring Programs

Understanding how to use SYSWIN while connected is best done by example, and a small sample project supplied with the software can be used for this purpose. Although the example project is designed for a CPM1 PLC, it also works with most other PLCs.

Begin by preparing for online working, and downloading the program to the PLC:

◆ **Open the sample project file**

Using the **File|Open** command, select and open the file DEMO1C.SWP[†] = in the SAMPLES sub-directory of the SYSWIN directory.

◆ **If you haven't got a CPM1 PLC, change the PLC type to match the unit**

In the **Project|Project setup** dialog, check and set the correct PLC type for your hardware. The program asks if you want to convert your data - choose *Yes* and then *Execute* with the *Move System Variables* option checked. You may see a Process Program dialog screen. If so press *Execute*.

◆ **Check that the program is correct**

Select the **Project|Program check** command with all features switched on. Press *Execute*.

◆ **Check the PLC communications**

Use the **Project|Communications** dialog to make sure that the computer and PLC are communicating properly.

◆ **Download the program to the PLC**

Use the **Online|Download program to PLC** command and transfer the program to the PLC.

◆ **Set the PLC mode to Monitor**

In the **Online|Mode** dialog, make sure this is selected.



Press the **Monitoring** button on the toolbar (**Ctrl+F11**) or select the **Online|Monitoring** command. Parts of the program in the workspace should then be highlighted to show the flow of execution. To view a larger portion of the program while monitoring, you can use the **Preferences|Overview mode** command (**Shift+F12**).

With the sample program running, the monitoring feature highlights sections of the program showing the execution sequence. The data elements of appropriate instructions (for example - the INC instruction in the example) are also highlighted, showing the data values changing. However, remember that, because the communications link is considerably slower than the execution speed of the PLC, only a sample of the program's execution is displayed.

The SYSWIN monitoring continues to show the progress of program execution visually in the workspace, even while other dialogs are open in front of it. The monitoring is active until a network is edited, at which point the monitoring stops until the changed network has been verified and downloaded.

If *Show full powerflow monitoring* is switched on in the Monitoring section of the **Preferences|Drawing** menu, then the power flow is highlighted on the display.

[†] Several sample programs are supplied, including DEMO1C.SWP for C series PLCs and DEMO1CV.SWP for CV series PLCs.

3 TESTING WHILE CONNECTED

Online Editing

NOTE! It is usual to have the PLC running in **Monitor** mode while using online editing functions. Online editing is not possible in **Run** mode.



Working on networks while the PLC is connected and being able to easily change the program is one of the quickest ways to complete and check a project. With the PLC running in monitor mode, you are able to make any changes to the program, as if you were working while not connected. The difference is that once a network has been completed, it is downloaded automatically to the PLC (if necessary replacing the previous version) while the program is running.

Certain parts of SYSWIN are not available while online editing is active: the Block Manager is the main function that cannot be used, which in turn means that library import is not possible.

In order to use SYSWIN's online editing feature, the **Online|Online edit** command must be enabled - this menu option is a toggle, so each time it is selected, it alternately switches online editing on or off.

If, in the **Preferences|Drawing** command the option to automatically start monitoring after Online Edit is switched on, then monitoring automatically restarts after a network is downloaded.

NOTE! When working with a C200H PLC, and downloading during online edit, the error light on the PLC will indicate that the scan time has exceeded 100ms. This error can be cleared using the **Online|Status** dialog, but it is not necessary to do so.

Changing Networks

Any change that you would normally make to a network while not connected can also be made while connected. If *Confirm all operations that affect the PLC* is enabled, you are warned if you do anything that changes critical parameters within the PLC.



Use the normal workspace controls to edit the program. The editing cursor changes to red as soon as you start changing the network. When you are ready to update the PLC, use the **Test Network** toolbar button (**Shift+F8**), or press **Alt+Enter**. This verifies that the original network is the same in the PLC and if so the new network will be downloaded to the PLC. If *Automatically start monitoring after online edit* is enabled from the **Preferences|Drawing** menu, the monitoring restarts. As an alternative to using **Test Network** or **Alt+Enter**, you can move to a different network and it has the same effect.

NOTE! This command may not be available for the particular PLC with which you are working.

Ladder Monitoring Checks

When ladder monitoring is activated, you can use the right-hand mouse button to click on contacts, outputs and function parameters.

When a bit address is right-clicked, such as on a contact, output or function with bit parameters, a small floating menu will appear. Two types of floating menus are displayed depending on the currently selected PLC.

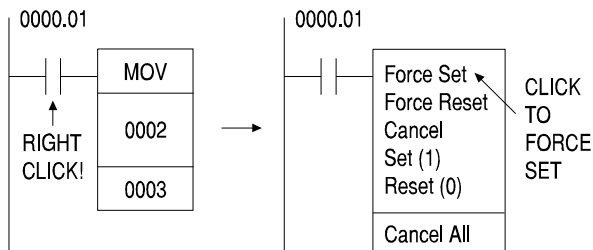
On older C series PLCs, it is only possible, on a single bit address, to:

Force Set
Force Reset or,
Force Cancel All

However, on the newer PLCs, it is possible on multiple bits, to:

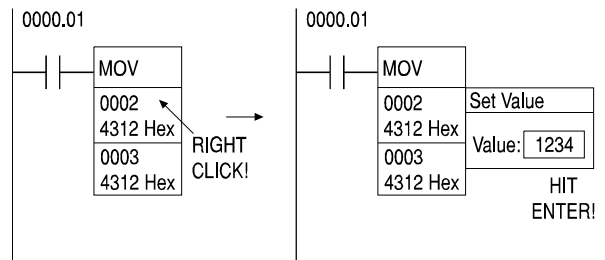
Force Set
Force Reset
Force Cancel
Release Force then Set
Release Force then Reset or,
Force Cancel All

The diagram below demonstrates the effect of right-clicking on a contact:



When a channel address is right-clicked, as found on most function parameters, you can enter a new value which is written down to the PLC. When the monitoring values are being interpreted, it is assumed that the value that has been typed is the same format as is being displayed. For example: if '0.02' is being displayed, then you can type '1.23' directly without entering the format specifier. When the monitoring values are not being interpreted, it is assumed that the typed value is hexadecimal. See Appendix B for information on the Format Specifiers.

The diagram below demonstrates right-clicking on a parameter:



When you are setting values in the PLC, you can directly write text messages up to 20 characters long by using quotes, for example: "switch on the boiler". It is not possible to change the values of immediate parameters; you must use online editing to do this.

If the *Display* option in the **Preferences|Drawing** menu is enabled, then a pair of arrows is shown on the ladder diagram showing that the bit address is forced. Note that the information on which addresses are being forced is discarded at the end of the current editing session. This information is displayed only for guidance.

3 TESTING WHILE CONNECTED

Data Set Bar

The Data Set Bar area at the bottom of the screen allows you to monitor and view memory areas within the PLC. It is used during the testing of a program to change values of bits and channels in the PLC. It is enabled in the Windows section of the Preferences. When enabled it can display either 2 or 4 rows of data.

✦ **Move the cursor to the Data Bar**

Press the **Tab** key to move the cursor to the Data Set bar (or you can click the mouse on a box in the Data Set area). This allows you to input data in this area.

✦ **Enter an address to monitor**

Press the **Enter** key or double-click the mouse. A dialog is opened into which you can enter the address that you wish to monitor.

If a bit address is entered (for example: '253.13'), then the *Action* field is displayed with options for you to:

- Read the value of the Address
- Force Set the address
- Force Reset the address
- Force Cancel
- Set(1) the address to ON
- Reset(0) the address to OFF
- Cancel All

If you enter a channel address and type in the *Value*, SYSWIN automatically tries to recognise the number format. If it is incorrect you can change the format using the *Format* list.

A *Browse* button is available so that you can select an address to monitor from the list displayed in the Address Symbol Editor.

If no value is entered in the *Address* field then when you press **Enter** the value is read from the PLC. If a value is entered then the value is written to the PLC when you press **Enter**.

If monitoring is enabled, then the values change as the program is executed. If monitoring is not enabled then the values are as displayed.

NOTE!	Bit addresses must be entered in the SYSWIN format, using a dot to separate the channel and bit address.
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Setting Data Values



The **Online|Set** command allows you to view and change specific addresses and their contents while the program is resident in the PLC, even while it is running. This means that you can examine in detail how the program is performing, and quickly find out if a data value is being incorrectly changed. The Set command has a button on the toolbar (**Ctrl+F3**).

To gain a quick overview of how the Set command can be used, follow the steps given here with the sample program that was downloaded earlier:

- ✦ **Set the PLC into Monitor mode**
In the **Online|Mode** dialog, select *Monitor*.
- ✦ **Start the Set dialog**
Select the **Online|Set** command.
- ✦ **Enter an address to examine**
Go to the first *Address* field and enter '253.13' (for example: for a C200H and some other PLCs this is the Always On flag) which is at the start of the program. Then click on *Read*. The *Value* for that address should appear as '1'.
- ✦ **Enter a second address**
In the next *Address/Name* field, enter 'HR1' - this is the address that is incremented by the INC instruction at the bottom of the program. A number appears in the *Value* field (for example: '2087').
- ✦ **Change the data value and write it back**
Select the *Value* next to the HR1 address, and overwrite it with '0'. Then click on the *Write* checkbox to the right of the value. Click on the *Write* button to download this new value to the PLC.
- ✦ **Monitor the data values**
Click on *Start Monitoring*. The data value against HR1 will now start changing as the program executes.

Through this simple example, you can see how to change data conveniently while still in the main SYSWIN programming environment, and how to monitor data values.

NOTE! Bit addresses in the Set dialog must be entered in the SYSWIN format, using a dot to separate the channel and bit address, for example: use '253.13' and not '25313'.

NOTE! Timer and counter flag bits must be entered with a '.F' suffix, for example: TIM002.F. Using TIM002 would only refer to the channel.

Display

Addresses can be displayed in their absolute form or by their symbol name assigned with the Address Symbol Editor.

Format

Data values can be displayed in either hexadecimal or binary. The latter may be preferred when viewing status flags, logically altered data and I/O bits in a channel.

Read

This causes SYSWIN to read the data values from the PLC for the list of specified addresses. Using this button while monitoring is in progress stops the monitor and effectively 'freezes' the values on-screen. The program continues to run.

Write

Data values in the list with the *Write* attribute checked are written back to the PLC. However, this is possible only in the **Monitor** and **Stop/Program** modes, and if you attempt to write while the PLC is in **Run** mode, an error message is displayed, and monitoring stops.

3 TESTING WHILE CONNECTED

Save Data

The list of address and data values can be saved to a disk file for later use. This option is useful if you wish to create or store particular test data sets for verifying the correct operation of a program after modification. A standard Windows file saving dialog allows you select a directory for the file and name it. By default, SYSWIN gives data set files an extension of .DST.

Load Data

Data sets previously saved can be restored with this option. A Windows open file dialog allows you to locate a file and read it into SYSWIN. For the data to become effective in the PLC, you must use the *Write* button to download the new values.

Clear Fields

Use this button with some caution, as it clears the entire list of addresses and data values. No change takes place in the PLC, but the information being viewed is cleared. With a long list, you may wish to save it to a disk file before clearing it, so that it can be restored quickly another time.

Start / Stop Monitoring

This button switches data monitoring within the Set dialog on and off, without affecting the status of the PLC. This is independent of the program monitoring.

Forcing Address Bits



The **Online|Force** command is used to force address bit status, and can be used only while the PLC is in **Monitor** mode. For older C series PLCs, it is possible to force a single address, while later PLCs support the forcing of multiple addresses.

Once an address bit has been forced, it is locked in that state until explicitly cancelled, or the PLC restarted.

The Force dialog for multiple addresses provides for the changing of up to ten address bits at once, and is used in a similar way to the Set dialog described above. Addresses and actions are selected, then executed by writing to the PLC; execution status is shown in the *Status* field at the bottom of the dialog.

Read

You can display the Forced Set/Reset addresses from the PLC by selecting the *Read* button. If a large range is selected, this may take a few minutes.

Display

Addresses can be displayed in their absolute form or by a symbol name assigned with the Address Symbol Editor.

Address

Enter here only bit addresses that can be written to. A symbol can be used if it refers to a valid bit address.

NOTE!	Bit addresses in the Force dialog must be entered in the SYSWIN format, using a dot to separate the channel and bit address.
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Action

A choice of several actions is provided in a list box:

<i>Cancel</i>	Releases a forced bit from its locked condition
<i>Force Reset</i>	Forces a bit low(0) and locks it - the reset state
<i>Force Set</i>	Forces a bit high(1) and locks it - the set state
<i>Reset (0)</i>	Sets a bit low(0) until changed by program execution
<i>Set (1)</i>	Sets a bit high(1) until changed by program execution

Write

Addresses in the list with the *Write* attribute checked are written back to the PLC. However, this is possible only in the **Monitor** mode. If you attempt to write while the PLC is in **Run** mode, an error message is displayed.

Cancel All

This provides a quick way of releasing all forced states in the PLC. It writes to the PLC immediately for execution, but the selections in the *Action* fields do not change.

Save Data

The list of address and data values can be saved to a disk file for later use. This option is useful for creating test data sets for verifying the operation of a program after modification. A standard Windows file save dialog allows you select a directory for the file and name it. By default, SYSWIN gives data set files an extension of .DFC.

Load Data

Test data sets previously saved can be restored with this option. A Windows open file dialog allows you to locate a file and read it into SYSWIN. For the data to become effective in the PLC, you must use the *Write* button to download the new values.

Clear Fields

This button should be used with some caution, as it clears the entire list of addresses and actions. No change takes place in the PLC, so any addresses that have been forced will remain so until you re-enter and cancel them. If you have created a list of several items, you may wish to save it to a disk file before clearing it, so that it can be restored easily another time.

Forced Addresses

Forced addresses when read display a list of current force set addresses and their state.

NOTE! This list is current only at the time of being read and does not reflect changes made by other devices or software packages.

Read

This button supplies a selectable list of memory areas to scan for Forced Addresses. If any Forced Addresses are found they are appended to the *Forced Addresses* list box.

Clear

This button clears the list of Forced Addresses.

3 TESTING WHILE CONNECTED

Other Functions

Setting the Clock

On all CV series and some of the CH series PLCs, there is a real time clock. The command **Online|Set clock** opens a dialog that shows the clock settings on the PLC and the PC. If these are different then by pressing the *Synchronise* button, the time in the PLC is set to the same time as the PC.

If you wish to set the time to anything other than the PC time then use the *New time and date* fields to enter the values and press the Set button.

The *Close* button closes the dialog.

Clearing PLC Memory

All CV series and some CH series PLCs can have areas of their memory cleared quickly. The **Online|Clear memory** command will open a dialog showing memory areas for you to select to clear. Selecting the *OK* button accepts the settings and clear the selected areas.

Memory Card Support

CV For CV series PLCs, memory cards can be used to attach File Memory to the CPU. The

Online|Memory Card command opens a dialog allowing you to transfer files between the CPU and Memory Card. The *Close* button accepts the settings and closes the dialog.

Format Card

A Memory Card must be formatted before use. The *Format Card* button formats the Memory Card so files can be transferred. The *Label Card* button can be used to assign a name to the Memory card.

Disk

The Disk portion of the Memory Card dialog shows the files, drive and directory which can be amended as necessary to transfer files to the Memory Card.

Card

The Card portion of the Memory Card dialog lists the files transferred to the Memory Card.

Copy

The >> *Copy* >> button copies the selected file from the Disk portion of the dialog to the Memory Card. The << *Copy* << button copies the selected file from the Card portion of the display from the Memory Card to the selected drive and directory in the Disk portion of the dialog.

Compare

The > *Compare* < button compares identically named files from the disk and Memory Card to make sure the files themselves are identical. The files must be selected first from both the Disk portion and Card portion of the display.

Checksum

The *Checksum* button checks the checksum of the selected file in the Memory Card.

Rename and Delete

The *Rename* button and Delete button allow you to rename or delete files from the disk or Memory Card.

Refresh

The Refresh button updates the display with the files currently on the Memory Card.

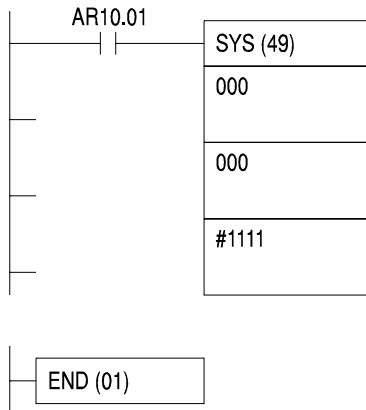
PLC Memory

Memory areas on the PLC can be copied to a file on the Memory Card and visa versa using the *To Card* button and *From Card* button. Select an area of memory and enter a valid range. The *Compare* button compares the information on the PLC and Memory Card. An Action No. must be entered if Program Area is selected.

Password Protection

C For particular C series PLCs, password protection can be applied to the program.

The program must first be set up with an open contact with the address 'AR10.01' applied. The password protection can then be applied. The password can be any four digit number. To set the password, select **Online|Protect program** to display the dialog and press the *Set* button. The protection can be released by pressing the *Release* button. The following example illustrates the functionality of the password protection, with the password of '1111'.



When enabled, the password is required every time the program is accessed. Projects can also be protected with a password; refer to the Advanced Projects chapter.

Error Log

An Error Log can be accessed on all PLCs that have a real-time clock. Select **Online|Error Log** to display the Error Log dialog. The *Read* button refreshes the Error Log display and the *Clear* button resets the display.

C The *Enable/Disable Error Log* settings and the *Shuffle When Full/Stop When Full* settings are appropriate for C series PLCs only.

The *Enable/Disable Error Log* setting controls the functioning of the Error Log. If this option is set, the Error Log is enabled.

The *Shuffle When Full/Stop When Full* settings refreshes the Error Log according to the limit of the Error Log entries. If the *Shuffle When Full* option is set when the Error Log is full, the next Error Log entry replaces the oldest. If the *Stop When Full* option is set when the Error Log is full, the next Error Log entry is discarded.

CV For CV series PLCs, the Error Log settings are controlled in the PLC set up.

4 DATA DISPLAY EDITOR

SYSWIN provides a special full screen editor for viewing, monitoring and changing blocks of data from the PLC. The Data Display Editor enables you to upload and download sections of PLC memory, and manipulate the data values as required. This editor is started from the **Editors** menu, or by starting it from the Choose Editors button (**Ctrl+F4**).

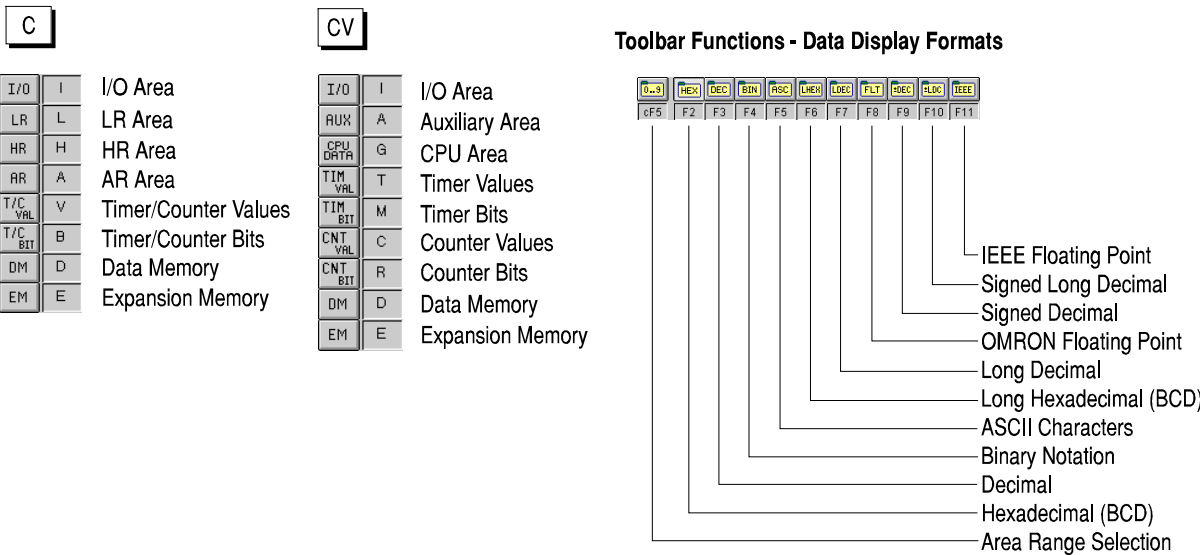
When you switch to the Data Display Editor, the SYSWIN screen changes to provide new toolbar options and modified menus. The selection buttons that are displayed reflect the features of the PLC that you have selected. Many of the commands used in normal SYSWIN operation can still be used, however, including the file and online commands.

When you open the Data Display Editor for the first time in a project the screen is blank. However, each time it is opened thereafter it displays the last area viewed.

At all times, the status bar at the bottom of your screen indicates the mode of the PLC, and whether SYSWIN monitoring is enabled.

To return to the ladder workspace, use the **File|Exit data display editor** command, or the Choose Editor button (**Ctrl+F4**).

The data formats that can be used in the Data Display Editor are shown in the diagram below.



4 DATA DISPLAY EDITOR

While working within the Data Display Editor, you can use the **File|Save data** and **File|Load data** commands, to create and open data files respectively. These are helpful in creating sample data for testing programs and loading different sets of data. The **File|Print** command provides you with printout of the current data area.

Keyboard for Data Display Editor

Using the keyboard during data display editing is as intuitive as when programming. The area selection buttons at the left of the screen, or their shortcut keystrokes, can be used to select a memory or data area to be examined and monitored. Individual locations can be selected by clicking the mouse or navigating with the arrow keys.

The Data Display Editor has its own toolbar and while some of the standard functions are provided, there are special functions for selecting the format of the data display and controlling online operations. The display formats offer great flexibility in the way in which you can view PLC data.

Status Bar

The status bar at the bottom of the screen provides the following helpful pieces of information:

<i>Instant Help</i>	A brief message appears in the Status Bar as menu commands are selected. At other times, a description of the data area being edited is displayed.
<i>Cursor address</i>	The address in the memory area where the cursor is currently located.
<i>Online status</i>	The current status of the connection to the PLC.
<i>PLC mode</i>	When connected to a PLC, this shows the current PLC mode. Connection errors are also displayed here.
<i>Progress</i>	When reading from or writing data to the PLC, the percentage completed is displayed here.

The status bar can be enabled and disabled with a command in the **Preferences|Window** menu.

Memory Holes

Some C series PLCs have memory holes, for example, the CPM1 PLC has a hole in the I/O area. Memory holes are areas in the address space that do not contain any memory. In the Data Display Editor, the holes appear on the screen as red dashes (“----”). These addresses cannot be edited.

NOTE! The OMRON floating point format is not used on the CVM1-V2 PLCs; these use the IEEE floating point format instead.

NOTE! BCD display is a subset of hexadecimal, and shows values in the range 0-9999. Hex values are in the range 0-FFFF, and the decimal values are between 0 and 65535.

Setting Up the Data Display Editor

When you first enter the Data Display Editor, the main workspace on the screen is blank. You need to begin by selecting the area of PLC memory that you wish to examine, as follows:

◆ **Select the data area to edit**

Use the **Data|Area** command to display the selection dialog, or just click on the appropriate area button on the toolbar. Notice that each one has a single keystroke, as in SYSWIN’s programming mode.

◆ **Specify the range of locations within that area**

A dialog appears, asking you to select the entire area or part of it for display. For the moment choose *All* and press **Enter**.

◆ **Select a suitable display mode**

Use the **Data|Format** command to bring up a dialog, or just click on the appropriate format in the toolbar (for example, DEC to display in decimal).

◆ **Upload the selected data area from the PLC**



Use the **Online|Upload** command, or its toolbar button (**Ctrl+F9**), to read the PLC’s memory. If the PLC is connected, however, this is done automatically.

◆ **Switch on the SYSWIN monitor**



Use the **Online|Monitoring** command, or its button in the toolbar (**Ctrl+F11**).

NOTE! Only the *displayed* area of the PLC’s memory is monitored in the Data Display Editor, and the cursor changes to indicate when monitoring is in progress.

4 DATA DISPLAY EDITOR

Multiple Windows

You can display up to eight separate data display windows on the screen at the same time. When you select a new memory area, you are given the option to display the data in a new window. If you choose not to open a new window, the data in the current window is replaced.

When selecting a new memory area, you can choose to display only a part of the area. This feature is most useful when editing large memory areas, for example, the Data Memory Area.

The current window will be displayed with a highlighted title bar. Using the mouse, you can change the current window by clicking inside any part of the window you wish to edit. You can press **Tab** to go down to the next window, **Shift+Tab** takes you up to the previous window, and **Escape** takes you to the window at the top of the screen.

When you have finished editing a memory area, you can close the current window using the **File|Close current data window** command. The **File|Close all data windows** command removes all the windows from the workspace.

Editing Data Items

To change an item, use the arrow keys to navigate around the data area displayed, and press **Enter** when the item you want is highlighted. Alternatively, you can double-click on the item directly with the mouse.

The data item is then displayed in its own dialog, giving you the opportunity to change it. You can change the format of display and entry with the *Format* options. The value is displayed in three comparable formats for reference at the bottom of the dialog.

If you are editing a few adjacent addresses, you can move to the next and previous data items with the buttons at the bottom of the dialog box, and the cursor in the data area behind moves with you. Any changes that you make are recorded as you move to another memory location and when you click on *OK* to close the dialog.

The *Cancel* button (or the **Escape** key) closes the dialog, ignoring the last change that you made, provided you have not moved to another item.



Monitoring is switched off when you enter an editing dialog, and changed items should be downloaded to the PLC before re-enabling monitoring (otherwise data items you have changed are overwritten with data read by the monitor). Use the **Write** toolbar button (**Ctrl+F10**) to do this. Then switch monitoring on (**Ctrl+F11**).

NOTE!	When you use the Write command to update the PLC's memory, <i>all</i> locations are written, including those that may have been scrolled out of the Data Display window.
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5 DATA TRACE AND TIME CHART MONITORING

Data Trace and Time Chart Monitoring allow you to analyse the execution of the program in the PLC. The values of several memory addresses can be recorded and then analysed on screen. Trigger conditions and trigger delays can also be configured which assist debugging by allowing you to pinpoint specific events.

Data Trace is available on all CV series PLCs and it is also available on some of the newer C series PLCs. You can use Time Chart Monitoring on all PLCs.

The editors are started with the **Editors|Data tracing** and the **Editors|Time chart monitoring** commands. You can also change the editor using the *Choose Editor* button (**Ctrl+F4**).

While a Data Trace is executing, the PLC records the data values and holds them in an internal buffer. When the trace is complete, the values are uploaded from the PLC into SYSWIN and are then displayed on the screen. Data Tracing provides very fast and accurate data capture.

When executing a Time Chart Monitor, SYSWIN uses the communications link to directly read the data values as they are required. The display is updated as each sample is read from the PLC. Time Chart Monitoring provides slower and less accurate data capture; however, the sampling interval ranges from 0.5 second up to 60 seconds.

SYSWIN retains the trace information after you have closed the editors; this allows you analyse the trace while examining the program. You can change editor while a Data Trace is executing, but you may need to explicitly upload the trace from the PLC when you return to the Data Trace editor. If you are using the Time Chart Monitoring, sampling automatically stops when you close the editor.

You can use the **File|Load trace file** and **File|Save trace file** commands to access stored trace files. If you are not connected to a PLC, you can still review trace information that has been stored previously.

5 DATA TRACE AND TIME CHART MONITORING

Configuring the Trace



You need to configure the trace parameters by using the **Trace|Configure** command before recording the trace. The configuration dialogs are slightly different for C and CV series PLCs for Data Trace.

If you are configuring a CV series Data Trace, you can either specify the samples to be taken at a *Fixed Interval*, *Once Per Cycle* or *On TRSM instruction*.

Trigger

You can set a trigger condition to occur when either a channel reaches a preset value or a bit address changes state. When the trigger condition occurs, the samples are recorded until the buffers are full.

NOTE!	When using Data Trace on C series PLCs, you must program the trigger bit to stay high (1) after the trigger occurs. SYSWIN forces the trigger low (0) immediately before sampling starts. You can use a latching circuit to achieve this.
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Trigger Delay

You can optionally add a trigger delay to the configuration. If a *positive* delay is entered, then the specified number of samples are discarded *after* the trigger condition occurs. If a *negative* delay is entered, then the specified number of samples are kept *before* the trigger condition occurs. A negative trigger is useful for analysing events leading up to the trigger condition.

Sampling

When you are configuring Time Chart Monitoring, you will need to specify a sampling interval. The minimum allowable sampling interval is 100ms.

When configuring a Data Trace for C series, you can either specify the samples to be taken at a *Fixed Interval* or under *Program Control*. If you choose *Program Control*, then you would use the TRSM instruction in your ladder program. If you select *Program Control* and do not have any TRSM instructions in the ladder program, then the samples are taken at the end of every cycle.

5 DATA TRACE AND TIME CHART MONITORING

Recording the Trace

Record and Pause

Press the *Record* button (**F11**) to start *sampling* the trace. The Record button will change to red and will stay depressed. The *Pause* button will also be automatically depressed.

When the trigger condition occurs, the *Pause* button will pop back up and the samples will then be *recorded*. You can manually trigger the recording by releasing the Pause button (**F10**).

Stop and Upload

When the trace buffer is full, the recording stops and the Record button pops back up. When executing a Data Trace, the trace is automatically uploaded when the recording stops.

You can manually stop the recording by pressing the *Stop* button (**F9**). When executing a Data Trace, you need to upload the trace by pressing the *Upload* button (**F12**).

Reviewing the Trace

The screen display of the Trace shows a bit trace in the upper part of the screen and channel trace in the lower section. The cursor aligns the bit and channel samples.

At the top of the screen the Time or Sample number is displayed above the data.

Moving Around the Data Trace

You can use the cursor keys to move the screen cursor by a single sample. **PageUp** and **PageDown** move you by a page of channel samples (about 10 samples). **Shift+PageUp** and **Shift+PageDown** move you by a page of bit samples (about 40 samples). The **Home** and **End** keys move you to the start and end of the trace respectively.

5 DATA TRACE AND TIME CHART MONITORING

The Data Trace and Time Chart Monitoring toolbar have video style function keys which can be used to move quickly around a trace.



This moves the cursor to the start of the trace (**F2**).



The cursor scrolls back through the bits display of the trace (**F3**).



The cursor scrolls back through the channel display of the trace (**F4**).



The cursor moves to the trigger point (**F5**).



The cursor scrolls forward through the channel display of the trace (**F6**).



The cursor scrolls forward through the bit display of the trace (**F7**).



The cursor moves to the end of the trace (**F8**).

6 CONFIGURING PLC SPECIFIC FEATURES

Function Mapping

C Some C series PLCs have expansion functions. These can be edited with the **Project|Function mapping** command.

The PLCs that support function mapping have additional built-in functions. There is a default set of functions. These can be exchanged for other functions that would not otherwise be available.

The *Function Mapping* dialog lists the current mapping of the functions, together with a second list of functions that can replace them. A function cannot be allocated to more than one expansion slot.

All the function slots must be filled before writing or closing the dialog. However, on the CPM1 PLC, up to 7 slots may be left empty.

NOTE! Functions that have been used in the ladder program, but not assigned to expansion slots will be drawn in red. These must be corrected before downloading the program to the PLC. You can use the **Project|Program check** command to find these.

Adding and Removing Functions

The *Remove* button below the list of PLC expansion slots takes a selected function from that list and adds it to the Functions list, freeing the slot. The *Add* button at the bottom of the function list moves a selected function to the expansion list. Double-clicking on an item in the *Functions* list automatically exchanges the two sides at that position in the list.

Defaults

Use this button to restore the default functions to the expansion slot list. It only affects the display in the dialog, so to set the defaults in the PLC, you must also use the *Write* button.

Load

Use the *Load* button to bring into the current project the function mapping parameters used in another project.

Read

This button reads the list of functions currently set in the PLC's mapping, and can be used to read it again after writing a new list.

Write

Use the *Write* button to download changes to the PLC. The expansion functions are usually downloaded to the PLC when the program is downloaded.

Verify

The *Verify* button compares the contents of the PLC's expansion area with the displayed list, without changing anything.

Restore

This button returns both function lists to the state they were when you entered the dialog, or last wrote to the PLC.

Close

Use this button to exit the dialog.

NOTE! This command may not be available for the particular PLC with which you are working.

6 CONFIGURING PLC SPECIFIC FEATURES

Memory Allocation

C Some C series PLCs have a memory map that can be edited with the **Project|Allocate memory** command, to provide more space for data memory, while reducing program memory. The extended data memory can be accessed with the XDMM instruction.

The dialog for this command shows you the maximum program size for the PLC that is selected for the project, and allows you to allocate a section of the program memory to data expansion memory. The amount of memory that you allocate is chosen from the *Expansion DM Size* list box. When you choose an amount by which the data memory is to be increased, the *Maximum Program Size* field reduces by that amount.

Regardless of when the memory allocation is changed, it only becomes effective in the PLC when the **Online|Download** command is next used.

NOTE! This command may not be available for the particular PLC with which you are working.

I/O Table Editing

The input/output map for PLCs can be edited with the **Project|Edit I/O table** command.

The I/O table in SYSWIN is used to maintain a desired configuration of racks, slots and units within the PLC.

With SYSWIN, there are three versions of the I/O table, all of which should ideally have the same contents. I/O table editing allows you to manipulate an internal version of the table, and modify the PLC's view of how the hardware is configured.

<i>ACTUAL</i>	The real hardware configuration of the PLC units and slots.
<i>REGISTERED</i>	The internal PLC table: this is the one used by the PLC when running, regardless of the state of the actual hardware. It can be read and, for CV Series PLCs, written by the SYSWIN software.
<i>SYSWIN</i>	The I/O configuration understood by SYSWIN. It can be created and modified directly, independently from the PLC, and can be downloaded with a program.

6 CONFIGURING PLC SPECIFIC FEATURES

The Registered Table and SYSWIN's table can be changed from your computer, but the actual configuration requires the physical manipulation of the PLC hardware.

Setting up the I/O table is done by allocating slot and unit options to a list of actual slots and units. The dialog allows you to add or remove options as required.

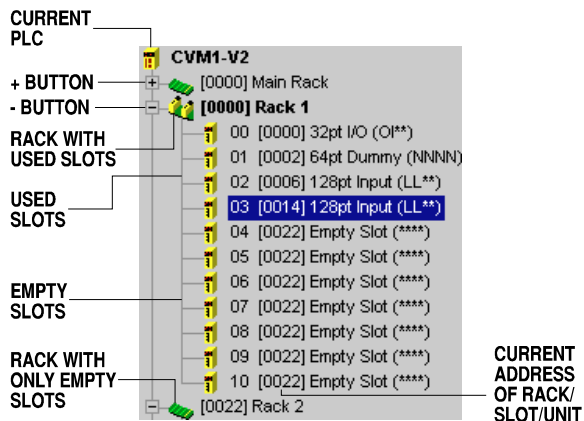
Editing the I/O Table

The Edit PLC I/O Table dialog allows the correct configuration of Racks, Slots and Units. Some C Series PLCs do not support this function.

IO Table

The *IO Table* field displays the hierarchical structure of the PLC for the configuration of Racks and Slots, using the available hardware as reference. The hierarchy can be traversed by selecting the + button or the – button, or the **Space Bar**, to expose or hide appropriate portions of the hierarchy.

The icons associated with the PLC, racks and Slots assist with the identification of the position within the hierarchy. The Rack icon also identifies whether any of the Slots within the Rack are used (the Rack entry is also emboldened).



In this example, selecting the + button exposes the Slots within the Rack. Selecting the - button hides the Slots within the Rack.

Rack IO Options

When a Slot is displayed, the *Rack IO Options* field is enabled with a list of Unit options that can be applied to the Rack. Use the <<Add>> button or double-click on an option to allocate the IO Option to the Slot in the Rack. Use the >>Remove>> button or double-click on a used Slot to deallocate the IO option.

NOTE! In CV Series PLCs, only 10 slots are displayed for Rack 0, since one slot is permanently allocated to the PLC's CPU.

Some IO Options require additional configuration information. In such instances, the Choose Unit Number dialog is displayed for you to enter the extra details.

If the *SYSMAC-BUS* or *SYSMAC-BUS/2 Master (RM)* IO Option is selected, the hierarchy in the *IO Table* field can be further expanded to expose the Remote Terminals and I/O Terminals that form part of the SYSMAC-BUS option. See later in this chapter for information regarding SYSMAC-BUS and Remote Terminals.

Create

Create requests the PLC to examine the actual I/O configuration, and establish it in both the registered table and the SYSWIN table. Thus, all three versions of the I/O table are made the same. You would normally use this button when you first enter the dialog, to ensure a stable starting point. To use this button, the PLC needs to be online.

NOTE! For C1000H and C2000H PLCs, you may be required to enter Word multipliers to set the base address of I/O Terminals on each SYSMAC-BUS Remote Master.

Compare

This button compares the registered table in the PLC with the actual hardware configuration, and displays a message if there are any differences. This is helpful to confirm that a table that has been set up in SYSWIN and downloaded to the PLC agrees with how the hardware is set up. To use this button, the PLC needs to be online.

6 CONFIGURING PLC SPECIFIC FEATURES

Read

The PLC's registered table is uploaded to SYSWIN with this button, replacing the currently displayed setup. This function can also be done as part of a general upload. To use this button, the PLC needs to be online.

Write

CV You can download the SYSWIN I/O table to the PLC with this button at any time while connected. Alternatively, you can wait until other configuration dialogs are complete (for example, PLC Setup) and download all of the configuration with the program. To use this button, the PLC needs to be online.

Verify

Use the *Verify* button after writing or downloading to the PLC, to check that the registered I/O table is the same as the SYSWIN table. A message is displayed if there are any differences. To use this button, the PLC needs to be online.

Clear

The *Clear* button clears all allocations in the current slot or unit list, requesting confirmation before doing so.

Load

Instead of entering all of the I/O allocations, you can load an I/O table from another project file. The *Load* button gives you a standard file selection dialog, in which you can specify a project from which to read in the table. Having loaded in a table in this way, it can be changed, written to the PLC and verified in the usual way.

Check

The *Check* button performs checks on the I/O table shown in SYSWIN such as address overlaps or overflows.

Restore

This button returns all of the SYSWIN I/O table to its state when you first entered the dialog, or when the table was last downloaded to the PLC.

Close

Use this button to exit the dialog.

Editing SIO Units

CV SIO Units within the Rack are located following the last Slot. When a Unit is displayed, the *SIO Options* field is enabled with a list of SIO options that can be applied to the Rack. The *SIO Options* field is identical in function to the *Rack IO Options* field for Slots.

Software Switches

You can set software switches for the Unit number that is highlighted. This can only be done when connected to the PLC.

Software switches give status information on each SIO unit on the PLC. It may be necessary for you to configure them. See later in this chapter for details on setting the software switches.

Unit Setup

You can set unit information for the Unit number that is highlighted. This can only be done when connected to the PLC. See later in this chapter for details on setting up Units.

Editing Remote I/O via SYSMAC-BUS

The *SYSMAC-BUS Master (RM)* IO Option consists of a further level for the configuration of Remote Terminals (Racks). As with Racks, Remote Terminals are made up of Slots which, when selected, invoke the display of options.

When a Remote Terminal Slot is displayed, the *Remote IO Options* field is enabled with a list of Remote IO options that can be applied to the Remote Terminal. The *Remote IO Options* field is identical in function to the *Rack IO Options* field for Slots, except certain units are not available for remote use.

The IO Terminals are located following the last Remote Terminal in the hierarchy.

6 CONFIGURING PLC SPECIFIC FEATURES

C For C Series PLCs C200H/HS/HX/HG/HE, if the *SYSMAC-BUS Master (RM)* IO Option is added, a unit number must be specified, either 0 or 1. A mixture of C500 and C200H Remote Terminals can be added, up to a limit of five units.

NOTE! The C500 Remote Terminal option occupies two remote slots.

C For C Series PLCs C1000H/C2000H, if the *SYSMAC-BUS Master (RM)* IO Option is added, the required Remote Terminals will need to be added. A word multiplier to define the base address for all attached I/O Terminals can also be specified.

SYSMAC-BUS/2 SIO Unit

CV The *SYSMAC-BUS/2 Master (RM)* SIO Option consists of a further level for the configuration of Remote I/O, made up of three Groups. Group 1 and Group 2 support 32 and 16 I/O Units respectively. Group 3 is reserved for Racks and supports eight Racks, each of which supports eleven slots.

When a Slot is displayed, the *Group IO Options* field is enabled with a list of Remote IO options that can be applied to the Slot. The *Remote IO Options* field is identical in function to the *Rack IO Options* field.

See later in this section for a description of the software switches associated with SYSMAC-BUS/2.

Software Switches

CV The following paragraphs describe the Software Switches settings that can be specified for a SIO Unit.

Special I/O Unit Information

This shows the unit you are communicating with. The CIO address range and the DM address range show where the software switches for that unit are. Not all of the areas are used by all communication settings. As well as having dialogs related to the communications settings, each has the following standard buttons:

Read

Pressing this uploads the Software Switches from the PLC.

Write

This downloads the current settings to the Software Switches in the PLC.

Verify

This compares the settings in the display with those in the PLC. It displays a message if there are any differences. This button should be used after you have downloaded settings to check that the table has been correctly set in the PLC.

Close

This closes the dialog.

6 CONFIGURING PLC SPECIFIC FEATURES

Hostlink Software Switches

One of four views can be selected:

- **General Setup**
This allows you to specify the local node number you are downloading from and the setting errors that occur in the Hostlink unit. These may be cleared from the PLC.
- **Port 1 Setup**
This allows you to set details of the communications settings and protocol details for the port, and displays any errors which have occurred during data transmission.
- **Port 2 Setup**
This is identical to the setup information for Port 1 but the settings may be different.
- **Communications Test**
The dialog for this view allows you to select the test port and its type from the lists. Select the test baud rate and a list of the communications errors that occurred in the Unit is displayed. These may be cleared.

SYSMAC-LINK Software Switches

One of three views may be selected:

- **General Setup**
This allows you to start the Node and/or the Data Link Test and stop it to read the current settings. The Status of the Node Test and the Power settings may be displayed and any errors that have occurred in the Unit are displayed.
- **Network Status**
This displays the Node and Network information giving the local network, node and unit numbers as well as the polling node number. The status of all nodes that are connected to the network is shown.
- **Data Link Status**
This displays status information about each node.

SYSMAC-NET Software Switches

One of three views may be selected:

- **General Setup**
The Node Address is displayed together with the number and list of errors that occur in the Unit. The status of the network regarding the power supply, the network status and the loop condition are displayed.
- **Node Test Setup**
You may choose Start to run the node test and then Stop to read the current settings. The test results showing the number of Tests executed, the number of Timeout errors, the number of times the system was Busy, the Response errors and the number of Tokens lost are displayed in the Results area. The current errors are displayed in the Status area and all of the current errors are shown in the Error area.
- **Data Link Status**
If you choose Start Data links, the link status is displayed and if you choose Stop Data links the settings are displayed. The current status is shown and the Active and Error status is displayed for each Node in the CIO address range.

6 CONFIGURING PLC SPECIFIC FEATURES

Ethernet Software Switches

The following settings can be set for the Ethernet Software Switches:

- **Internode Test**
Choose *On* to run the test and *Off* to stop the test (the settings must be written to the PLC for them to take action).
- **Target Network Number**
The network number the internode test uses.
- **Target Node Number**
The node number the internode test uses.
- **Send Data Length**
The length of the data the internode test uses.
- **Response Monitor Time**
The response time in milliseconds the internode test monitors.
- **Online Status**
The read/write status of the dialog and any errors that might occur.

Controller Link Software Switches

The following settings can be set for the Controller Link Software Switches:

- **Polling (Server)**
This indicates whether this is a polling or polled unit.
- **Clear EPROM**
This indicates whether to clear the Controller Link unit EPROM.
- **Online Status**
This displays the read/write status of the dialog and any errors that might occur.

SYSMAC-BUS/2 Software Switches

The following settings can be set for the SYSMAC-BUS/2 Software Switches:

- **General Setup**
The *Type* field displays the Unit type: this can be either Wired or Optical. The *Status* field displays general unit status and specifies error flags. The *Terminator* field displays the Status, Group and Unit of the terminating node.
- **Communications Test**
A communications test can be set up from these settings. A test can only be executed if the *Test possible* field indicates so.
- **Communications Control**
Communication settings for SYSMAC-BUS/2 can be enabled and disabled from these settings.
- **Slave Status**
These settings displays the status of all Units connected to the SYSMAC-BUS/2 Remote Master.

All Other SIOU Units

The Unit number, CIO and DM address range values are displayed together with a message informing you to use the Data Display editor to change these settings. Refer to the SIOU Unit System Manuals for further information.

6 CONFIGURING PLC SPECIFIC FEATURES

Unit Setup

CV The following paragraphs describe the Unit settings that can be specified for a SIO Unit.

Special I/O Unit Information

This shows the unit you are communicating with. The CIO address range and the DM address range show where the software switches for that unit are. Not all of the areas are used by all communication settings. As well as having dialogs related to the communications settings, each has the following standard buttons:

Read

Pressing this uploads the unit setup from the PLC.

Write

This downloads the current settings to the unit setup in the PLC.

Verify

This compares the settings in the display with those in the PLC. It displays a message if there are any differences. This button should be used after you have downloaded settings to check that the table has been correctly set in the PLC.

Close

This closes the dialog.

Hostlink Unit Setup

For each Port, the following information can be set:

- **Baud rate, Stop bits, Duplex control, Parity, Data length and Xon / Xoff control**
Select the appropriate options to define the communications protocol that you require.
- **Transmission delay time**
Expressed in ms.

SYSMAC-NET Unit Setup

The SYSMAC-NET unit setup consists of selection of the appropriate C or CV series command mode and the form of coding, ASCII or Binary.

SYSMAC-LINK Unit Setup

The polling unit, which controls communications in the network, should be set to the lowest unit number to be the polling unit.

Ethernet Unit Setup

The following settings can be set for the Ethernet unit setup:

- **General settings**
The IP Address Setting, Broadcast Address Setting, IP Address Conversion method and FINS UDP Port number can be set.
- **Local Node IP address**
Insert the IP address into the four fields.
- **Sub-net Mask**
Insert into the four fields.
- **UDP Port**
Enter the UDP Port number in this field.
- **FTP Login**
Enter the FTP login name and password in the relevant fields.
- **IP Ad Table**
The IP Address Table can be edited by selecting the *Edit* button.
- **IP Router Table**
The IP Router Table can be edited by selecting the *Edit* button.
- **Online Status**
The read/write status of the dialog and any errors that might occur.

PLC Setup

A wide range of PLC parameters can be set with the **Project|PLC setup** command. All of the main internal procedures and PLC CPU configuration can be established and downloaded with this command. While using the PLC Setup dialog, you need to have your PLC operational manual available for reference. Some C Series PLCs do not support this function. The parameters available are dependant on the PLC selected. For instance, the 'High Speed Counter Settings' parameter can only be set for PLC types CPM1, CPM2 and CQM1.

CV For CV Series PLCs, the dialog is split into three sections. At the top is a list box of PLC parameters that can be set. You can move up and down the list with the arrow keys, or just click on an item with the mouse, to have the option fields displayed. The centre section of the dialog is used to sub-divide a parameter where necessary (for example, rack numbers and addresses). Use this to select more detail as required. In the bottom section, the options appropriate for the selected parameter are displayed.

C For C Series PLCs, the dialog is split into two sections. At the top is a list box containing the available parameters. You can move up and down the list with the arrow keys, or just click on an item with the mouse, to have the option fields displayed. In the bottom section, the options appropriate for the selected view are displayed. These are check boxes and buttons for simple options, or fields in which you must enter a suitable value, such as an address or timing value. Your operational manual provides guidance on the options and values to use.

Load

CV Instead of specifying all of the PLC configuration item by item, you can load a setup from another project file. The **Load** button gives you a standard file open dialog, in which you specify a project from which to load the information. Having brought in a table in this way, it can be changed, written to the PLC and verified.

Default

The **Default** button resets the value of the PLC setup to the original settings.

Read

This button uploads the current configuration from the PLC and sets the dialog with the appropriate options and values.

Write

Use this button to download the new configuration to the PLC. You can also download it as part of the general **Online|Download** command, along with other PLC configuration data.

Verify

This button compares the current settings with those in the PLC and will display a message if they are different. It is recommended to use this button after writing values to the PLC to ensure that the table has been correctly set.

Restore

This button returns the PLC configuration to its state when you first entered this dialog, or when it was last downloaded to the PLC.

Close

Use this button to exit the dialog.

To change the settings for the on-board RS232/422 Hostlink interface, you must use the **Project|Hostlink settings** command, described in the Advanced Communications chapter.

7 ADVANCED PROJECTS

Project Setup Dialog

It is possible to start a trial project with those selections that SYSWIN defines in the Project Setup dialog as described in the Working with PLC Projects chapter. This chapter gives a detailed description of all of the features that can be used within a project and how they are set up.

A dialog is displayed when starting a new project. Select the **File|New project** menu. This screen is the same as the **Project|Project setup** one. For a new project it is titled 'New Project Setup', whereas when Project Setup is used, it is titled 'Change Project Setup'. *New* creates an empty project and *Change* allows you to modify an existing one.

Project

When a new project is created SYSWIN automatically inserts preselected values for the project features. These initial settings allow you to start a project but you may change any or all of these values.

PLC Series

Select the basic C or CV series of OMRON PLCs. The choice you make here will affect a number of other parameters that may need to be set up. For example, the CV series requires setting up the I/O table, and using the PLC Setup dialog to establish specific PLC characteristics.

PLC Type: *Model and CPU*

Choose the appropriate PLC model from the list box for this item. SYSWIN uses your selection to determine the PLC characteristics for checking and online working. For some PLC models (the CQM1, for example), a further choice of CPU will need to be made. In these cases, the list box to the right of the model selector becomes active so that you can make a selection. For the CQM1H, CPU51 or CPU61, two more list boxes appear for the inner board settings.

Editor

Choose between the *Ladder Diagram* and *Function Plan* Editor methods of preparing a program. Ladder programming is the standard method. From either mode, you can use the Statement List Editor to work at instruction level. Function Plan editing is covered in detail in the Advanced Functions chapter.

Project Type

Typically you prepare a program that can be downloaded and executed by the PLC. However, select *Library* if you wish to create modules for insertion in a SYSWIN library, working exclusively off-line or choose *Template* if you are editing a template for future use with a particular PLC.

The Advanced Functions chapter deals with Libraries and Templates and gives guidance on the way to structure a SYSWIN program to make best use of the facilities.

The types of file that are created by each of the *Project Type* options are shown in Appendix A.

7 ADVANCED PROJECTS

Communications

Interface

When you are connected to a PLC, you use a particular communications method. You need to specify the type of communications interface to be used to connect to the PLC, as follows:

SYSWIN supports two basic methods of communication between the PC on which the program is being developed and the PLC that is attached. These are:

Serial Communications or Networked Communications which can be either SYSMAC-LINK, SYSMAC-NET, Ethernet or Controller Link. Note that the networked communications are not available on all PLCs.

Network communications have no further options to select except for Ethernet which has Bridge Options (see below), but serial communication has options that you need to understand in order to ensure correct communication between the two pieces of hardware.

Bridge Option

Choose between *Direct* and *CV bridge*. *Direct* means that you are connected to the PLC on which the program runs.

C Bridge means that you are using a C series PLC to 'bridge' onto a network on which the target PLC is connected.

CV Bridge means that you are using a CV series PLC to 'bridge' onto a network on which the target PLC is connected.

Modem Option

Choose the appropriate option to be either connected directly to the PLC, or connected over telephone lines which require you to use a modem.

Coding Option

If you are connected to the RS232 interface on the PLC, select *SYSMAC-WAY*. If you are connected to the peripheral port on a CV series PLC, select *Toolbus*.

Descriptions of communications connections are shown in the Advanced Communications chapter. Before setting up communications with a PLC it is important that this chapter is read and understood.

Closing Setup

When you accept the setup, you are returned to the programming window. If you are changing the PLC type for the project and have already entered program steps, SYSWIN asks if you wish to convert the program. If you choose to do so then you must confirm the conversion from one PLC to another (see the next section in this chapter). SYSWIN then checks the program, and any addresses or functions that are invalid for the PLC that you have specified are highlighted in red. These items need to be corrected before you can download and execute the program. You can use *Overview Mode* to scan the program for such items more quickly before continuing.

When a new project is being created and if *Automatically Load Template* is selected in **Preferences|Options** then the Address Symbol Template file for the chosen PLC is loaded. This template contains a standardised set of address symbols for the system variables.

Conversion to Other PLCs

If the **Project|Project setup** command is used to change the PLC type that is selected for the project then SYSWIN starts the Convert Program dialog if you choose.

The PLC type that is included in the program to convert, and the PLC type that has now been selected is displayed in a confirmation dialog.

Conversion

SYSWIN uses the templates to match up system variables between different PLCs.

NOTE!	The symbol names for the system variables must be the same in all template files for this feature to work.
--------------	--

When converting from a C Series to another C series PLC, the system variables can be moved.

When converting from a C to a CV series PLC, system variables can be moved as before and the option of moving HR and LR addresses to addresses in the CIO area is given. Default addresses are shown, but the default values may be edited by you.

When converting from a CV to a C series PLC, system variables can be moved and the option of moving specific CIO addresses to HR and LR areas is given. Default addresses are shown, but the default values may be edited by you.

To start the conversion, select *Execute* or select *Cancel* if you choose not to do it.

Process

Depending on the two PLC types, you may need to Process the program.

Project Preferences

These preferences are saved with each project and are reloaded when the project is loaded. They are not Global preferences. These preferences are selected by choosing the **Project|Project preferences** command. Some options may be disabled depending on the selection of PLC in the Project Setup.

Display

Show Network Groupings (Default ON)

When enabled, this indicates that network separators will only be displayed when the network has a name. It allows groups of networks to be formed in the ladder diagram and function plan display. When disabled, every network separator is displayed.

Wrap Block and Network Comments (Default ON)

The comment areas in the Block and Network Header Bars are approximately 30,000 characters in length.

When enabled, using the Block and Network Symbol Editor, it is only necessary to press **Enter** at the end of the paragraph. SYSWIN wraps the information to suit the output so that it appears in a legible form on the network display. However only three lines of the display are shown on the screen.

When disabled, the comments are unwrapped and you must press **Enter** at the end of each line. This option ensures backwards compatibility with previous versions of SYSWIN.

7 ADVANCED PROJECTS

Ladder

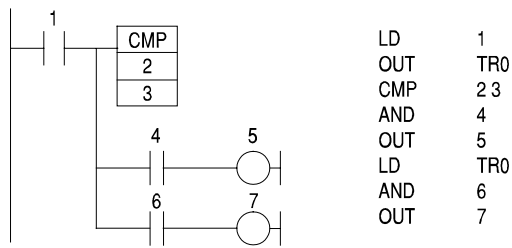
Draw CMP / CMPL as Non-Intermediate By Default (Default ON)

The CVM1-V2 PLC supports both intermediate and non-intermediate forms of the CMP and CMPL instructions. CMP(20) and CMPL(21) are the CV-compatible intermediate forms and CMP(28) and CMPL(29) are the C-compatible non-intermediate forms.

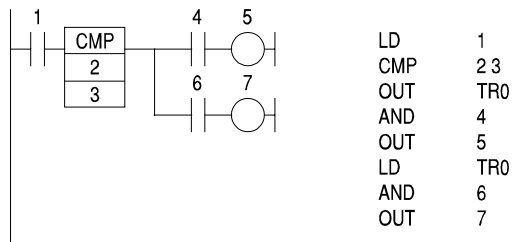
Note that for the CVM1-V2, the CMP/CMPL instruction will appear in the statement list editor with the function number after it.

It is advisable to select this option so that the CMP instructions are drawn as non-intermediate as the instruction does not actually alter the powerflow. Use it deselected if you are trying to maintain compatibility with older CV series PLCs.

NON-INTERMEDIATE FORM



INTERMEDIATE FORM



Download

Use Block Marker Instructions (Default ON)

In order to preserve the block structure of a program, SYSWIN can download special marker instructions, which separate blocks within the PLC. These markers are recognised during the upload process, so that uploaded programs can be separated into blocks.

A block marker appears as a CMP #DEAD #DEAD instruction, which is a valid instruction, and this is visible on a programming console if one is used. Markers appear only between blocks, so there is not one at the start or end of the program.

When enabled it allows SYSWIN to correctly break up the program when it is uploaded.

Note that the feature is not available on the C20 type PLCs.

NOTE! The CMP instruction mentioned above can alter the status of flags in the PLC. However, you should not carry flag status over blocks within a program, since blocks should be unrelated once they have been assembled into PLC code.

Use Double END(01) Instructions (Default ON)

When enabled, SYSWIN downloads a double END(01) instruction at the end of the program. When disabled, SYSWIN only downloads a single END(01) instruction at the end of the program.

When uploading the program with this feature enabled, it allows SYSWIN to detect the real end of the program when it finds a double END(01) instruction. If the feature is disabled then SYSWIN detects the end of the program when a single END(01) instruction is found.

Note that you can insert END instructions in the middle of a program for debugging purposes and still upload the whole program if you have this option enabled.

Optimise

Re-use TR Registers Within Networks (Default OFF)

When this option is selected, the network optimiser generates statement list code that can reuse Temporary Relays within the network. This allows the creation of even larger networks. SYSWIN internally can handle up to 32 Temporary Relays which are then optimised down to the standard 8 Temporary Relays.

Note that if the *Optimise Temporary Relays* option is selected in the Process section of the Process Program dialog, then the reuse of TRs is taken into account.

Defaults

This button sets all the defaults shown above.

OK

This accepts the options chosen.

Cancel

This cancels all the selections and revert to the previously stored ones.

Project Password

This dialog allows you to protect your project by assigning a password to it. A password can be applied to a project by choosing **Project|Project password**. The password must be entered twice for confirmation. You must save the project for the password to take effect. If you load a new project before saving the current project, you do not receive a prompt to save the current project.

The password for a project can be changed by choosing **Project|Project password** and typing the old password first. The password can also be removed by replacing the current password with an empty field. A password can be between 1 and 19 characters.

7 ADVANCED PROJECTS

Processing the Program

This dialog allows the user to process the program. Any information that is output from it is displayed in the Report Dialog so that the user may browse through it.

Optimise Temporary Relays

When this option is selected, the program may be shortened and may consequently execute quicker. This option is useful for optimising other programs that use too many temporary relays in a network.

Convert CMP/CMPL From Intermediate (CV) Type

Until the introduction of the CVM1-V2, the CV series of PLCs only supported the intermediate form of the CMP/CMPL instruction. When this option is enabled, SYSWIN processes networks and, where possible, converts intermediate CMP/CMPL instructions to the non-intermediate forms as found on the C series.

This feature is useful when converting programs from CV series to C series. Note, however, that not all networks can be converted.

Fix CMP/CMPL Instructions on CV Series

When an old SYSWIN 2.0 CV series program is loaded, a message appears prompting you to 'fix CMP/CMPL instructions'. When importing blocks or networks from a SYSWIN 2.0 library file, it is necessary to fix the CMP/CMPL instructions.

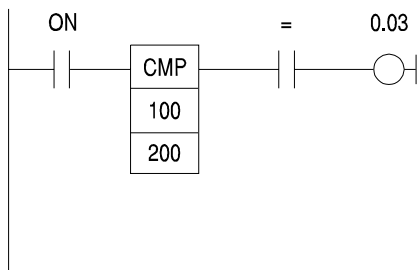
When the program is processed, all CMP/CMPL instructions that now appear in their non-intermediate form and that are drawn in red, are corrected and arranged back to the intermediate form.

Scope

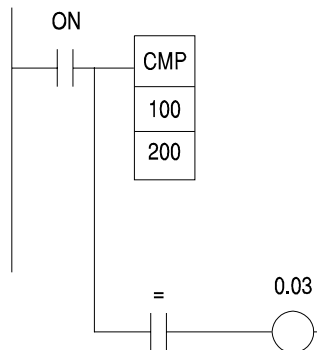
You can choose to search just the current block or all blocks. When the *Scope* is set to *All Blocks*, *Go To Top* moves the start position to the top of the program and searches *Down*. When the *Scope* is set to *Current Block*, *Go To Top* moves to the start of the current block and searches *Down*.

When the options have been selected, start the processing by selecting *Execute* or select *Cancel* if you choose not to do so.

The following CV network will be converted from:



To the C series from:



8 ADVANCED COMMUNICATIONS

Chapter 3 included a section that described standard serial communications between the computer and the PLC. SYSWIN can communicate with PLCs using several different types of connection.

This chapter is divided into separate guides that contain additional guidelines for getting your communications working.

- **Connection Guide**

Use the diagrams in the **Connection Guide** to identify the type of connection that you wish to make, then configure the Project Setup dialog with the settings provided. The instructions in this guide direct you to other sections within this chapter.

- **Information Guide**

You may need to read parts of the **Information Guide** before attempting to connect to the PLC using SYSWIN.

- **Procedures Guide**

The instructions in the **Procedures Guide** that guide you through the various Communications dialogs.

- **Bridging Guide**

When using networked PLCs, it is possible to use CV series PLCs as bridges so that you can communicate across networks. The valid combinations are shown in the **Bridging Guide**.

- **Dialogs Guide**

When you are using networked PLCs, you may also need to configure the PLC Routing Tables and their Data Link Tables. When using the RS-232 port on a CV series PLC, you may also wish to configure the protocol settings using the Host Link Interface Settings dialog. These are described in the **Dialogs Guide**.

If you have problems that you can not resolve after using the information within this chapter, you should contact Customer Services.

Connection Guide

SYSWIN supports the following types of connection:

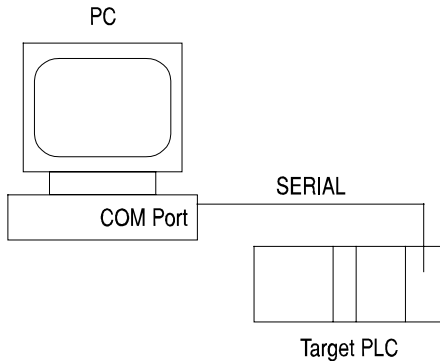
- Serial connection
- Serial connection with modem
- Serial connection to C Bridge
- Serial connection to CV Bridge
- Serial connection with modem to CV Bridge
- Network connection using a SYSMAC-LINK Network Service Board
- Network connection using a SYSMAC-NET Network Service Board
- Network connection using a Controller Link Network Service Board
- Ethernet connection
- Ethernet connection to C Bridge
- Ethernet connection to CV Bridge

Use the diagrams to identify the type of connection that you wish to make, then configure the Project Setup dialog with the settings provided.

8 ADVANCED COMMUNICATIONS

Serial Connection

This is the most common connection where the PLC is directly connected to your computer. You communicate directly from the computer, through the COM port to the Target PLC.



◆ **Complete the Project Settings dialog as follows:**

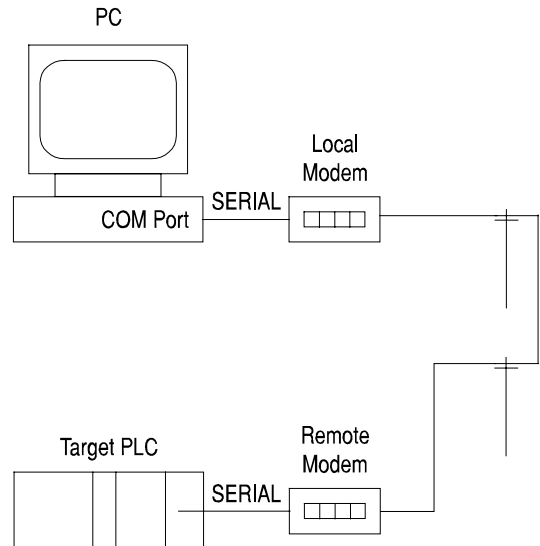
- *Interface:* Serial communications
- *Bridge Option:* Direct
- *Modem Option:* Local
- *Coding Option:* SYSMAC-WAY or Toolbus for CV peripheral port.

◆ **Do the following steps:**

- Read the *Serial Connections* section in the *Information Guide*.
- Check the *Cable Connections* in Appendix E.
- Follow the *Standard Communications Procedure* in the *Procedures Guide*.

Serial Connection With Modem

When the PLC is remote, you can use a modem to communicate with the PLC.



◆ **Complete the Project Settings dialog as follows:**

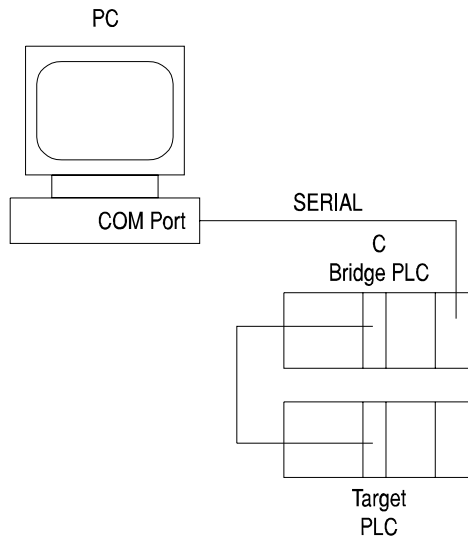
- *Interface:* Serial communications
- *Bridge Option:* Direct
- *Modem Option:* Modem
- *Coding Option:* SYSMAC-WAY or Toolbus for CV peripheral port

◆ **Do the following steps:**

- Read the *Serial Connections* in the *Information Guide*.
- Check the *Cable Connections* in Appendix E.
- Follow the *Standard Modem Communications Procedure* in the *Procedures Guide*.

Serial Connection to C Bridge

By using a C series PLC as a bridge, you can communicate with other PLCs on SYSMAC-LINK and Controller Link networks.



◆ **Complete the Project Settings dialog as follows:**

- *Interface:* Serial communications
- *Bridge Option:* C Bridge
- *Modem Option:* Direct
- *Coding Option:* Toolbus for peripheral port.

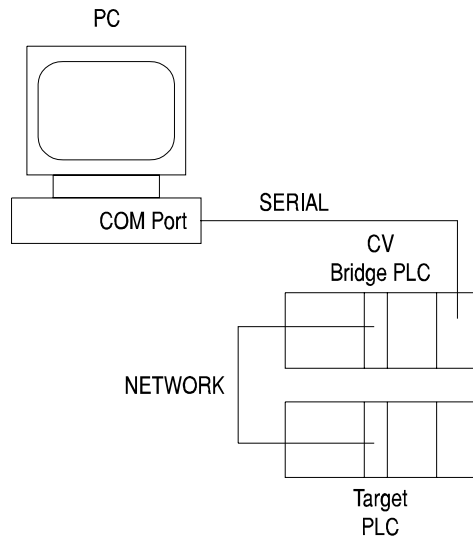
◆ **Do the following steps:**

- Read the *Serial Connections* in the *Information Guide*.
- Check the *Cable Connections* in Appendix E.
- Check the network in the *Bridging Guide*.
- Follow the *Bridged Communications Procedure* in the *Procedures Guide*.

NOTE! For Controller Link to work with C Bridging, the Routing Tables need to be set up.

Serial Connection to CV Bridge

By using a CV series PLC as a bridge, you can communicate with other PLCs on SYSMAC-LINK, Controller Link and SYSMAC-NET networks.



◆ **Complete the Project Settings dialog as follows:**

- *Interface:* Serial communications
- *Bridge Option:* CV Bridge
- *Modem Option:* Direct
- *Coding Option:* SYSMAC-WAY or Toolbus for CV peripheral port.

◆ **Do the following steps:**

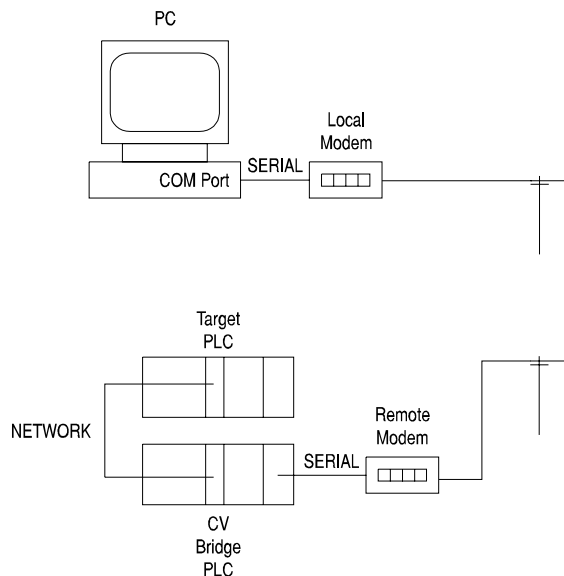
- Read the *Serial Connections* in the *Information Guide*.
- Check the *Cable Connections* in Appendix E.
- Check the network in the *Bridging Guide*.
- Follow the *Bridged Communications Procedure* in the *Procedures Guide*.

NOTE! For Controller Link to work with CV Bridging, the Routing Tables need to be set up.

8 ADVANCED COMMUNICATIONS

Serial Connection With Modem to CV Bridge

You can use a modem, through a CV series PLC acting as a bridge and communicate with remote PLCs on SYSMAC-LINK, Controller Link and SYSMAC-NET networks.



▶ **Complete the Project Settings dialog as follows:**

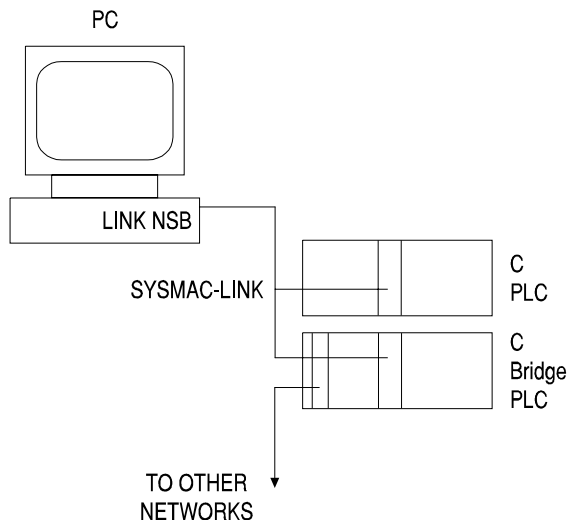
- *Interface:* Serial communications
- *Bridge Option:* CV Bridge
- *Modem Option:* Modem
- *Coding Option:* SYSMAC-WAY or Toolbus for CV peripheral port

▶ **Do the following steps:**

- Read the *Serial Connections* in the *Information Guide*.
- Check the *Cable Connections* in Appendix E.
- Check the network in the *Bridging Guide*.
- Follow the *Bridged Modem Communications Procedure* in the *Procedures Guide*.

Network Connection Using a SYSMAC-LINK Network Service Board

By using a SYSMAC-LINK Network Service Board, you can communicate at high speed with networked PLCs. You can also communicate to PLCs on other networks using CV series PLCs acting as network bridges.



▶ **Complete the Project Settings dialog as follows:**

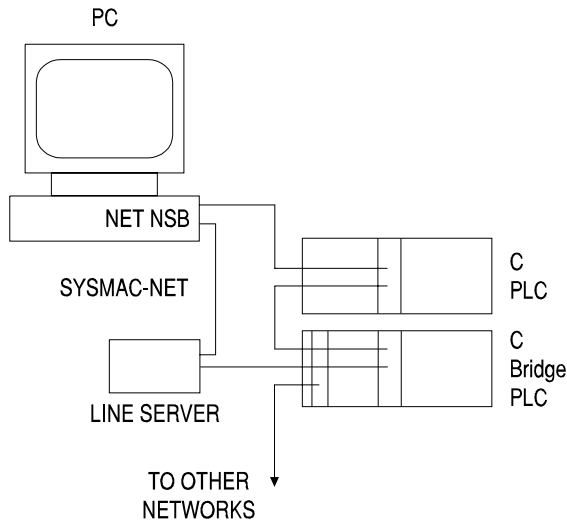
- *Interface:* SYSMAC-LINK

▶ **Do the following steps:**

- Read the *SYSMAC-LINK Connections* in the *Information Guide*.
- Check the network in the *Bridging Guide*.
- Follow the *SYSMAC-LINK Communications Procedure* in the *Procedures Guide*.

Network Connection Using a SYSMAC-NET Network Service Board

By using a SYSMAC-NET Network Service Board, you can communicate at high speed with networked PLCs. You can also communicate to PLCs on other networks using CV series PLCs acting as network bridges.



▶ **Complete the Project Settings dialog as follows:**

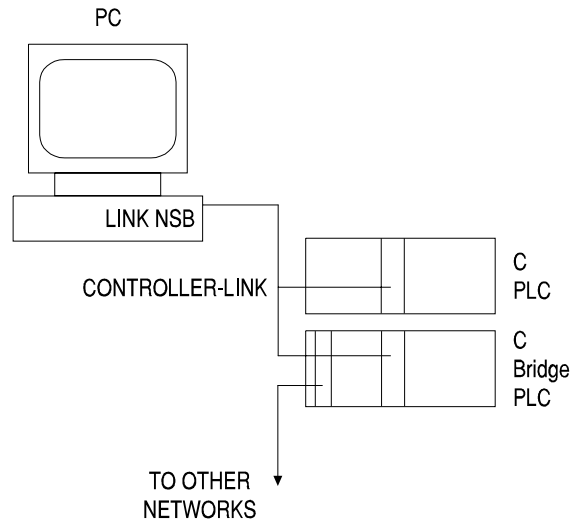
- *Interface:* SYSMAC-NET

▶ **Do the following steps:**

- Read the *SYSMAC-NET Connections* in the *Information Guide*.
- Check the network in the *Bridging Guide*
- Follow the *SYSMAC-NET Communications Procedure* in the *Procedures Guide*.

Network Connection Using a Controller Link Network Service Board

By using a Controller Link Network Service Board, you can communicate at high speed with networked PLCs. You can also communicate to PLCs on other networks using CV series PLCs acting as network bridges.



▶ **Complete the Project Settings dialog as follows:**

- *Interface:* Controller Link

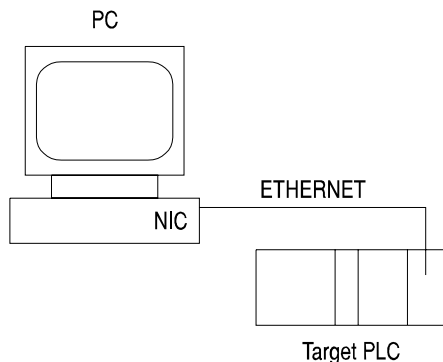
▶ **Do the following steps:**

- Read the *Controller Link Connections* in the *Information Guide*.
- Check the network in the *Bridging Guide*.
- Follow the *Controller Link Communications Procedure* in the *Procedures Guide*.

8 ADVANCED COMMUNICATIONS

Ethernet Connection

A direct Ethernet connection allows you to communicate directly with CV series or Alpha series PLCs. Communication is possible for those users who have installed TCP/IP on their PC. You can communicate to the Alpha PLC through the NIC port on the computer to the Target PLC.



➤ **Complete the Project Settings dialog as follows:**

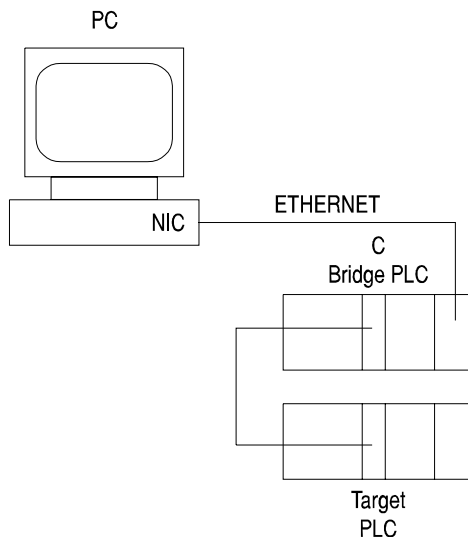
- *Interface:* Ethernet communications
- *Bridge Option:* Direct

➤ **Do the following steps:**

- Read the *Ethernet Connections* section in the *Information Guide*.
- Follow the *Standard Communications Procedure* in the *Procedures Guide*.

Ethernet Connection to C Bridge

By using a C series PLC as a bridge, you can communicate with other PLCs on an Ethernet network.



➤ **Complete the Project Settings dialog as follows:**

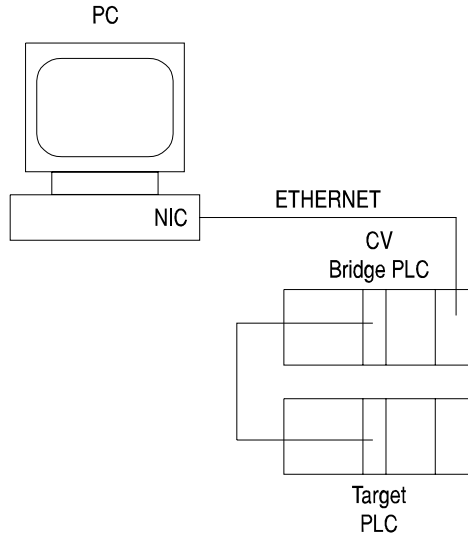
- *Interface:* Ethernet communications
- *Bridge Option:* C Bridge

➤ **Do the following steps:**

- Read the *Ethernet Connections* in the *Information Guide*.
- Check the network in the *Bridging Guide*.
- Follow the *Bridged Communications Procedure* in the *Procedures Guide*.

Ethernet Connection to CV Bridge

By using a CV series PLC as a bridge, you can communicate with other PLCs on an Ethernet network.



➤ **Complete the Project Settings dialog as follows:**

- *Interface:* Ethernet communications
- *Bridge Option:* CV Bridge

➤ **Do the following steps:**

- Read the *Ethernet Connections* in the *Information Guide*.
- Check the network in the *Bridging Guide*.
- Follow the *Bridged Communications Procedure* in the *Procedures Guide*.

Information Guide

This guide contains the following sections:

- Serial connections
- SYSMAC-LINK connections
- SYSMAC-NET connections
- Controller Link connections
- Ethernet connections
- CV series Peripheral Port connections
- CV series Peripheral Port Modem connections
- Network, Node and Unit numbers

Serial Connections

Your computer probably has at least one serial (RS-232) port; the first port is called COM1. You can only connect to a single PLC using an RS-232 port.

If you wish to use a serial connection to several PLCs, you need to use Link Adapters that convert from RS-232 to RS-422 and Optical Fibre. A diagram showing the use of Link Adapters is shown in the description of Serial Networks in the **Network, Node and Unit numbers** section. The rest of the diagrams within this chapter do not show Link Adapters being used, but they would be connected in the serial line between the computer and the PLC or between the remote modem and the PLC.

C series PLCs have several different points of connection:

- CPU-mounted Host Link unit
- Rack-mounted Host Link unit
- Direct CPU RS-232 port
- Direct CPU Peripheral port

When connecting to the Peripheral port on C series PLCs, you need to use a special CIF cable.

8 ADVANCED COMMUNICATIONS

CV series PLCs have several different points of connection:

- Rack-mounted Host Link unit
- Direct CPU RS-232 port
- Direct CPU Peripheral port
- Remote SYSBUS/2 Peripheral port

When connecting to Peripheral ports on CV series PLCs, you need to use a special CIF cable and you must also specify the Toolbus protocol in the Project Setup.

You need to check the various Baud rate, Protocol settings and Handshaking settings in order to get a working connection. These can be configured by the DIP switches, Rotary switches, PLC Setup settings and Software Switches.

The standard protocol settings are 9600 baud, 7 data bits, even parity and 2 stop bits. SYSWIN supports 1: N link type and the CTS line on the PLC needs to be forced to 0V. If you are connecting to a single PC, you would normally set the PLC to be Unit 0. On some host link units, you need to set the Command Level to 3 so that you can download programs to the PLC.

When using a CPU-mounted Host Link unit, you will need to ensure that you are using the correct Host Link unit for the correct PLC:

<i>3G2A6-LK201</i>	CxxH, C200H, C120, C250, C500, C1000H, C2000H
<i>3G2C7-LK201</i>	C20, CxxK

If you are experiencing problems making a serial connection, you should check that the serial port on your computer is enabled and that you do not have a mouse driver loaded or connected to the same port.

For PLCs with direct serial connections on the CPU, you can also set the default communications settings by changing the DIP switches on the front of the CPU. The default protocol settings are 9600 baud, 7 data bits, even parity and 2 stop bits. Older PLCs have a default baud rate of 2400.

If you are using a CV series Peripheral Port connection, you should refer to the **CV series Peripheral Port connections** description.

If you are using modems, you should refer to **Setting Up Modem Connections** in the **Procedures Guide**.

SYSMAC-LINK Connections

You need to install a SYSMAC-LINK Network Service Board inside your computer. You also need to add the SYSMAC-LINK drivers into the CONFIG.SYS file. Windows NT does not support the use of MS-DOS drivers therefore SYSMAC-LINK cannot be used with Windows NT.

CONFIG.SYS example:

```
DEVICE = C:\SLK\SLKBSIB.SYS /IA /T05
        /AD800
DEVICE = C:\SLK\SLKDVBIB.SYS /E
```

where:

/IA	Interrupt number, here it is IRQ10 (A in hex)
/AD800	Card address, here it is D800

Refer to the SYSMAC-LINK Network Support Board manual for further details on installation

You need to check the various Addressing and Protocol settings in order to get a working connection. These can be configured by the DIP switches, Rotary switches and Routing Tables.

You can mix both C and CV series PLCs on a SYSMAC-LINK network.

SYSMAC-NET Connections

You need to install a SYSMAC-LINK Network Service Board inside your computer. You also need to add the SYSMAC-NET drivers into the CONFIG.SYS file. Windows NT does not support the use of MS-DOS drivers therefore SYSMAC-NET cannot be used with Windows NT.

CONFIG.SYS example:

```
DEVICE = C:\SYSNET\CP_3200.SYS /IO0300H,  
        NET00H, M1, LO  
DEVICE = C:\SYSNET\DGIOX.SYS /R2000,  
        03,A00
```

where:

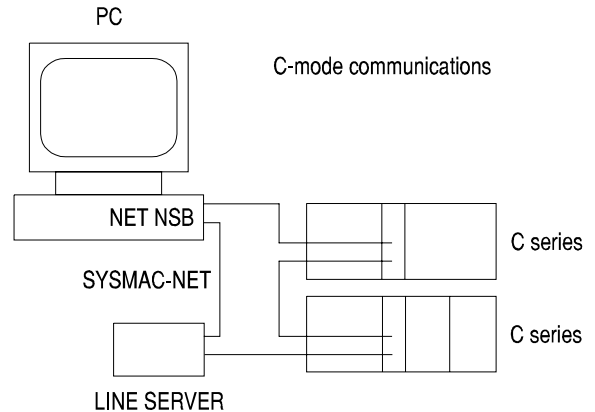
```
/IO0300  Port address, here it is 0300  
NET00    Network number, here it is 00
```

Refer to the SYSMAC-NET Network Support Board manual for further details on installation.

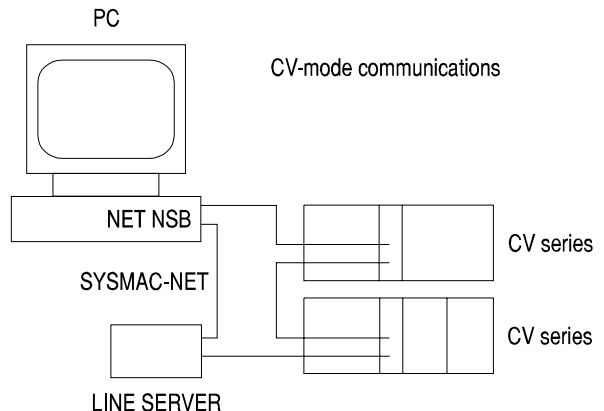
You need to check the various Addressing and Protocol settings in order to get a working connection. These can be configured by the DIP switches, Rotary switches and Routing Tables.

You can mix both C and CV series PLCs on a SYSMAC-NET network, however, you have to select the correct Command Mode for all the SYSMAC-NET units and the SYSMAC-NET Network Service Board. The following diagrams show the most common configurations:

C series only networks

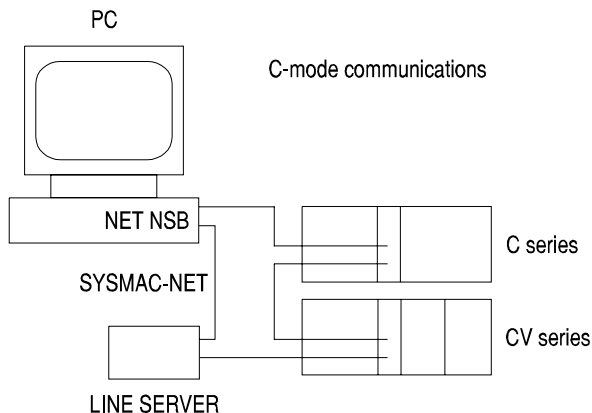


CV series only networks



8 ADVANCED COMMUNICATIONS

Mixed C and CV series networks



Controller Link Connection

You need to install a Controller Link Network Service Board inside your computer. You also need to add the associated Controller Link software into the computer: these are Windows files that update the content of SYS.INI.

Refer to the Controller Link operation manual for further details on installation.

You need to check the various Addressing and Protocol settings in order to get a working connection. These can be configured by the DIP switches and Rotary switches.

You can mix both C and CV series PLCs on a Controller Link network.

Ethernet Connection

You will need to install an NIC board inside your computer. You will also need to add and configure TCP/IP protocols. The Ethernet connections cannot be used on a Windows 3.1 system, unless third party software is providing the ethernet service.

Refer to the Ethernet System Manual for further information.

CV Series Peripheral Port Connections

If you wish to connect to the Peripheral Port on a CV series PLC, you need to use a special CIF cable. You can also use the CIF cable to connect to the Peripheral Port on remote SYSBUS/2 racks. When you connect to the CPU using a CIF cable, communications are much quicker than the standard RS232 connection. However, if you connect to a SYSBUS/2 remote rack using a CIF cable, communications will be slower than using a CIF cable to the CPU.

While you are changing the baud rate or protocol of the Peripheral Port, the communications may become “latched up” and you are not able to connect to the PLC. You need to reset the communications by unplugging the connector from the Peripheral Port and plugging it back in again.

You can connect to the PLC at the 4.8, 9.6 and 19.2 kbs (4800, 9600 and 19200 baud) by changing the DIP switches on the front of the CPU. SYSWIN does not communicate at 50 kbs rate. The protocol is fixed at 8 data bits, odd parity and 1 stop bit.

If you are using a modem with a CV series Peripheral Port connection, you should refer to the **CV series Peripheral Modem Port** connections description.

CV Series Peripheral Port Modem Connections

You can use a modem connection to the Peripheral Port on a CV series PLC; however, communications setup may be difficult as many modems do not support the unusual fixed 11-bit protocol.

You must set up the remote modem that is connected to the PLC, so that it communicates with the PLC at a fixed baud rate (4.8, 9.6 or 19.2). To reduce time-out problems, you should set the baud rate between SYSWIN and the modem to the same rate.

Toolbus communications uses a fixed protocol of 8 data bits, odd parity, 1 stop bit. You can set the protocol between SYSWIN and the modem to be different, but the protocol must still have 8 data bits. You must not configure the modem to use Xon/Xoff handshaking as the Toolbus protocol is binary. Normally you would not need to use any handshaking between the modem and the PLC.

Ideally your remote modem should support “Quiet Answer”, which is sometimes called “Dumb Answer”. If you can use the Hayes command set to configure your modem, you would normally select “Quiet Answer” with an ATQ2 command. You should also use an AT&D0 command that will make the modem ignore the DTR input signal which is not generated by the CIF cable. You can also use an ATSO=1 command to enable auto-answer mode on the remote modem.

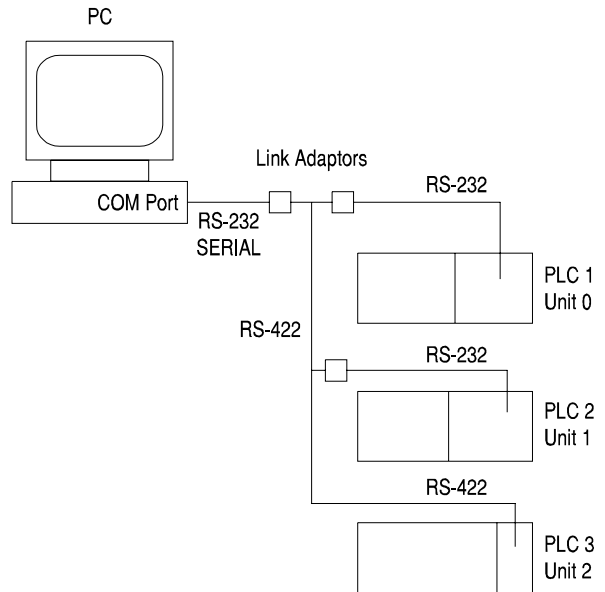
When you have got a basic communications link working, you may want to enable error correction and data compression on both modems. The modems must be able to communicate at a rate higher than the modem to remote PLC rate. If you are using a 19.2k transfer rate, you should use V34 modems, for 9.6k use V32bis modems and for 4.8k use V32 modems.

You should refer to the **Setting up Modem connections** description in the **Procedures Guide**.

Network, Node and Unit Numbers

Serial Networks

When connecting a computer to a serial network of PLCs, you need to configure each PLC to have a different Unit number, as shown below.



You need to configure the Unit number for C series PLCs as follows:

<i>CPU-mounted</i>	DIP switches on back of unit
<i>Host Link unit</i>	
<i>Rack-mounted</i>	
<i>Host Link unit</i>	Rotary switches on front of unit
<i>Direct CPU</i>	
<i>RS-232 port</i>	Internal DM settings
<i>Direct CPU</i>	
<i>Peripheral port</i>	Internal DM settings

8 ADVANCED COMMUNICATIONS

You need to configure the Unit number for CV series PLCs as follows:

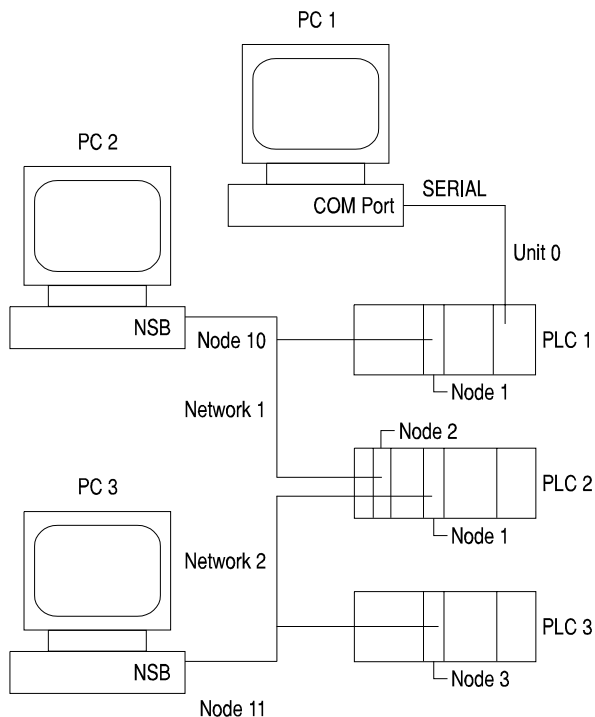
<i>Rack-mounted</i>	Unit Setup dialog
<i>Host Link unit</i>	
<i>Direct CPU</i>	Hostlink settings dialog
<i>RS-232 port</i>	
<i>Direct CPU</i>	Fixed as Unit 0
<i>Peripheral port</i>	
<i>Remote</i>	Fixed as Unit 0
<i>SYSBUS/2</i>	
<i>Peripheral port</i>	

NOTE! The unit number rotary switches on the top of CV series SIO units is the unit number of that Special I/O Unit on that PLC rack and not the Unit number of the PLC on the serial network.

SYSMAC-LINK, Controller Link and SYSMAC-NET Networks

When you have SYSMAC-LINK, Controller Link and SYSMAC-NET networks, you need to configure each PLC on each network to have different Node numbers. If you have two or more networks joined together and wish to communicate between them, you need to create Routing Tables and give each network a unique Network number.

In the diagram below, there are two networks, *Network 1* and *Network 2*. *Network 1* has three nodes, a Network Service Board in *PC 2* on *Node 10* and two PLCs on *Node 1* and *Node 2*. *Network 2* also has three nodes, a Network Service Board in *PC 3* on *Node 1* and two PLCs on *Node 1* and *Node 3*.



When the Routing Tables have been set up, you are able to communicate from all the computers to all PLCs. Although each network is given a specific number, you can always address the local network as network 0. If you communicate using *PC 2*, you can also address *PLC 1* as *Node 1* on Network 0. If you have a serial connection to a CV series PLC, network 0 refers to the network that is connected to the lowest numbered Special I/O Unit, so if you communicate using *PC 1*, you are able to address *PLC 2* as *Node 2* on Network 0.

Each node on a network must have a specific number; however you can always address the local node as node 0. When you have a serial connection to a CV series PLC, you can address the local PLC as Node 0, so if you communicate using *PC 1*, you are able to address *PLC 1* as Node 0 on Network 0.

When communicating from *PC 1* using the serial connection to *PLC 1*, you need to specify Unit 0 as the unit number. Remember that the Unit number that is specified in the communications dialog is not related to the Special I/O Unit number as set by the rotary switches on the top of CV series SIO units.

Procedures Guide

When you have set up the Project Settings dialog, you will need to use the Communications dialogs to make the link between SYSWIN and the PLC.

This guide contains the following procedures for the Communications dialogs:

- Standard Communications Procedure
- Standard Modem Communications Procedure
- Bridged Communications Procedure
- Bridged Modem Communications Procedure
- SYSMAC-LINK Communications Procedure
- SYSMAC-NET Communications Procedure
- Controller Link Communications Procedure
- Ethernet Communications Procedure
- Setting up Modem Connections Procedure

While trying to connect to a PLC, you will receive status messages in the dialog. The more common messages are:

- **Checking connection**
SYSWIN is attempting to connect to the PLC.
- **Connect failed**
SYSWIN did not connect a PLC.
- **Incompatible PLC**
SYSWIN found a PLC, but it was not the same as was specified in the Project Setup dialog.

8 ADVANCED COMMUNICATIONS

Standard Communications Procedure,

Follow this procedure to connect to a local PLC:

- ✦ Check the port on the computer for the connection to the PLC.
- ✦ Check the *Baud* and *Protocol* fields for the communications link.
- ✦ If the protocol you require is not available, press the *Protocols* button.
- ✦ Check the *Unit number*; this is usually 00 if you are connecting to a single PLC.
- ✦ Press the *Test PLC* button to check the link to the PLC.
- ✦ When successfully connected, press the *Close* button.

Standard Modem Communications Procedure

The following procedures apply when connecting to a PLC using a modem:

Testing the link from the computer to the modem:

- ✦ Check the *port* on the computer for the connection to the modem.
- ✦ Check the *Baud* and *Protocol* fields for the communications link.
- ✦ If the protocol you require is not available, press the *Protocols* button.
- ✦ Check the Modem configuration by pressing the *Configuration* button. Further details can be found in **Modem Configuration** in the **Dialogs Guide**.
- ✦ Press the *Test Modem* button; the modem should respond with OK.

Testing the link from the modem to the PLC:

- ✦ Check the *Phone Number* and press the *Connect* button.
- ✦ Check the *Unit number*; this is usually 00 if you are connecting to a single PLC.
- ✦ Press the *Test PLC* button to check the link to the PLC.
- ✦ When successfully connected, press the *Close* button.

Bridged Communications Procedure

The following procedures apply when connecting a PLC through a bridge.

Testing the link from the computer to the Bridge PLC:

- ✦ Check the port on the computer for the connection to the bridge PLC.
- ✦ Check the *Baud* and *Protocol* fields for the communications link.
- ✦ If the protocol you require is not available, press the *Protocols* button.

- ✦ Press the *Test Bridge* button to check the link to the Bridge PLC.

Testing the link from the Bridge PLC to the Target PLC:

- ✦ Check the *Network* and *Node* addresses for the Target PLC.
- ✦ Press the *Test PLC* button to check the link to the Target PLC.
- ✦ When successfully connected, press the *Close* button.

Bridged Modem Communications Procedure

The following procedures apply when connecting a PLC through a bridge using a modem.

Testing the link from the computer to the modem:

- ✦ Check the port on the computer for the connection to the modem.
- ✦ Check the *Baud* and *Protocol* fields for the communications link.
- ✦ If the protocol you require is not available, press the *Protocols* button.
- ✦ Check the Modem configuration by pressing the *Configuration* button. Further details can be found in **Modem Configuration** in the **Dialogs Guide**.
- ✦ Press the *Test Modem* button; the modem should respond with OK.

Testing the link from the modem to the Bridge PLC:

- ✦ Check the *Phone Number* and press the *Connect* button.
- ✦ Check the *Unit number*; this is usually 00 if you are connecting to a single PLC.
- ✦ Press the *Test Bridge* button to check the link to the Bridge PLC.

Testing the link from the Bridge PLC to the Target PLC:

- ✦ Check the *Network* and *Node* addresses for the Target PLC.
- ✦ Press the *Test PLC* button to check the link to the Target PLC.
- ✦ When successfully connected, press the *Close* button.

SYSMAC-LINK Communications Procedure

Follow this procedure to connect to a PLC using a SYSMAC-LINK Network Service Board:

- ✦ Check the *Network* and *Node* addresses for the PLC.
- ✦ Press the *Test PLC* button to check the link to the PLC.
- ✦ When successfully connected, press the *Close* button.

Controller Link Communications Procedure

Follow this procedure to connect to a PLC using a Controller Link Network Service Board:

- ✦ Check the *Network* and *Node* addresses for the PLC.
- ✦ Press the *Test PLC* button to check the link to the PLC.
- ✦ When successfully connected, press the *Close* button.

8 ADVANCED COMMUNICATIONS

SYSMAC-NET Communications Procedure

Follow this procedure to connect to a PLC using a SYSMAC-NET Network Service Board:

- ✦ Check the *Command Mode* and *Coding* fields for the network.
- ✦ Check the *Network* and *Node* addresses for the PLC.
- ✦ Press the *Test PLC* button to check the link to the PLC.
- ✦ When successfully connected, press the *Close* button.

Ethernet Communications Procedure

Follow this procedure to connect to a PLC using a SYSMAC-LINK Network Service Board:

- ✦ Check the *Fins UDP Port Number* and *Workstation Address*.
- ✦ Check the *Source Network* for the source code network address.
- ✦ Check the *IP address* for the PLC.
- ✦ Check the *Network* and *Node* addresses for the PLC.
- ✦ Press the *Test PLC* button to check the link to the PLC.
- ✦ When successfully connected, press the *Close* button.

Setting Up Modem Connections Procedure

SYSWIN, by default, uses the Hayes command set to control the *Local Modem*. You should read the **Modem Configuration Dialog** description in the **Dialog Guide** in order to configure SYSWIN correctly. You need the manuals for your modem available.

Modems usually need to be configured by setting registers inside the modem; these registers are typically referred to as S-registers. You need to configure the S-registers in both the *Local Modem* and the *Remote Modem*. You need to configure the *Local Modem* using *PC 1*.

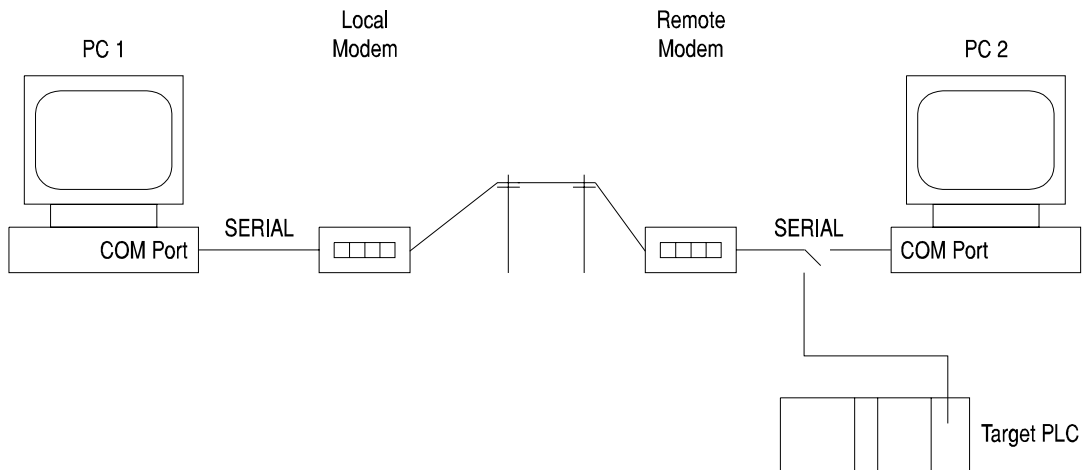
You need another PC, shown here as *PC 2*, at the remote site in order to configure the *Remote Modem*. Generally, you are not able to configure the *Remote Modem* from *PC 1*.

You can use Windows Terminal, or an equivalent program, to configure the modems.

The diagram below shows the typical modem arrangement.

Some useful Hayes commands used to configure modems are:

<i>AT</i>	gets attention of modem
<i>ATS?</i>	displays S-registers
<i>ATS0=1</i>	set S-register 0 to a value of 1
<i>AT&V</i>	displays configuration
<i>AT&F</i>	get default factory configuration
<i>ATZ</i>	get configuration from modem memory
<i>AT&W</i>	save configuration to modem memory



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You need to take care when configuring the following parameters on the *Remote Modem*:

- Auto-answer mode
- Quiet/Dumb answer mode
- Baud rate and Protocol settings
- Handshaking settings

Follow this procedure to configure the modem link:

- ✦ Using Terminal on *PC 1*, check the S-registers on the *Local Modem*.
- ✦ Using SYSWIN on *PC 1*, use the Communications dialog:
 - Check the *Port*, *Baud* and *Protocol* fields.
 - Press the *Configuration* button to check the *Local Modem* configuration.
 - Press the *Test Modem* button to check the link to the *Local Modem*: the *Local Modem* should respond "OK".
- ✦ Attach the *Remote Modem* to *PC 2*.
- ✦ Using Terminal on *PC 2*, check the S-registers on the *Remote Modem*.
- ✦ Leave *PC 2* attached and running Terminal; do not touch *PC 2* keyboard.
- ✦ Switch the *Remote Modem* OFF and ON again; do not touch *PC 2* keyboard.
- ✦ Using SYSWIN on *PC 1*, use the Communications dialog:
 - Press the *Test Modem* button to check the link to the *Local Modem*:
 - The *Local Modem* should respond "OK".
 - Check the *Phone Number* field.
 - Press the *Connect* button to dial up the *Remote Modem*:
 - The message "CONNECT" should appear in SYSWIN.
 - Check the *Unit number* field.
 - Press the *Test PLC* button:
 - C series: The message "@00MM40*" should appear on *PC 2*.
 - CV series: The message "@00FA00000FC00050178*" should appear on *PC 2*. The message is not readable when trying a CV Peripheral Port connection.
 - Press the *Disconnect* button to break the link to the *Remote Modem*.
- ✦ Switch the *Remote Modem* OFF.
- ✦ Attach the *Remote Modem* to the *Target PLC*.
- ✦ Switch the *Remote Modem* ON again.
- ✦ Using SYSWIN on *PC 1*, attempt to connect to the *Target PLC*.
- ✦ If you fail:
 - Check the Baud rate and Protocol settings in the *target PLC*.
 - Check the cable from the *Remote Modem* to the *target PLC*.
 - Re-check the S-registers in the *Remote Modem*.

Bridging Guide

You can use this guide to check if your proposed communications link is permissible. Remember that you are able to use modems on the serial links between your computer and the bridge PLC.

You may wish to refer to the **Network, Node and Unit numbers** description in the **Information Guide**.

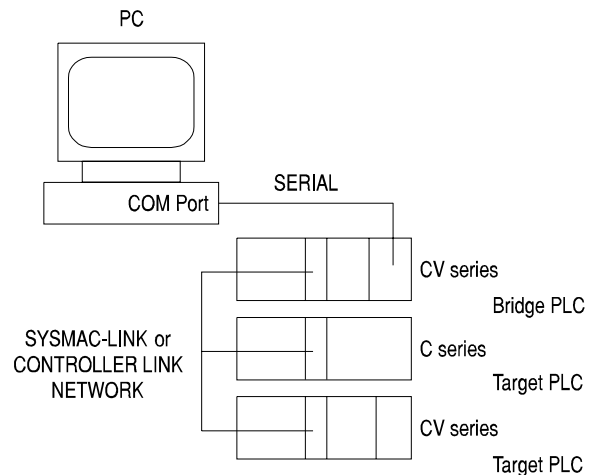
This guide contains the following sections (since SYSMAC-LINK and Controller Link are similar, they are described together):

- Simple SYSMAC-LINK / Controller Link networks
- From SYSMAC-LINK / Controller Link to SYSMAC-LINK networks
- From SYSMAC-LINK / Controller Link to SYSMAC-NET networks
- Simple SYSMAC-NET networks
- From SYSMAC-NET to SYSMAC-NET networks
- From SYSMAC-NET to SYSMAC-LINK / Controller Link networks

NOTE! The following sections assume that the Routing Tables have been correctly set up.

Simple SYSMAC-LINK and Controller Link Networks

Using a serial connection, you can jump onto a SYSMAC-LINK / Controller Link network through a CV series PLC acting as a bridge.

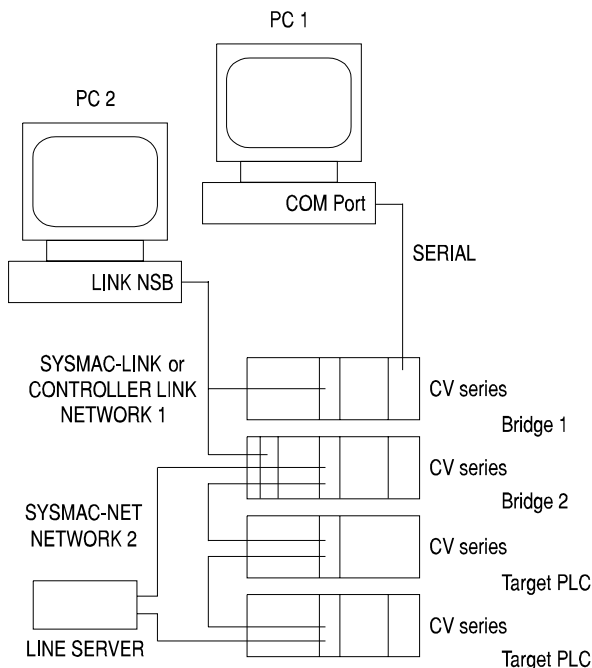


8 ADVANCED COMMUNICATIONS

From SYSMAC-LINK / Controller Link to SYSMAC-LINK / Controller Link Networks

Using a serial connection from *PC 1*, you can jump onto SYSMAC-LINK / Controller Link *Network 1* with *Bridge 1*, then through *Bridge 2* to both C and CV series PLCs on SYSMAC-LINK / Controller Link *Network 2*.

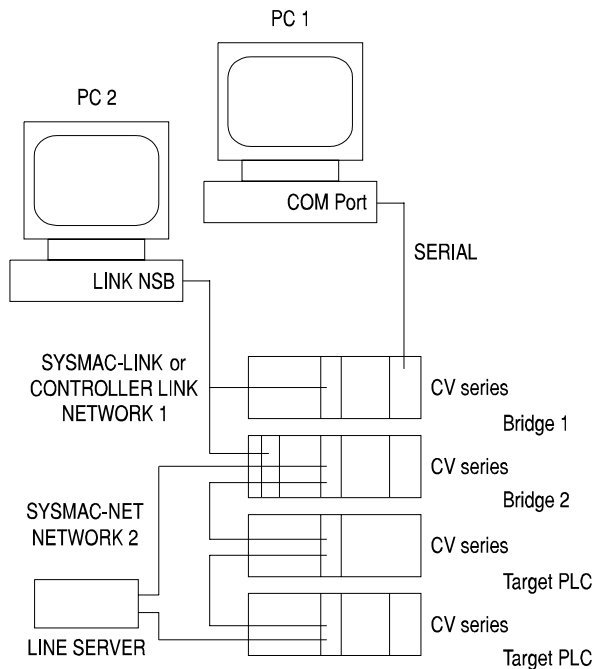
Using a SYSMAC-LINK / Controller Link Network Service Board from *PC 2*, you can jump through a CV SYSMAC-LINK / Controller Link bridge to talk to other C and CV PLCs on another SYSMAC-LINK / Controller Link network.



From SYSMAC-LINK / Controller Link to SYSMAC-NET Networks

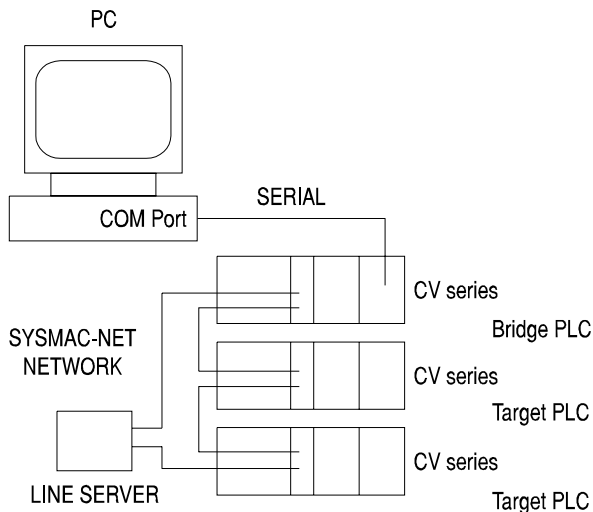
Using a serial connection from *PC 1*, you can jump onto SYSMAC-LINK / Controller Link *Network 1* with *Bridge 1*, then through *Bridge 2* to CV series PLCs on SYSMAC-NET *Network 2*.

Using a SYSMAC-LINK / Controller Link Network Service Board from *PC 2*, you can jump through a CV SYSMAC-LINK / Controller Link bridge to talk to other CV series PLCs on a SYSMAC-NET network.



Simple SYSMAC-NET Networks

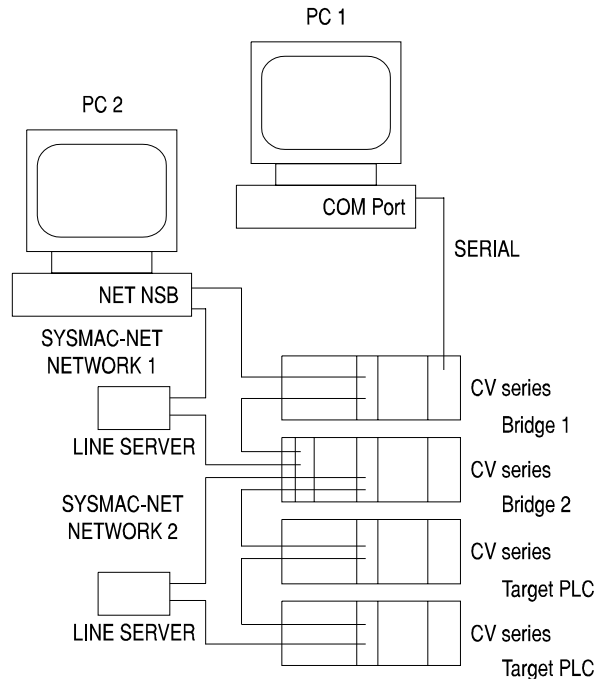
Using a serial connection, you can jump onto a SYSMAC-NET network and communicate to CV series PLCs through a CV series PLC acting as a bridge.



From SYSMAC-NET to SYSMAC-NET Networks

Using a serial connection from *PC 1*, you can jump onto SYSMAC-NET Network 1 with *Bridge 1*, then through *Bridge 2* to CV series PLCs on SYSMAC-NET Network 2.

Using a SYSMAC-NET Network Service Board from *PC 2*, you can jump through a CV SYSMAC-NET bridge to talk to other CV series PLCs on another SYSMAC-NET network.

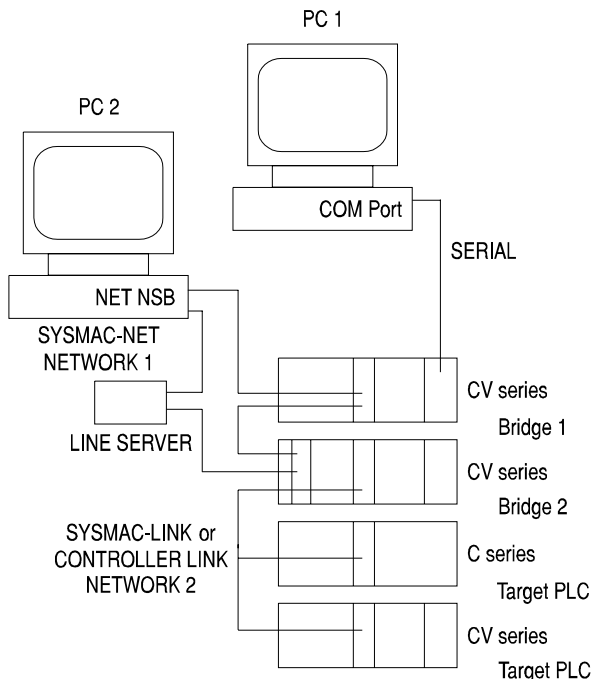


8 ADVANCED COMMUNICATIONS

From SYSMAC-NET to SYSMAC-LINK / Controller Link Networks

Using a serial connection from *PC 1*, you can jump onto SYSMAC-NET *Network 1* with *Bridge 1*, then through *Bridge 2* to C and CV series PLCs on SYSMAC-LINK / Controller Link Network 2.

Using a SYSMAC-NET Network Service Board from *PC 2*, you can jump through a CV SYSMAC-NET bridge to talk to other C and CV series PLCs on a SYSMAC-NET network.



Dialogs Guide

This guide contains the following sections:

- Modem Configuration Dialog
- Host Link Interface Settings Dialog
- Routing Tables Dialog
- Data Link Tables Dialog

Modem Configuration Dialog

Flow Control

For both the transmitter and receiver sides of the link, it is necessary to specify a means of controlling the flow of data between them. The default setting is *None*, and it normally needs changing only if the link speed and PLC speed are different, or if you are using an error-correcting modem which requires a specific type of flow control.

The CTS/RTS and DSR/DTR options are hardware methods, requiring the appropriate types of RS232C cable, while XON/XOFF is software only. If you use DTR flow control, then this method cannot be used for disconnection, and vice versa.

Modem Test

You need to enter here the appropriate AT command string to which your modem will give a standard response that can be checked by SYSWIN. This is used to establish whether the modem is actually connected and switched on at the time of a connection attempt.

NOTE! To enter special control characters in the fields of the communications dialogs, type the characters as seen. For example, for a carriage return (^M), type '^' and 'M'. SYSWIN provides a similar way to insert delays in command strings (but not responses). For example, for a one second delay, enter '^I'.

Dial

This section is used to establish the parameters used when attempting to connect to the remote PLC.

- **Initialise**

The command string entered here is used to initialise the modem before dialling. It may include commands to set software protocols and error correction levels, and so forth.

- **Prefix**

This is the dialling command that precedes the connection number. It is usually 'ATDP' (for pulse mode dialling), or 'ATDT' (for digital tone dialling).

If you are dialling from within a local exchange (PABX or similar), it may be necessary to prefix the number with a 'dial-out' code, such as '9'. This may need to be followed by a delay to allow the exchange to provide an open line. If you are using a Hayes compatible modem, use the comma character ',' to cause the modem to insert a short delay before dialling.

- **Suffix**

This string is placed after the connection number, to complete the dialling command. Usually, a return character (^M) is all that is used.

- **Timeout**

Specify here the time that you wish the modem to wait for a connection. After the number of seconds specified, if there is no proper response, the modem automatically disconnects the telephone line. If a no *Failure* message is indicated (see below), the software always waits for the full timeout before disconnecting.

- **Number of Retries**

This is the number of times you wish the modem to attempt to connect to the remote PLC if it is not successful on the first attempt. For example, the line may be busy, or the responding modem may not connect properly.

- **Carrier Detect**

Check this option if you wish SYSWIN to use the modem's carrier detect feature when connecting. SYSWIN uses the modem's DCD signal. This requires a modem cable with the appropriate line connected.

Responses

When the modem connects to the remote PLC, it issues status messages which must be recognised by SYSWIN to keep you informed of status.

- **Success**

A successful connection results in a message such as 'CONNECT 9600'. The string required in this field is the main status word which is common to any successful connection - the default is 'CONNECT'. If a success string is used in addition to the *Carrier Detect* feature (see above), then both are required to achieve a good connection.

- **Failures**

Several messages may be required to indicate various reasons why a connection failed, such as 'BUSY', or 'NO DIALTONE'. Your modem manual lists the possible responses, and there is provision in this dialog for up to five such messages.

Disconnect

This sets up the method which SYSWIN will use to end a connection and disconnect the telephone line. Two methods are available - DTR (hardware signal) and modem command. If the DTR method is chosen, then you cannot use DTR for flow control, and vice versa.

The appropriate command string usually consists of a special character sequence to place the modem into AT command mode, followed by the disconnect command.

NOTE!	There is no automatic disconnection after a timeout. You must explicitly disconnect with the Online/Disconnect command.
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Defaults

This button resets all of the fields and settings in the Configuration dialog to their initial default values.

General Notes

The CPU-mounting LK201, LK201 (C200H/HS RS232C) and 3G2A5 (C500 RS232C) host link units honour the CTS signal from the modem if the CTS selector switch is set to External. (By default, this switch is set to 0V, which means that the PLC ignores CTS from the modem.)

For CV series PLCs, the CV500-LK201 unit can be configured for either CTS or XON/XOFF transmitter flow control.

The SYSWIN to local modem link can use different flow control from the PLC to remote modem link. The modems use their own methods between each other, regardless of the communications method.

Hostlink Interface Settings

The **Project|Hostlink Settings** command allows you to change the communications settings in the PLC for the on-board RS232/422 Hostlink Interface (the 9-pin connector on the CPU module). Although these parameters are actually part of the PLC setup area in the PLC itself, they are not set with the **Project/PLC Setup** command.

When using SYSMAC-WAY (the Hostlink itself), a communications fault could arise when writing new parameter values, because the action of writing them changes the settings for the channel through which the writing is being performed. The **Hostlink Settings** command attempts to deal with this problem by resetting the SYSWIN communications parameters after writing the new values; this may take a few seconds. When using SYSMAC-LINK, no delay is incurred.

For these reasons, it is good practice to establish any changes required to the Hostlink Settings early in the project development.

The **Hostlink Settings** dialog allows you to read from and write to the PLC, and to change the communications parameters.

Parameter Set

The *Default* option sets the on-board Hostlink to 9600 baud, 7-bit data, even parity, 2 stop bits, and selects Unit 0. Use the *Custom* option if you wish to use a different set of parameters.

Unit

Select here the PLC unit number that you wish to use while connected.

Baud, Byte Size, Parity, Stop Bits

Select the appropriate options from these fields to define the communications protocol you require.

Read

This button reads the current Hostlink Settings from the PLC, and changes the settings in the dialog to match them.

Write

The settings are written to the PLC with this button, to change the on-board Hostlink Settings. SYSWIN then disconnects from the PLC, and attempts to re-connect; a message appears if re-connection is not successful.

NOTE! For modem connection, the *Write* button is not available, thus preventing possibly irretrievable communication failures.

Restore

This button sets the Hostlink Settings to the state they were when you entered the dialog.

Close

Use this button to exit the dialog.

Routing Tables Dialog

The Routing Table Setup dialog allows you to configure networked PLCs so that they can communicate with each other through bridges between networks. It is only necessary to set up Routing Tables if two or more SYSMAC-LINK, Controller Link or SYSMAC-NET networks are connected together and you wish to communicate between them. The dialog allows you to set up Routing Tables for both C and CV series PLCs and also for the SYSMAC-LINK, Controller Link and SYSMAC-NET Network Service Boards (NSBs).

You start the Routing Table Setup dialog by using the **Project|Routing tables** command. When you are connected to a PLC, you are able to read and write the Routing Table information in the PLC. You can change connection on the network so that you can edit the Routing Tables for other PLCs. When a Routing Table has been written, you may need to activate it. You can then check your Routing Table by testing connections to remote nodes.

There are six types of Routing Table:

<i>CV PLC</i>	for CV PLCs on SYSMAC-LINK and SYSMAC-NET networks
<i>C PLC NET</i>	for C PLCs on SYSMAC-NET networks
<i>LINK NSB</i>	for SYSMAC-LINK Network Service Boards
<i>NET NSB</i>	for SYSMAC-NET Network Service Boards
<i>C-LINK NSB</i>	for Controller Link Network Service Boards
<i>C PLC C-LINK</i>	for C PLCs on Controller Link Network

Important Points to Remember

A bridge PLC is a C or CV series PLC that has two or more network cards. If Routing Tables are created for that PLC, communications messages can cross from one network to another. Although C series PLCs do have Routing Tables for Controller Link networks, they do not have Routing Tables for SYSMAC-LINK networks.

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When configuring SYSMAC-NET Network Service Board Routing Tables, SYSWIN cannot directly access the Routing Table on the Network Service Board, however you can read and write the ROUTE.DAT file. This file is usually loaded by the SYSMAC-NET DOS utilities when your computer is restarted.

When using Routing Tables on SYSMAC-LINK and Controller Link Network Service Boards, the SYSMAC-LINK DOS utilities allow you to read and write .DAT routing files. The Routing Table information is typically loaded from the ROUTING.DAT file when your computer is restarted. SYSWIN will only create .SWR files and these cannot be used by the SYSMAC-LINK utilities. However, you can read and write the Routing Tables directly from the Network Service Board. You then need to use the SYSMAC-LINK utilities to read the Routing Table information from the Network Service Board using the SYSMAC-LINK utilities, and save it to a .DAT file.

When you have a direct serial connection, you can only create the Routing Tables in the local PLC. To create Routing Tables in remote PLCs on a network, you need to use a serial CV bridge connection, a SYSMAC-LINK connection or a SYSMAC-NET connection.

You should give each network a specific number. However, you can refer to the local network as network 0. If you are using a Network Service Board, network 0 always refers to the local network directly attached to your NSB. If you have a serial connection to a CV PLC, network 0 refers to the network that is connected to the lowest numbered Special I/O Unit.

You must give each node a specific number. However, you can refer to the local node as node 0. If you are using a Network Service Board, node 0 always refers to the local Network Service Board. When you have a serial connection to a CV PLC, node 0 refers to the local PLC.

Using the Dialog

When the dialog starts, the *Network* number, *Node* number and PLC information are displayed for the currently connected PLC. If you wish to connect to another PLC on the network, change the *Network* and *Node* fields, then press the *Connect* button. If the connection is successful, the information on the new PLC is displayed. The correct type of Routing Table is automatically chosen for the new PLC. You can then configure the Routing Table for that PLC.

When you have written the Routing Table to a PLC, you may need to press the *Activate* button for the new settings to take effect. You can test a Routing Table to a *Remote Node* by entering a *Remote Network* number, a *Node* number and then pressing the *Test* button.

To test a Routing Table on a CV PLC, it is usual to use a serial connection to the PLC and bridge onto a SYSMAC-LINK, Controller Link or SYSMAC-NET network. If the remote node test succeeds, then you will have tested the Routing Table in the bridge PLC.

The status field displays messages from SYSWIN that indicate the current status of the communications.

CV Series SYSMAC-LINK, Controller Link and SYSMAC-NET Routing Tables

For each of the SYSMAC-LINK or SYSMAC-NET units on the PLC, enter their Special I/O Unit numbers. You then need to enter the Local Network number to which the unit is directly attached.

To access PLCs on a Remote Network, you need to specify the Relay Network, which must be one of the Local Networks attached to the local Special I/O Units. You must also specify the Relay Node on the Relay Network that is the bridge to the Remote Network.

C Series SYSMAC-NET Routing Tables

For both the *Level 0 Network* and the *Level 1 Network*, enter the *Network number* that is attached to that SYSMAC-NET Unit.

To access PLCs on a *Remote Network*, you need to specify the Relay Node that is the bridge to the Remote Network.

SYSMAC-LINK NSB Routing Tables

Enter the Local Network number to which the NSB is directly attached.

To access PLCs on a Remote Network, you need to specify the Relay Network, which must be the same as the Local Network. You must also specify the Relay Node on the Relay Network that is the bridge to the Remote Network.

C Series Controller Link Routing Tables

Enter for each Level, the Level and Local Network number that is attached to the Controller Link unit. To access PLCs on a remote network, you need to specify the Relay Network which must be the same as the Local Network. You must also specify the Relay Node on the Relay Network that is the bridge to the Remote Network. The Routing Table Enable bit must be set.

Controller Link NSB Routing Tables

Enter the Local Network number to which the NSB is directly attached. To access PLCs on a remote network, you need to specify the Relay Network which must be the same as the Local Network. You must also specify the Relay Node on the Relay Network that is the bridge to the Remote Network.

SYSMAC-NET NSB Routing Tables

To access PLCs on a Remote Network, you need to specify the Relay Node that is the bridge to the Remote Network.

The following section describes the operation of the buttons on the dialog:

Connect

When the *Connect* button is pressed, SYSWIN attempts to connect to another PLC/NSB as specified by the Network and Node fields in the Connected Node section. You can then edit the Routing Table information for that new connection.

Test

After you have written a new Routing Table to a PLC/NSB, you can press the *Test* button. SYSWIN attempts to communicate with the PLC/NSB as specified by the Network and Node fields in the Remote Node section.

Load

For many PLCs on a network, the Routing Tables are similar. You can *Load* an existing Routing (.SWR) file and then change it for the new PLC/NSB. You need to *Write* the table to the PLC/NSB in order for the new table to become effective.

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Save

You can *Save* the current Routing Table to a Routing (.SWR) file. This should be done as a backup precaution as Routing Table information is not stored as part of the SYSWIN project.

Clear

Press the *Clear* button to empty out the current settings in the dialog. This does not affect the Routing Table in the currently connected PLC/NSB.

Read

When the *Read* button is pressed, the Routing Table is uploaded from the currently connected PLC or SYSMAC-LINK Network Service Board.

If you are configuring a Routing Table for SYSMAC-NET Network Service Board, the *Read* button opens the standard File Open dialog. You would normally read the ROUTE.DAT file that is used by the SYSMAC-NET DOS utilities.

Write

Press the *Write* button to download the Routing Table to the currently connected PLC or SYSMAC-LINK Network Service Board. You may need to press the *Activate* button to make the new table become active.

When configuring SYSMAC-NET Network Service Board, the *Write* button opens the standard File Save dialog. You would normally save the file as ROUTE.DAT and then use the SYSMAC-NET DOS utilities to write the table to the Network Service Board.

Verify

After writing a new Routing Table to the PLC/NSB, it is useful to check that the information held in the dialog and the actual settings in the PLC/NSB are the same. Simply press the *Verify* button and if there are any differences, a message is displayed.

Activate

After you have written a new Routing Table to some PLCs, you may need to press the *Activate* button. This makes the PLC use the new Routing Table that you have downloaded.

Restore

If you wish to discard any editing changes that you have made, press the *Restore* button. The Routing Table information in the dialog is returned to the state when the table was last downloaded to the PLC/NSB.

Close

This closes the Routing Table Setup dialog. Any changes that have not been saved or written down to the PLC/NSB are lost.

Data Link Tables Dialog

The Data Link Table dialog allows you to configure a PLC to participate in one or more automatic data sharing schemes, over SYSMAC-LINK, Controller Link and SYSMAC-NET networks, without the need for special programming. Words of I/O and DM can be set aside for use as data link words, which are allocated to various nodes in the network. Limits on the amount of data and number of nodes varies with network and PLC types. The allocation of words to nodes is defined by one or more data link tables, created using this facility.

You start the dialog by using the **Project|Data link tables** command. Note that if you wish to read, write or verify tables from/to a PLC, you will need to have previously connected to it before starting the dialog.

Data link words can be allocated either automatically, where data is shared equally between all participating nodes, or manually if greater flexibility is required. Automatic allocation splits a fixed amount of I/O and DM equally between the number of participating nodes. For C series PLCs, automatic data links are configured using DIP switches on the network units. Use manual allocation where the amount of data read or written by each node varies widely.

Important Points to Remember

SYSWIN can only set up data link tables for a single PLC. It will be necessary to repeat the process for each PLC on the SYSLINK / Controller Link network.

Data can only be shared on a single physical network. A bridge cannot be used to pass information from one network to another.

SYSMAC-NET data links can be configured so that both C and CV series PLCs can share data. However, it is a limitation that in these mixed configurations the master must be a C series PLC. There are no such restrictions for SYSLINK and Controller Link networks.

Using the Dialog

When the dialog starts, it displays the I/O Unit number (*Level* for C series PLCs) and network *Type* for that unit. You may change the *Unit* and *Type* to select the data link table that you require. Select *None* if there is no data link table to be set.

After selecting the required data link table you should set the type of *Allocation* to be one of:

- Automatic I/O only
- Automatic DM only
- Automatic I/O and DM
- Manual

If you select one of the automatic modes, it is then necessary to set the *Auto Size* to the appropriate number of participating nodes.

SYSMAC-LINK Manual Data Link Tables

The table is split into two distinct sections:

The *Common Area* defines the amount of I/O and DM transmitted by each node and should be identical for all PLCs in the network. You should specify the number of words of I/O and DM where 0 indicates that a node receives data but does not send any. Leave both fields blank to show that a node does not participate in the data link at all. Set the *Cycle Time* to between 5 and 255ms or 0 for automatic selection.

The *Refresh Table* defines the data received by this particular node and needs to be set individually for each PLC. Specify the node numbers which supply data including an entry for the local node.

Controller Link Manual Data Link Tables

The Controller Link data link table requires a Status Address (CIO / LR / DM / EM) to be specified where the status to the data link resides. There are two areas associated with the Controller Link manual data link table. Each area has a Data Link Status Address (CIO / LR / DM / EM), for each node specified in an area. The number of words and the offset from the area Start Address can be specified.

SYSMAC-NET Manual Data Link Tables

SYSMAC-NET data links require a single co-ordinating master which controls all data exchange amongst a number of slaves. It is only necessary to set a table for the master which can either participate in or simply control the data link.

Enter a *Delay Time* appropriate for the network load conditions of either 5, 10, 20 or 30 ms.

You should then make an entry for each participating node specifying the amount of I/O and DM which it will provide in the data link. Set the I/O and DM base addresses at which the shared data will start within the PLC.

The following section describes the operation of the buttons on the dialog:

■ Load

For many PLCs on the network, the data link tables will be similar. Existing tables can be loaded from other project files and modified for the new PLC by pressing this button. You need to *Write* the new table to the PLC in order for it to become effective. The new table is saved as part of the current project file.

■ Read

When the *Read* button is pressed, the data link table for the selected *Unit* is uploaded from the connected PLC and displayed in the dialog.

8 ADVANCED COMMUNICATIONS

- **Write**

Press the *Write* button to download the data link table for the currently selected *Unit* to the connected PLC. For some PLCs you may need to restart the Unit for the data to become active.

- **Verify**

After writing the table to the PLC it is often useful to check that the information in the dialog and the settings in the *Unit* are the same. Simply press the *Verify* button and if there are any differences, a message is displayed.

- **Start / Stop**

Press this button to *Start* the data link in the selected *Unit*. Once active, a second press of the button will *Stop* the data link.

- **Clear**

The *Clear* button allows you to clear the contents of the table shown in the dialog. Note that this does not affect any table in the connected PLC.

- **Restore**

If you wish to discard any editing changes that you have made, press the *Restore* button. The information in the dialog is returned to the state when the table was last downloaded to the PLC or the dialog was closed.

- **Close**

This will *Close* the Data Link Tables dialog. Remember to save the project otherwise any changes will be lost.

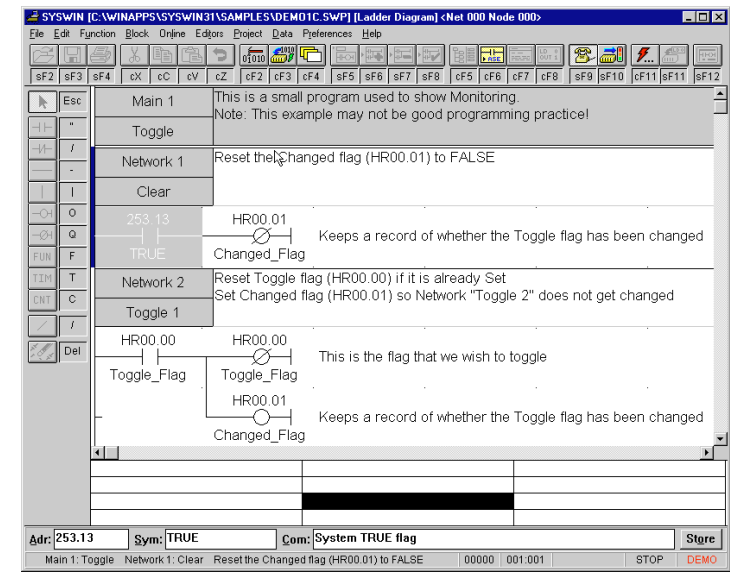
9 ADVANCED FUNCTIONS

Function Plan Editor

Many PLC programmers are familiar with the function plan method of creating PLC programs, and SYSWIN provides the necessary facilities for using this in place of ladder diagrams. Using the Function Plan Editor is essentially the same as ladder programming, except that AND and OR gates are used to join contacts. The SYSWIN controls are used as described in Section 2 - *Creating PLC Programs*.

The selection of function plan editing is usually done when a project is created, and although you can switch from one editing method to the other at any time, this is not recommended. However, it is helpful in situations where you might create a program using ladder diagrams, then pass it to someone else who finds the function plan editor more convenient.

To set the project in function plan editing mode, use the **Project|Project setup** command and select the Function Plan Editor under the *Editor* options.



Function Plan Drawing Tools

	KEY	FKEY	DRAWING TOOL
	Escape		Selection Tool
	"(quote)	F2	Input
	/(slash)	F3	Inverted Output
	-(hyphen)	F4	Horizontal Short
	(bar)	F5	Vertical Short
	O	F6	Output
	Q	F7	Inverted Output
	F	F8	Function
	T	F9	Timer
	C	F10	Counter
	&	F11	AND Gate
	i	F12	OR Gate
	/(slash)		Negate Element
	Del		Delete Element

9 ADVANCED FUNCTIONS

Importing a Project From Disk

The **File|Import** command allows you to load whole projects or parts of them into an existing project. It is generally used to import complete sections of files, but can also be used to import specific parts of PMD files.

Programs and parameters imported with this command replace the existing project details, and therefore a dialog allows you to select only those details that you wish to import, from the following list:

- Block and networks
- Block/network comments
- Address symbols
- Expansion Functions
- I/O table
- PLC setup

If a particular item does not apply to the PLC series for which the current project has been set up, it will be greyed out and unavailable.

The only usefully editable files are .PMF and .ADR files. Appendix C contains details and examples of these files. Refer to that chapter for a full description.

Maintaining Libraries

By using libraries created in SYSWIN, you can greatly speed up program development, re-using blocks and networks in different projects. SYSWIN libraries can consist of complete programs or just individual blocks, according to the level of detail that you wish to use. Libraries can only be created and maintained while not connected to a PLC, and it is therefore necessary to test networks while they are part of a normal SYSWIN project, before extracting them into a library file.

Editing Library Files

The recommended method of creating and working with a library is to follow this general sequence:

- ◆ **Create and test a block within an existing project**
Make sure that the block is complete and operates correctly within the PLC.
- ◆ **Save the project as usual**
- ◆ **Create or load a library file**
For a new library, select the *Library* option in the **Project Setup** dialog, otherwise open an existing library file.
- ◆ **Import blocks from the saved program**
Use the *Load* button in the **Block / Network Manager** to copy the tested blocks into the current library.
- ◆ **Save the library file to disk**
- ◆ **Create a new PLC program, or open an existing one**
Open a project in the normal way, ready to accept blocks from the library.
- ◆ **Load the library with the Block / Network Manager**

Saving Library Files

Saving a library file to disk follows the same procedure as for other SYSWIN files. If you are saving the library for the first time, use the **File|Save project** command; otherwise use the **File|Save project as** command to display the saving dialog box.

The workspace is saved as a library only if the *Library only* option in the **Project Setup** dialog was selected when the program was created.

Recalling Library Files

There are two ways of recalling library files while programming. *Importing* a file brings a library into the workspace, replacing whatever was there previously. *Loading* a library (from within the Block/Network Manager) inserts the library module into an existing program.

Importing a Library

Use the **File|Import** command to replace completely the current program with one from a library file. This dialog is similar to the one for the **File|Open project** command, and allows you to select from a list of standard SYSWIN file types. Select *Library File (SWL)* - or *V1 Library File (LIB)* if you wish to import an older version file - to list the files available.

Loading a Library

From the **Block/Network manager**, you can load a library or program file and insert it within the list of blocks or networks. Insertion is always done at the point above the currently selected item, so to append a library, you must select the blank line below the last entry in a list for it to be inserted correctly.

Templates

Each PLC that is supported by SYSWIN is supplied with a standard set of address symbol definitions. Address symbols are stored in .SWT files in the TEMPLATE sub-directory.


Standard system addresses have been given symbols. If you set the option to *Automatically Load Template for New Project* in the **Preferences|Options** dialog, when you start a new project, the template for the PLC that you have selected is loaded. These templates are not a definitive list; they are just a starting point. You can add to them as you wish.

The template files are also used during project conversion from one PLC to another. If you alter a standard symbol name in one template then you must alter it in all the other templates. In a C200H for example, 253.13 is the ON Flag. If you change to, say, a CV series, the symbol name must be identical. If you are in any doubt about the use of the corresponding symbol names, it is advisable not to alter the symbol template files.

During conversion your existing symbols are not replaced by the ones in the templates and your original symbols are moved to their new addresses.

9 ADVANCED FUNCTIONS

Producing EPROMs

 Several C series PLCs can have EPROMs. When you use the **File|Save EPROM Image** command to generate an EPROM image, a dialog is displayed giving you the choice of file type. There are three possibilities:

- .BIN for straight Binary format
- .IHX for Intel Hexadecimal format
- .MOT for Motorola 5 format

The file name should be entered and, where required, the appropriate directory in which you wish the file to be saved.

The program is checked and if there are any faults the Statement List Editor will start and the first error is highlighted. Use the functions of the Statement List Editor to correct these errors.

Another dialog box is displayed showing the PLC model and CPU type for you to check. The program size and the amount of memory required are shown. If the actual program size is greater than the maximum program size then the EPROM type should be changed to another one in the list. Note that it may not be possible to change the EPROM type depending on the PLC that you have selected. If necessary you may have to use the **Project|Allocate memory** command to change the expansion DM size.

If you wish to include initial DM settings, then enable the box. The range of addresses which are included in the EPROM image are displayed. Press *Select* to open the required .DDM file. Data files must have been prepared using the Data Display Editor. The range of addresses in the data is displayed; only the relevant DM addresses are included.

To include the I/O Table in the EPROM image, check the *Include I/O Table* option.

To enable the detection and indication of a low battery, enable the *Include detect battery* check box.

Accept the dialog, and the EPROM image file is created.

Saving to PMF File Format

PMF files are the text-based form of information within a project. They are designed to allow SYSWIN project files to be used by other applications. SYSWIN allows the saving of both projects and Address Symbol Tables as PMF files.

The PMF file feature is also used internally by SYSWIN when converting projects from other packages. It is an intermediate file before the SYSWIN files are produced. Note that the .PMF file is left in the original directory after a conversion is completed. For detailed information on the layout of a PMF file, see Appendix C.

Saving Projects as PMF Files

Not all information in the project is included in the PMF file. The feature should not be used on a regular basis to **Save** and **Open** project files. It should only be used when the project is to be imported from or exported to another application.

To save project as a .PMF file, select **File|Save project as** and choose PMF as the file format in the *List Files of type* field.

Saving Address Symbol Information as PMF Files

Address Symbol information within the Address Symbol Editor can be saved in the .PMF file format. Within the Address Symbol Editor, select the *Save* button and type a valid file name in the *File name* field. Select *OK* to save the file.

Converting Projects From Other Packages

Files can be converted from other packages for use in SYSWIN. Use the **File|Convert from** command to set up the parameters for conversion. The Select File for Conversion dialog is displayed. This is a standard Windows File Open dialog with the possible file types as .DAT for LSS library files or .COD for CVSS program files. Choose the file from the list or change the directory to the location of the file to be converted.

If the LSS file type is chosen, then select the LSS program from the library you have selected and the correct PLC and CPU for the program.

If you choose CVSS, select the correct PLC and CPU for the program.

The network comments, address symbol comments and program are converted. A .PMF file is created in the same directory as the original .DAT or .COD file. Any errors that SYSWIN detects during the conversion process are written to a report file (.REP) that you can look at with any text editor.

Be certain to check that the conversion is done correctly.

10 CONFIGURING THE ENVIRONMENT

The system starts with a series of default preferences. These are the most commonly used settings. You may alter these to suit your own particular requirements. Note that the Global Preferences affect the working environment of all projects and Project Preferences affect the individual project. This chapter describes the preferences that are available when creating ladder diagram or function plan networks, using the Data Display Editor, Data Trace and Time Chart Monitoring.

Global Preferences - Ladder Diagram / Function Plan

The main purpose of configuring the SYSWIN display is to make as much space as possible for working with ladder diagrams while retaining the appropriate controls to suit your way of working.

The **Preferences** menu allows you to change the global settings for your working environment. Selecting this menu gives further selections.

Window

This command changes the screen format altering the regions of the screen that are affected by each option.

As options are selected or deselected the screen changes immediately. The SYSWIN window itself can be manually resized by click-dragging the bottom right-hand corner, or by using the normal Windows controls in the system menu. The default settings for each region are designed to give an acceptable programming environment for first time users.

Toolbar (Default ON)

The SYSWIN toolbar contains quick 'push-button' alternatives to the most commonly used menu commands. Each button has a key equivalent to allow fast access, if you prefer to use the keyboard. When not selected, the buttons and the keys are not shown.

Keys (Default - Function Keys)

If you prefer to use the mouse to select the toolbar commands, or if you are familiar with the keystrokes for them, the strip showing the keys can be disabled. This selection is only available if the Toolbar is switched ON.

10 CONFIGURING THE ENVIRONMENT

Drawing Tools (Default ON)

These are the main tools used to create ladder diagrams (a similar set is available for function plan editing). When the Show Drawing tools is selected, the tools can be displayed either vertically (the default) or horizontally.

Keys (Default - Alpha Keys)

If you prefer to use the mouse to select the drawing tools, or if you are familiar with their keystrokes, these can be removed from the display. Click the *No keys* option to turn them off. You can choose to display either *Alpha* or *Function* keys.

Data Set Bar (Default ON)

This controls the display of the area at the bottom of the screen where values for data items may be displayed. When selected you can choose to have either *2 rows* or *4 rows* of information displayed.

Other Windows

Show Network bar (Default OFF)

This displays the header and comments relating to the currently selected network.

Show Address bar (Default ON)

The Address Bar shows the address and name of the currently selected element, and allows editing of this information and the addition of comments.

Show Status bar (Default ON)

This is used to show the current address position in a program, the PLC monitor mode, online status and instant help for menu commands.

Drawing

The *Drawing Preferences* dialog allows you to configure the ladder diagram view to suit your needs. It shows areas where you may modify the display and also gives the opportunity to select the fonts to be used in both standard and overview display.

Network Display

Show grid marks (Default ON)

Each element of a ladder diagram is placed on a notional grid in the display. This menu option specifies whether you wish the grid itself to be displayed for reference. A small dot is displayed at each intersection of the grid, providing minimal interference with the ladder diagram.

Show descriptions after Functions (Default ON)

A description of the function is displayed on the network if this is selected.

Show comments after Outputs and Functions

(Default ON)

This displays the address symbol comments after Outputs and Functions when selected.

Show differentiation mark on Contacts or Inputs

(Default ON)

The differentiation mark is displayed if this is selected. If DIFU or DIFD instructions are used within the program, a small differentiation mark is displayed on contacts and inputs.

Ladder (Default - Show Both)

Show addresses

When selected, only the addresses on the ladder diagram are shown.

Show symbols

When selected, the symbols on each ladder step in the network are displayed.

Show Both (the Default)

This displays both the address and the symbol on each ladder element.

Network Separators

Show network comments on separators (Default ON)

Each network is separated in the program display by a header which shows the network number. When enabled, the first three lines of the network comments are displayed.

Monitoring

Automatically start monitoring after online-edit

(Default ON)

When selected, monitoring restarts automatically after a program is changed online, accepted and downloaded to the PLC. See the *Testing While Connected* chapter for detailed information about monitoring.

Interpret values when monitoring *(Default ON)*

When enabled, values are interpreted when monitoring. Parameters within functions are interpreted and displayed in an appropriate format. For example, parameters 1 and 2 of the FDIV instruction are displayed in long BCD and parameter 3 is displayed in floating point format.

Display forced state of bit addresses *(Default OFF)*

All bit addresses that have been forced are displayed with markers on the elements within the network.

Show full powerflow monitoring *(Default ON)*

When enabled and running online, the display of the full powerflow throughout the network is shown. When disabled, the state of the contacts, outputs and values of function parameters only are displayed.

Fonts

Pressing the *Standard Font* or the *Overview Font* button displays a list of supported fonts that the user may select.

Standard Font

The font you choose here is used for all text in the ladder display, including headers, symbols and comments. Normally, this is set to a point size of 9 or greater, depending on the resolution of your screen.

A standard Windows font selection dialog is used, and any changes made become effective as soon as the dialog is accepted.

Overview Font

SYSWIN's overview mode allows you to view a program at reduced size, showing much more than would be displayed in standard mode. This is useful to locate networks quickly.

The font size used for text should be significantly smaller, though still readable. Point sizes of 8 or less are generally used for overview mode.

10 CONFIGURING THE ENVIRONMENT

Editing

Functions

Direct entry of function names from ladder (*Default OFF*)

When selected it is not necessary to press the '**F**' or **F8** key to start the editing dialog. Simply type the mnemonic directly; for example, type **MOV**.

Note that timers and counters can be entered by typing **TIM** and **CNT** directly.

Accept 3 digit functions for all PLCs (*Default OFF*)

If you wish to enter function numbers as 3 digits for all PLCs, select this option.

Keyboard Options

Roll over network separators (*Default ON*)

When enabled, if the cursor reaches the top or the bottom of the current network it rolls over to the next network. To extend a network, press the **Space Bar**.

When disabled, you have to press the **PageUp** or **PageDown** key to change network.

Automatically select ladder drawing tool (*Default OFF*)

When enabled, any tool selected by the keyboard remains active allowing successive placement of symbols by pressing the **Enter** key. If disabled, the default condition, **Enter**, allows editing of the symbol.

Editing Dialogs

Show all buttons on large dialogs (*Default ON*)

This is used in the ladder editing dialogs and, when enabled, shows the **OK**, **Cancel** and **Reference** buttons on these dialogs. The **Reference** button starts the correct quick reference guide (the same as pressing **Ctrl+F1**).

Display symbol information by default (*Default OFF*)

When editing ladder diagrams, the symbol name is displayed instead of the address in the ladder editing dialogs.

Options

Startup

Automatically open last project (*Default OFF*)

If you enable this, SYSWIN automatically opens the last used project file, and restores the project status. This saves you having to explicitly open a file that you were working on when last using SYSWIN.

Automatically connect to PLC (*Default ON*)

When enabled, this option automatically connects to the PLC whenever a project file is opened. A message appears on each attempt to connect, informing you of the connection status.

Automatically load template for new project (*Default ON*)

If this is enabled, the address symbols for the PLC are loaded from the appropriate template file when a new project is started.

Communications

The number of times that SYSWIN will try to reconnect communications to the PLC before timing out. The default value is 3, but may be amended as required by the *Number of reconnection attempts*: field.

Safety

Confirm all operations that affect the PLC (*Default OFF*)

Changing programs while online can have serious effects on the operation of the equipment controlled by a PLC. SYSWIN's Safety Mode warns you before undertaking any critical operation that can affect the state of the PLC. It does not interfere with your ability to go ahead and do that operation, but merely tells you that it is potentially critical. The recommended usage of safety mode is as follows:

- Connected with outputs active: ON
- No outputs connected to PLC: OFF
- Advanced user: OFF

Help

Display bubble help on toolbar buttons (*Default ON*)

When selected, a short description of the button's function is displayed on the screen as the cursor is held over it. If it is not selected, then the description is displayed in the Status Bar when the toolbar button is pressed.

Global Preferences - Data Display

When you switch to the *Data Display Editor*, the SYSWIN screen changes to provide additional toolbar options and modified menus. Many of the commands used in normal SYSWIN operation can still be used, however, including the file and online commands. Preferences for the Data Display Editor can be set by selecting Preferences from the Menu Bar and then choosing Font, Window or Options.

Window

Toolbar (Default ON)

Show Toolbar

If selected, the Toolbar shows the buttons and function key selections that are available. They are not displayed if this is not selected.

Keys (Default - function keys)

You have the option of not displaying the function keys when the toolbar is displayed. For those users who are experienced in the use of SYSWIN, the function keys may be switched off, giving a greater area for the display of the data areas.

Area Tools (Default - ON)

The Area Tools, showing the data areas that can be edited, are controlled by this option. When selected, they can be positioned either vertically or horizontally.

Keys (Default - Area Keys)

The keyboard equivalents may also be displayed alongside by selecting the Keys switches. For those users who are experienced in the use of SYSWIN, the keys may be switched off, giving a greater area for the display of the data areas.

Other Windows

Show Status Bar (Default ON)

This displays the Status Bar, the PLC monitor mode, online status and instant help for menu commands at the bottom of the screen if selected.

Options

The two features on this display are described in the previous section: Global Preferences - Ladder Diagram / Function Plan.

Font

The font type, size and style in which you wish the data areas to be displayed are selected with this option.

10 CONFIGURING THE ENVIRONMENT

Global Preferences - Data Trace / Time Chart Monitoring

When you select *Data Trace* or *Time Chart Monitoring* you can set preferences for the screen layout.

Window

Toolbar

Show Toolbar (*Default ON*)

The toolbar shows the buttons and function keys that are available during Data Trace / Time Chart Monitoring. It may be disabled to give you more display area.

Keys (Default - function keys)

If the Toolbar is selected then you can choose to have the function keys displayed or not. For those users who are experienced in the use of SYSWIN, the function keys may be switched off, giving a greater area for the display of the traces.

Options

The two features on this display are described in the previous section: Global Preferences - Ladder Diagram/Function Plan.

Font

The font type, size and style in which you wish the data areas to be displayed are selected with this option.

.INI File Preferences

Display Colours

Certain Windows display configurations can make it difficult to view the standard SYSWIN window. The default colours used for SYSWIN can be changed to suit your environment.

The global preferences for running SYSWIN are saved in a special file - SYSWIN.INI - in your Windows directory. This is a text file, which can be edited with any standard text editor. You must edit this file to change the colours used for the SYSWIN display.

In the SYSWIN.INI file, a section headed '[Prefs]' contains several environment settings. Add the following statements to specify the appropriate screen colours:

```
GreyColour=192,192,192  
RedColour=255,0,0
```

The default values have been given here. Colours are entered as RGB (red, green, blue) values in the range 0 to 255 (no colour to full colour). For example, to change the red to blue, you would enter:

```
RedColour=0,0,255
```

Help Colours

The colour used to highlight 'hypertext' words in the SYSWIN help system (usually green) can also be changed. This requires editing the Windows initialisation file WIN.INI in your Windows directory. The following statement can be added to the '[Windows Help]' section of this file:

```
JumpColor=255,0,0
```

This example changes the colour to red. Note the different spelling used here.

Startup Options

In the SYSWIN.INI file the section [Setup] contains various startup options.

Project Loading

If you have problems starting SYSWIN, change the following options:

```
Autostart = 0  
Autoconnect = 0
```

CPM1 Programming

If you do not have a token, SYSWIN usually runs in demonstration mode. However, if you wish to program in CPM1 mode, change the following:

```
CPM1OnlyMode = 1
```

NOTE! Be very careful when editing the SYSWIN.INI file! Do not change or remove any items other than the ones described above.

11 ADVANCED INSTALLATIONS

Chapter 1 described the standard installation of SYSWIN on Windows 3.1, Windows 3.11, Windows 95, Windows 98 and Windows NT 4.0 operating systems. SYSWIN can also be installed on computers using different operating systems, but some features of SYSWIN may not be available.

The following chapter gives you detailed information about installing SYSWIN on different operating systems. It will also help you to overcome any problems activating SYSWIN when using the Token Mover or Dongle.

To use SYSWIN, you need to install the program using the SETUP.EXE program on the CD-ROM or Program Disk 1. You need to activate SYSWIN before you can fully program all PLCs by entering the Serial Number, or by installing a Token Disk or a Dongle from a previous version. If SYSWIN is not fully activated, then you can run SYSWIN in either Demonstration Mode or CPM1 Mode. You are given this choice during the installation.

Operating System Compatibility

OMRON does not guarantee that SYSWIN will work on any other hardware other than 100% industry-standard PC-compatible hardware, and it does not guarantee that it will work under any operating system other than Windows 3.1, Windows 3.11 or Windows 95, Window 98 and Windows NT 4.0. The following information is provided for completeness. However, SYSWIN still may not work correctly even though the procedures given here are followed.

You will always be able to run SYSWIN in CPM1 Mode or Demonstration Mode. If you have a Token Disk, you need a PC with a 100% compatible floppy disk system which is also able to run MS-DOS in order to activate SYSWIN. Tokens may be lost or damaged during activation when using non-standard systems.

NOTE!	You will not be able to use your SYSMAC-LINK and SYSMAC-NET Network Service Boards under Windows NT as SYSWIN requires MS-DOS device drivers to be loaded which are not supported by Windows NT.
--------------	--

11 ADVANCED INSTALLATIONS

Installing and Activating SYSWIN

The next three sections in this chapter give information on the installation and activation of SYSWIN with Token Disks and Dongles. It is necessary to follow the instructions in the Operating System Installation Guide which then point you to further information in the Connection Guide and Procedure Guide.

NOTE!	If you are installing using the Dongle, refer to the README.TXT file located in the DONGLE subdirectory for more detailed information.
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Operating System Installation Guide

You can install SYSWIN either to your own workstation, or to a dedicated file server so that several people can use it. You can often 'share' your own hard disk on your workstation so that others can also use SYSWIN. You need a multi-user licence if more than one person is to use SYSWIN at the same time.

If you are using a Token mover or Dongle, choose a method below and follow the steps to install and activate SYSWIN:

- Installing to Your Own Windows 3.1, Windows 3.11, Windows 95, Windows 98 and Windows NT 4.0 Workstation
- Installing to Your Own Windows NT Workstation

Additional topics in this section are:

- Installing to Another Workstation Across a Network or Serial Link
- Installing to a Dedicated File Server
- Activating Across a Network

Installing to Your Own Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0 Workstation (Token)

- ◆ Refer to the **Local Drive Connection** in the Connection Guide.
- ◆ Start up Windows.
- ◆ Run SETUP.EXE; this installs the SYSWIN files to the Local Drive.
- ◆ Use the **Token Mover Procedure** to activate SYSWIN.
If successfully activated, you can use SYSWIN.
- ◆ If Token Mover failed:
Reboot to DOS prompt.
Use the **Token Manual Installation Procedure** to activate SYSWIN.
- ◆ If Token Mover failed again:
Use the **Token Manual Check Procedure** on another computer.
If succeeded, go to **Activating Across a Network (Token)**.
If failed, contact Customer Services.

Installing to Your Own Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0 Workstation (Dongle)

- ◆ Refer to the **Local Drive Connection** in the Connection Guide.
- ◆ Attach the SYSWIN Dongle to the parallel printer port on the PC. You can re-attach your printer to the Dongle later when you are sure that the Dongle is working correctly.
- ◆ Turn on the computer and start Windows.
- ◆ Run SETUP.EXE; this installs the SYSWIN files to the Local Drive.
- ◆ Use the Dongle installer.
If successfully activated, you can run SYSWIN.
- ◆ If Dongle install failed:
Check the port settings are correct for your PC
Use the Dongle installer.
- ◆ If Dongle install failed again:
Contact Customer Services.

11 ADVANCED INSTALLATIONS

Installing to Your Own Windows NT Workstation (Token)

If you are installing to a FAT (DOS-compatible) partition:

- ✦ Refer to the **Local Drive Connection** in the Connection Guide.
- ✦ Start up Windows NT.
- ✦ Run SETUP.EXE; this installs the SYSWIN files to the FAT partition.
- ✦ Reboot computer with MS-DOS.
- ✦ Use the **Token Manual Installation Procedure** to activate SYSWIN.
- ✦ If failed:
 - Use the **Token Manual Check Procedure** on another computer.
 - If succeeded, go to **Activating Across a Network (Token)**.
 - If failed, contact Customer Services.

If you are installing to an NTFS (Non-DOS) partition:

- ✦ Refer to the **Local Drive Connection** in the Connection Guide.
- ✦ Start up Windows NT.
- ✦ Run SETUP.EXE; this installs the SYSWIN files to the NTFS partition.
- ✦ Go to **Activating Across a Network (Token)**.

Installing to Your Own Windows NT Workstation (Dongle)

If you are installing to a FAT (DOS-compatible) or NTFS partition:

- ✦ Refer to the **Local Drive Connection** in the Connection Guide.
- ✦ Attach the SYSWIN Dongle to the parallel printer port on the PC. You can re-attach your printer to the Dongle later when you are sure that the Dongle is working correctly.
- ✦ Turn on the computer and start Windows NT.
- ✦ Run SETUP.EXE; this installs the SYSWIN files to the FAT partition.
- ✦ Use the **Dongle Manual Installation Procedure** and activate SYSWIN.
- ✦ If Dongle install failed:
 - Contact Customer Services.

Installing to Another Workstation Across a Network or Serial Link (Token only)

This is most easily achieved when the Client is a standard DOS/Windows computer:

- ◆ Refer to the **Remote Workstation Connection** in the Connection Guide.

- ◆ Start up both Client and Server Workstations.

On the Client Workstation:

- ◆ Check that the Client can fully access the Server's hard disk across the network.
- ◆ Run SETUP.EXE; this installs the SYSWIN files to the Network Drive.
- ◆ Use the **Token Mover Procedure** to activate SYSWIN.
- ◆ If Token Mover failed:
 - Reboot the computer with MS-DOS.
 - Use the **Token Manual Installation Procedure** to activate SYSWIN.
- ◆ If Token Mover failed again:
 - Use the **Token Manual Check Procedure** on another computer.
 - If succeeded, go to **Activating Across a Network (Token)**.
 - If failed, contact Customer Services.

On the Server Workstation:

- ◆ When successfully activated:
 - Use the **Groups Procedure** to register SYSWIN.
 - You can then use SYSWIN.

Installing to a Dedicated File Server (Token)

- ◆ Refer to the **Remote File Server Connection** in the Connection Guide.

- ◆ Start up both Client Workstation and File Server.

On the Client Workstation:

- ◆ Check that the Client can fully access the Server's hard disk across the network.
- ◆ Run SETUP.EXE; this installs the SYSWIN files to the Network Drive.
- ◆ Use the **Token Mover Procedure** to activate SYSWIN.
- ◆ If Token Mover failed:
 - Reboot the computer with MS-DOS.
 - Use the **Token Manual Installation Procedure** to activate SYSWIN.
- ◆ If Token Mover failed again:
 - Use the **Token Manual Check Procedure** on another computer.
 - If succeeded, use the **Token Manual Installation Procedure** to activate SYSWIN.
 - If failed, contact Customer Services.

On other Client Workstations:

- ◆ When successfully activated:
 - Use the **Groups Procedure** to register SYSWIN.
 - You can then use SYSWIN.

11 ADVANCED INSTALLATIONS

Installing to a Dedicated File Server (Dongle)

- ◆ Refer to the **Remote File Server Connection** in the Connection Guide.
- ◆ Attach the SYSWIN Dongle to the parallel printer port on the Server. You can re-attach your printer to the Dongle later when you are sure that the Dongle is working correctly.
- ◆ Start up both Client Workstation and File Server.

On the Client Workstation:

- ◆ Check that the Client can fully access the Server's hard disk across the network.
- ◆ Run SETUP.EXE; this installs the SYSWIN files to the Network Drive.

On the File Server:

- ◆ Use the **Dongle Sharing Procedure**.

On the Client Workstation:

- ◆ Use the Dongle installer.
If successfully activated, you can run SYSWIN.
- ◆ If Dongle install failed:
Check the port settings are correct for your PC
Use the Dongle installer.
- ◆ If Dongle install failed again:
Contact Customer Services.

On other Client Workstations:

- ◆ When successfully activated:
Use the **Groups Procedure** to register SYSWIN.
You can then use SYSWIN.
- ◆ Use the Dongle installer.
If successfully activated, you can run SYSWIN.

- ◆ If Dongle install failed:
Check the port settings are correct for your PC
Use the Dongle installer.
- ◆ If Dongle install failed again:
Contact Customer Services.

Activating Across a Network (Token only)

This is most easily achieved when the Client is a standard DOS/Windows computer:

- ◆ Refer to the **Remote Workstation Connection** in the Connection Guide.
- ◆ Start up both Client and Server Workstations.

If the Client Workstation is running Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0, follow this procedure on the Client Workstation:

- ◆ Check that the Client can fully access the SYSWIN directory on the Server.
- ◆ Use the **Token Mover Procedure** from the Server to activate SYSWIN.
- ◆ If Token Mover failed:
Reboot the computer with MS-DOS.
Use the **Token Manual Installation Procedure** to activate SYSWIN.
- ◆ If Token Mover failed again:
Use the **Token Manual Check Procedure** on another computer.
If succeeded, use the **Token Manual Installation Procedure** to activate SYSWIN.
If failed, contact Customer Services.

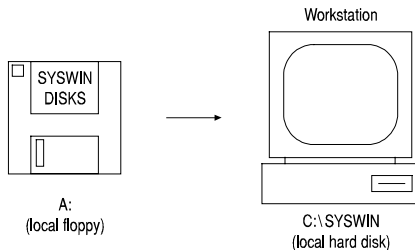
Connection Guide

This section provides information on the different ways of connecting computers together:

- Local Drive Connection
- Remote Workstation Connection
- Remote File Server Connection

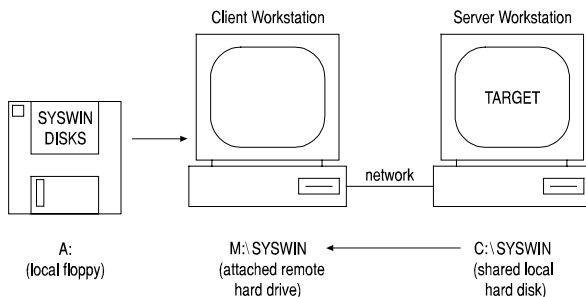
Local Drive Connection

This is the standard connection that you would normally use to install and activate SYSWIN on your local hard disk.



Remote Workstation Connection

You would use this connection to install SYSWIN onto another computer across a network or a serial connection. You would use a Client Workstation to install and activate SYSWIN on the remote Server Workstation.



You can use the Remote Workstation Connection when:

- Your Server Workstation does not have a 100% compatible floppy disk system and you are using a token.
- Your Server Workstation does not have a floppy disk drive (Notebook computer).
- Your Server Workstation is not running Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0.
- Your Server Workstation is not an 80x86/ Pentium based CPU.

If you need to install SYSWIN by running SETUP.EXE, then the Client Workstation must be able to run Windows programs.

If you need to activate SYSWIN with a Token, then the Client Workstation must have a 100% compatible floppy disk system.

If you are using Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0 on the Client Workstation, you can use the **Token Mover Procedure** or the **Dongle installer**.

If you are using any other operating system, you need to reboot your Client Workstation using MS-DOS and then use the **Token Manual Installation Procedure** or the **Dongle Manual Installation Procedure**.

You must let the remote Server Workstation “share” its hard drive so that your local Client Workstation can “attach” to the Server Workstation. Your Client Workstation will need full read/write access to the SYSWIN directory on the Server Workstation.

You can use the following networks:

- MS-DOS based INTERLINK RS232 serial/parallel networks

11 ADVANCED INSTALLATIONS

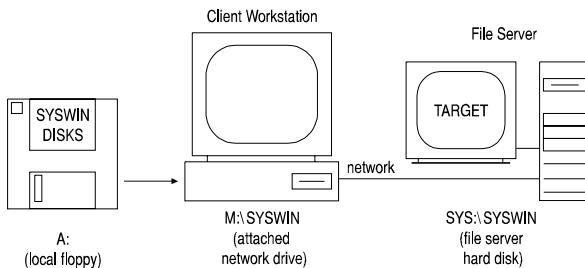
- MS-DOS based “Peer to Peer” networks, for example “Netware Lite”
- Windows for Workgroups networks and other networks

If you have a notebook PC that does not have any expansion slots for network cards and does not have a compatible floppy disk system, setting up an INTERLINK network using a 3-wire serial port connection is the ideal solution.

When installed and activated, you will be able to run SYSWIN on the Server Workstation. If you have a permanent network connection between the Client Workstation and the Server Workstation, then you will also be able to run SYSWIN on the Client Workstation. Remember that only one user may run SYSWIN at a time, unless a multi-user network version is being used.

Remote File Server Connection

You would normally use this connection to install a multi-user version of SYSWIN onto a file server. The Client Workstations then runs SYSWIN over the network directly from the remote file server.



You can use the Remote Workstation Connection when:

- You wish to share your copy of SYSWIN with other users
- You have a multi-user network version of SYSWIN
- You do not have enough space on your local drive
- Your File Server is not running Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0.

- Your File Server is not an 80x86/Pentium based CPU

If you need to install SYSWIN by running SETUP.EXE, then the Client Workstation must be able to run Windows programs.

As you need to activate SYSWIN, the Client Workstation must have a 100% compatible floppy disk system if you are installing a token. If you are using Windows 3.1, 3.11, Windows 95, Windows 98, and Windows NT 4.0 on the Client Workstation, you are able to use the **Token Mover Procedure** or Dongle installer. If you are using any other operating system, you need to reboot your Client Workstation using MS-DOS and then use the **Token Manual Installation Procedure** or the **Dongle Manual Installation Procedure**.

You must let the remote File Server “share” its hard drive so that your local Client Workstation can “attach” to the File Server. Your Client Workstation needs full read/write access to the SYSWIN directory on the File Server. If you are experiencing problems, check with your Network Administrator.

You can use the following network servers:

- Netware
- LAN Manager
- Banyan Vines
- LANTastic
- DECnet
- Sun PC-NFS
- Windows NT
- and other networks

When installed and activated, you can run SYSWIN on the Client Workstation. You are also able to run SYSWIN on the File Server if it can run Windows programs. Remember that only one user may run SYSWIN at a time, unless a multi-user network version is being used.

Procedure Guide

This section provides information on the following procedures:

- Token Mover Procedure
- Token Manual Installation Procedure
- Dongle Manual Installation Procedure
- Token Manual Check Procedure
- Dongle Manual Check Procedure
- Dongle Sharing Procedure
- Groups Procedure

Token Mover Procedure

The Token Mover is a Windows program, however, if you are running the Token Mover on operating systems other than Windows 3.1, 3.11, Windows 95, Windows 98 or Windows NT 4.0 you may only be able to scan the hard disk.

You can use the Token Mover to scan both the Token Disks and Installed Copy on the hard disk. When *scanning*, the Token Mover checks the disks for valid tokens. When you have found valid tokens, you can activate SYSWIN by moving a token from the Token Disk to the Installed Copy. When you want to use the token on another computer, you can *deactivate* SYSWIN by moving the Token from the Installed Copy back to the Token Disk.

The Token Mover guides you through both the *activation* and *deactivation* processes. You should follow the standard sequence by checking the details and pressing the flashing button. Useful hints are also given in the window at the bottom of the dialog.

Checking the Token Disk

- ◆ Start the Token Mover program.
- ◆ Put the Token Disk in the floppy drive.
- ◆ Check the details in the *Floppy Drive* field.
- ◆ Press the flashing *Scan Floppy Disk* button.
- ◆ The Token Report Dialog should be displayed giving details of the Tokens.
- ◆ If there are memory errors:
Reboot Windows and start the Token Mover program again.
- ◆ If there are problems with floppy disk drive:
You may have to **Activate across a Network** instead.
- ◆ If there are other problems:
You may have a damaged Token Disk.
You may have to use the **Token Manual Installation Procedure** instead.

11 ADVANCED INSTALLATIONS

Checking the Installed Copy

- ✦ Check the details in the *Installed Path* field.
- ✦ Press the flashing *Scan Installed Copy* button.
- ✦ If there are Tokens on the Installed Copy:
The Token Report Dialog is displayed giving details of the Token.
- ✦ If there are no Tokens on the Installed Copy:
A message is displayed saying that no Tokens were found.
- ✦ If there are problems:
You may not have SYSWIN installed in the directory.
You may have a damaged Token on the Installed Copy.
You may have insufficient access rights on a network drive.

Activating SYSWIN

If there are no Tokens on the Installed Copy, you are prompted to *Activate* SYSWIN:

- ✦ Press the flashing *Activate* SYSWIN button.
- ✦ If there are problems:
You may have insufficient access rights on a network drive.
You may have to use the **Token Manual Installation Procedure** instead.
- ✦ Otherwise, press the flashing *Scan Installed Copy* button.
- ✦ The Token Report Dialog should be displayed giving details of the Token.
- ✦ You can press the *Exit* button and run SYSWIN.

Deactivating SYSWIN

If there are Tokens on the Installed Copy, you are prompted to *Deactivate* SYSWIN:

- ✦ Press the flashing *Deactivate* SYSWIN button.
- ✦ If there are problems:
You may have insufficient access rights on a network drive.
You may have to use the **Token Manual Installation Procedure** instead.
- ✦ Otherwise, press the flashing *Scan Installed Copy* button.
- ✦ The message should be displayed saying that no Tokens were found.
- ✦ You can press the *Exit* button and run SYSWIN in Demonstration mode.

Token Manual Installation Procedure

The Manual Installation uses two MS-DOS programs, CCLOOK.EXE and CCMOVE.EXE. You should not run these programs in a DOS-compatible window. The two MS-DOS programs are on the Token Disk. You should normally run the programs directly from the Token Disk in preference to running other copies.

You can use CCLOOK.EXE to *scan* both the Token Disks and Installed Copy on the hard disk. When *scanning*, the disks are checked for valid tokens. When you have found valid tokens, you can use CCMOVE.EXE to *activate* SYSWIN by moving a token from the Token disk to the Installed Copy. When you want to use the token on another computer, you can *deactivate* SYSWIN by moving the Token from the Installed Copy back to the Token Disk.

NOTE!	After you have done a Manual Installation, you should run the Token Mover program on your target computer before using SYSWIN.
--------------	--

When you run the Token Mover, you may need to ignore the flashing buttons and directly press the *Scan Installed Copy* button to check the Token while running Windows.

- For Windows 3.1 and Windows 3.11 reboot the computer and do not go directly into Windows.
- For Windows 95, Windows 98 and Windows NT 4.0, reboot the computer in DOS Mode.
- For other operating systems reboot the computer with MS-DOS.

If you want to move a Token across a network, you need to start the network drivers and connect to the remote network drive.

The following sequence assumes that the floppy disk drive is A: and that SYSWIN is installed in the C:\SYSWIN directory. You may need to change the drive and directory names for your particular computer.

Checking the Token Disk

Put the Token Disk in the floppy drive.

- ◆ At the DOS prompt, type:

```
A:          {change to drive A:}
CD \        {move to the root directory}
CCLOOK A: {scan the Token Disk for Tokens}
```

- ◆ If there is a problem:

Reboot MS-DOS without a CONFIG.SYS and AUTOEXEC.BAT file and try to use the CCLOOK program again.

- ◆ If there are problems with the floppy disk drive:

You may have to **Activate Across a Network** instead.

- ◆ If there are other problems:

You may have no Tokens on the Token Disk.
You may have a damaged Token Disk.

- ◆ If you are successful, a screen appears with the following information:

The *Number of copies left on master* field tells you how many Tokens you have on the Token Disk.

The *Number of concurrent network users* field tells you how many Users can use the same token at the same time.

- ◆ Press **Escape** to leave the program.

Checking the Installed Copy

- ◆ At the DOS prompt, type:

```
C:          {change to the hard disk C:}
CD \SYSWIN {move to the SYSWIN
            directory}
DIR SYSWIN.EXE {check if SYSWIN is installed
               there}
A:          {change back to the floppy
            disk}
CCLOOK C:   {scan the Installed Copy for
            Tokens}
```

- ◆ If there is a problem:

Reboot MS-DOS without a CONFIG.SYS and AUTOEXEC.BAT file and try to use the CCLOOK program again.

- ◆ If there are problems:

You may have no Tokens on the Installed Copy.
You may have a damaged Token on the Installed Copy.
You may be using the wrong version of the CCLOOK program.

- ◆ If you are successful, a screen appears with the following information:

The *Number of concurrent network users* field tells you how many Users can use the same token at the same time.

- ◆ Press **Escape** to leave the program.

11 ADVANCED INSTALLATIONS

Activating SYSWIN

If there are no Tokens on the Installed Copy, you can then activate SYSWIN:

- ◆ At the DOS prompt, type:
CC MOVE A: C: {move the Token to the
Installed Copy}
- ◆ If there is a problem:
Reboot MS-DOS without a CONFIG.SYS and
AUTOEXEC.BAT file and try to use the
CCMOVE program again.
- ◆ If there are problems with the floppy disk drive:
You may have to **Activate Across a Network**
instead.
- ◆ If there are other problems:
You may be using the wrong version of the
CCMOVE program.
You may have insufficient access rights on a
network drive.
- ◆ If you are successful:
No error message is displayed.
- ◆ At the DOS prompt, type:
CC LOOK C: {scan the Installed Copy for
Tokens}
- ◆ You should find a Token.
- ◆ Reboot Windows and you should be able to run
SYSWIN.

Deactivating SYSWIN

If there are Tokens on the Installed Copy, you can then deactivate SYSWIN:

- ◆ At the DOS prompt, type:
CC MOVE C: A: {move the Token to the Token
Disk}
- ◆ If there is a problem:
Reboot MS-DOS without a CONFIG.SYS and
AUTOEXEC.BAT file and try to use the
CCMOVE program again.
- ◆ If there are other problems:
You may be using the wrong version of the
CCMOVE program.
You may have insufficient access rights on a
network drive.
- ◆ If you are successful:
No error message is displayed.
- ◆ At the DOS prompt, type:
CC LOOK C: {scan the Installed Copy for
Tokens}
- ◆ You should not find a Token.
Reboot Windows and you should be able to run
SYSWIN in Demonstration mode.

Dongle Manual Installation Procedure

The Dongle Manual Installation Procedure installs specific Dongle drivers for Windows NT only. The device driver **HARDLOCK.SYS** and support library **HLVDD.DLL** must be installed on the system.

HLINST.EXE is a command shell utility which can be used to install the Dongle driver. If an older version of the Dongle driver has already been installed, it must be uninstalled.

- ◆ At the DOS prompt, go to the directory containing device driver **HARDLOCK.SYS** and support library **HLVDD.DLL**.
- ◆ Type the following to remove an existing version of the device driver and library:
`HLINST -d`
- ◆ Type the following to install a new version of the device driver and library:
`HLINST`
- ◆ Edit the **SYSWIN.INI** file and ensure the following line exists in the [Setup] section:
`CheckDongle=1`

Token Manual Check Procedure

The Manual Check uses an MS-DOS program, **CCLOOK.EXE**. You should not run the program in a DOS-compatible window. The correct version of **CCLOOK.EXE** is on the Token Disk. You should normally run the program directly from the Token Disk in preference to running another copy.

You can use **CCLOOK.EXE** to scan the Token Disks to check for valid tokens.

- ◆ For Windows 3.1 and Windows 3.11:
Reboot the computer and do not go directly into Windows.
- ◆ For Windows 95 or Windows 98 and Windows NT 4.0:
Reboot the computer in DOS Mode.
- ◆ For other operating systems:
Reboot the computer with MS-DOS.

The following sequence assumes that you are using A: for your floppy disk drive. You may need to change the drive letter for your particular computer.

11 ADVANCED INSTALLATIONS

Checking the Token Disk

- ✦ Put the Token Disk in the floppy drive.
- ✦ At the DOS prompt, type:
 - A: {change to drive A:}
 - CD \ {move to the root directory}
 - CCLOOK A: {scan the Token Disk for Tokens}
- ✦ If there is a problem:
 - Reboot MS-DOS without a CONFIG.SYS and AUTOEXEC.BAT file and try to use the CCLOOK program again.
- ✦ If there are problems with the floppy disk drive:
 - You may have to use CCLOOK on another computer.
- ✦ If there are other problems:
 - You may have no Tokens on the Token Disk.
 - You may have a damaged Token Disk.
- ✦ If you are successful, a screen appears with the following information:
 - The *Number of copies left on master* field tells you how many Tokens you have on the Token Disk.
 - The *Number of concurrent network users* field tells you how many Users can use the same token at the same time.
- ✦ Press **Escape** to leave the program.

Dongle Manual Check Procedure

The Dongle Manual Check Procedure allows you to specify a Dongle port search order if the Dongle cannot be located. This is achieved using a DOS environment variable for Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0. For Windows NT, the Dongle port search order is specified using the Windows NT registry.

Windows 3.1, 3.11, Windows 95, Windows 98 and Windows NT 4.0

- ✦ At the DOS Prompt, type:
SET HL_SEARCH=*port address*

Where *port address* is the I/O address of the local printer port. For example:

```
SET HL_SEARCH=378p
```

The environment variable is set to the I/O address 0x378 for the Dongle on the local printer port.

```
SET HL_SEARCH=378p,278p,3BCp,IPX,NETBIOS
```

The environment variable is set to the automatic search order if the HL_SEARCH is not currently present.

By manually setting the port address, non standard hardware can be supported. If you specify a port number which is not supported by your system, the Dongle will fail.

Windows NT

The recognised registry entries for HARDLOCK.SYS can be found in:

```
HKEY_LOCAL_MACHINE/SYSTEM/  
CurrentControlSet/Services/HardLock/Parameters
```

The driver looks for the following optional values:

- **DisableDPA:REG_DWORD**

If present, the support for direct port access to the Dongle ports is disabled. This affects only DOS and Win16 programs with API versions prior to 3.20. If you are a system administrator on a multi-user machine you may want to enable this feature to prohibit the users from running the program (which also run only very slow), because they may interfere with the print system. The actual value entered is ignored, only the presence of the entry is checked.

- **NT31Mode:REG_DWORD**

Disable NT extensions to behave like the previous driver versions. This should be only enabled if problems occur. The actual value entered is ignored, only the presence of the entry is checked.

- **IoPortAddressX:REG_DWORD and
IoPortCountX:REG_DWORD**

Replace the 'X' with 0, 1, 2... (up to 9). If NT31Mode is not enabled and the default NT port driver does not detect a particular port/card you need to specify the port address with this entry. The IoPortCount is optional, it defaults to 4.

NOTE!	Only specify addresses you definitely know. Only specify addresses of parallel port interface cards. Specifying a port address of any other device will cause unexpected system behaviour or even shutdown the system.
--------------	---

11 ADVANCED INSTALLATIONS

Dongle Sharing Procedure

The Dongle Sharing Procedure allows you to share a Dongle across a Dedicated File Server using HL-Server.

Windows 3.1

- Use the DOS TSR 'HLSERVER.EXE'. You can load this automatically by checking the *Sharing* option in the Dongle installer.

For Windows for Workgroups and Microsoft TCP/IP 32

- Add the command line option '-x1' to remove problems arising when using NetBIOS over the MS-TCP/IP transport, for example:

```
HLSERVER -m20552 -x1
```

NOTE!	If HL-Server was once started WITHOUT the '-x1' option, the computer must be rebooted to allow a working installation of HL-Server WITH the '-x1' command line option.
--------------	--

- Recommended settings for the HL-Server PIF file are as follows:

First page of settings:
Ensure the *Background* option is set.
Advanced:
Set the Background Priority option to '100'.
Set the Foreground Priority option to '100'.
Ensure the *Detect Idle Time* option is NOT set.

Windows NT

The HL-Server runs in the NT DOS box. Due to Windows NT's special handling for idle programs in DOS boxes, you must start HL-Server via HLS_NT.EXE: this calls the original HLSERVER.EXE file. HL-Server does not terminate resident, but shows the HL-Server menu surface. If this is terminated, HL-Server also terminates. HARDLOCK.SYS and HLVDD.DLL must be installed on the same machine. To assure HL-Server working even in situations with a high CPU load, it should be started with high priority. For example:

```
start /high /min hls_nt -m20552
```

HLSERVER Version DOS TSR

Observe the following:

- The NetWare Bindery is no longer used to find HL-Servers on different network segments, so HL-Servers may be used network-wide without a Novell file server. An NLM version of the HL-Server is included, with identical functionality.
- An HL-Server can be accessed across bridges using IPX for Multi-segment communications using SAP.
- In the HL-Server menu surface, the network protocols for the listed HL-Servers in the display for Remote/Select and Remote/Rescan are abbreviated to the first letter (i = IPX, s = SAP and n = NetBIOS).
- HLSERVER.HLP can be found in HLSERVER.OVL
- Adjustable mailbox size**

All data packets HL-Server receives through the network are passed to a queue ('mailbox'), which is read out by the Dongle process. The default size of this mailbox is 16 entries, this will be the best value in most environments. If you are using HL-Server with a very small or a very large number of clients, you may change this value. Each additional mailbox entry increases the resident size by approximately 400 bytes. The setting of the mailbox size must be specified at installation time. The value may range from 6 to 128. For example, for very few users:

```
HLSERVER -I -t:0 -m20552 -b:6
```

Or, for a great number of users:

```
HLSERVER -i -t:0 -m20552 -b:40
```

Normally, you should not change the default setting unless you run into performance problems.

- **Optional midnight time correction**

Optional midnight time correction may be enabled by -MTC or -MIDNIGHT switch at the command line. You should not use it unless it is absolutely necessary.

- **‘Current Usage’ display in the Status/Main menu**

The displayed percentage should not be used as a linear growing value. When using HL-Server on a slow machine, there will be a threshold where more packets are received than could be processed. In this situation, the HL-Server packet buffers will be filled up in a short time and produce an overload situation. This threshold depends on the load put onto the HL-Server computer by any specific foreground application, so it cannot be determined by HL-Server.

HLSERVER Netware Version

The HL-Server NLM provides the same functionality as the HL-Server TSR, and an application using HL-Server cannot recognise any difference between them. Moreover, the Dongles used are the same, so you can select the HL-Server that fits best into your network environment.

All applications using the Dongle network routines supporting the Service Advertising Protocol (SAP) can use the HL-Server NLM without any changes.

In this version of the NLM, the HL-Server access cannot be limited to a single network segment, because all NUM's reside on a virtual LAN segment in the file server and must always be accessible via segment boundaries.

Starting HL-Server

HLSERVER.NLM is started at the file server console (or RCONSOLE) by the following:

```
LOAD HLSERVER options
```

The changes in command line options versus the HL-Server TSR are listed on the next page:

Example of loading the HL-Server NLM:

```
LOAD HLSERVER -i -t:0 -M:20552 -AUTO
```

The HL-Server NLM is loaded to serve Dongle 20552. The option -AUTO switches back to the system console after initialisation of HL-Server.

All command line options may be specified in the configuration file SYS:SYSTEM/HLSERVER.CFG. The syntax is identical to the command line, but the options may be split into several lines. Refer to the example configuration file HLSERVER.CFG.

11 ADVANCED INSTALLATIONS

Option	TSR	NLM
-?	Shows all available command line options.	Shows all available command line options.
-install	Installs HL-Server (this option may be omitted).	Installs HL-Server (this option may be omitted).
-uninstall	Stops HL-Server and removes it from memory.	Not available for NLM. HLSERVER.NLM may be unloaded by "UNLOAD HLSERVER" or through the HL-Server main menu.
-module:n[,m]	Module addresses of Dongles to be served This may be followed by a comma and a login limit, where the limit cannot exceed any other limitations (HL-Server licence or application licence). This parameter may be repeated up to three times, for different application Dongles.	Module addresses of Dongles to be served This may be followed by a comma and a login limit, where the limit cannot exceed any other limitations (HL-Server licence or application licence). This parameter may be repeated up to three times, for different application Dongles.
-display	Enables the status line display in the first screen line.	Not available for NLM. Status information can be obtained from the HL-Server screen. (switch between the file server screen with ALT-ESC or CTRL-ESC).
-comm:n	Selects network protocols to be used.	Not available for NLM. There is no NetBIOS available on a NetWare file server, so IPX/SAP is used.
-name:s	HL-Server name to be displayed on the local and remote menu screens. The default value for this option is 'HLServer'.	HL-Server name to be displayed on the local and remote menu screens. The default value for this option is the file server name.
-logindisable	Disables new logins into the HL-Server. This option may be switched via the command line even if HL-Server is running.	Disables new logins into the HL-Server. This option can only be specified when starting HL-Server. For switching while it is running, use the 'Options' menu entry at the HL-Server console screen.
-timeout:n	Timeout in Minutes (0 = no timeout, default = 15). This value may be changed from the command line even if HL-Server is running.	Timeout in Minutes (0 = no timeout, default = 15). This value can only be specified when starting HL-Server. For changing it while running, use the 'Options' menu entry at the HL-Server console Screen.
-password:s	Specifies the password for remote deletion of login entries with the HL-Server menu surface.	Specifies the password for remote deletion of login entries with the HL-Server menu surface.
-boxsize:n	Adjusts the receive buffer size.	Not available for NLM. Since memory consumption is not critical on the file server, this (critical) option is not necessary here.
-quickoff	Disables quick Dongle memory access (cache).	Disables quick Dongle memory access (cache).
-auto	-	Automatic return to system console screen. This is an NLM-only option. The active screen is switched back to the system console after initialising HL-Server.
-search:n,n,...	Specifies the LPT ports (278, 378, 3BC) where to search for the HL-Server Dongles. The addresses must be entered hexadecimal (default = all).	Specifies the LPT ports (278, 378, 3BC) where to search for the HL-Server Dongles. The addresses must be entered hexadecimal (default = all).
-forcecolor -forcemono	-	Disables monitor detection and forces use of colour/monochrome screen attributes.

NLM versus the HL-Server TSR command line options

HL-Server Menu Surface

The menu surface of HL-Server TSR can be used to monitor and test the HL-Server NLM. There are no differences between monitoring an HL-Server TSR and the NLM. The NLM itself uses a status screen and functions for manipulation the login tables and some parameters.

HL-Server Level

With HL-Server NLM, the term 'HL-Server Level' is introduced. While the version number denotes the implementation status of a product, the level describes the functionality that is presented to the client applications.

HL-Servers with the same level (TSR, NLM, or others) provide identical functions. In older versions of the TSR without an explicit level, the version number also expresses the level.

Requirements and Hints

On very fast heavily-loaded file servers, the message 'Process xxxx did not relinquish control frequently' may appear for NetWare 4.0x (when running HL-Server, and with NetWare build in tools). This message is not critical, and may be turned off by 'SET RELINQUISH CONTROL ALERTS OFF'.

Groups Procedure

The GROUPS.EXE program is a Windows program and you will find it in the SYSWIN directory.

You generally run the GROUPS.EXE program when you can access and run SYSWIN.EXE across a network, but do not have the SYSWIN groups present in Program Manager (or equivalent).

When you run the program, the two SYSWIN Program Manager groups are created for you. The installation path information is also added to the WIN.INI file so that you can start SYSWIN by directly clicking on the Program (.SWP) and Library (.SWL) files.

APPENDIX A - SYSWIN FILE TYPES

SYSWIN will recognise a variety of file types. They are recognised by the DOS type file extension. The following are a list of the standard extensions that are used by SYSWIN.

Current Program Files

.SWP	SYSWIN 2.x/3.x Program
.SWL	SYSWIN 2.x/3.x Library
.SWT	SYSWIN 3.x Template
.SWB	SYSWIN 2.x/3.x Backup file
.PMF	Program Metafile
.PMB	Program Metafile Backup file
.REP	File Conversion Report file

Old Program Files

.SWN	SYSWIN 1.x Program
.PMD	PMD Program
.PRG	SYSWIN 1.x/PMD network comment file
.ASF	SYSWIN 1.x/PMD address symbol file
.MAP	SYSWIN 1.x/PMD function mapping file
.AHD	SYSWIN 1.x/PMD address index file (not used by SYSWIN 3)

General Data Files

.DSB	Data bar
.DST	Data set
.DFC	Data force
.SDT	Data trace
.STC	Time chart
.SWR	Routing table
.ADR	Text Address Symbols

C Series Data Files

.DIO	I/O and internal relays
.DLR	Link relays
.DHR	Holding relays
.DAR	Auxiliary relays
.DTV	Timer/counter values
.DTB	Timer/counter flag bits
.DDM	Data memory area
.DEM	Expansion DM area

CV Series Data Files

.DIO	I/O and internal relays
.DAR	Auxiliary data area
.DCP	CPU data
.DIV	Timer values
.DIB	Timer flag bits
.DCV	Counter values
.DCB	Counter flag bits
.DSP	Step flags
.DTN	Transition flags
.DDM	Data memory area
.DEM	Expansion DM area

Import Files

.DAT	CSS library file
.COD	CVSS program file

B APPENDIX B - FORMAT SPECIFIERS

When entering # parameters in the ladder, or when setting values directly while monitoring, it is possible to type a value in a form other than hexadecimal. This is especially useful when dealing with the IEEE floating point found in the newer CV series PLCs.

The table below shows the specifiers that are recognised.

The format specifier is entered at the end of the value and should be separated with either a space or a semi-colon, for example:

#100 d or #110;d will be interpreted as #0064

#100.35 i or #100.35;i will be interpreted as #42C8B333

When entering # values in the Function dialog in the ladder editor, the default format is hexadecimal (or long hexadecimal) and the maximum number of characters that can be input is 4.

In the Statement List Editor, the default format is hexadecimal (or Long hexadecimal), semi-colons must be used when a format specifier is used, and up to 4 characters may be entered in text input.

When entering values in the Set Values dialog during monitoring, the default is the format shown in the function and the maximum number of characters for text input is 20.

The OMRON floating point format is specifically used with the FDIV instruction.

Specifier		Range - short			Range - long		
h	hexadecimal	0000	to	FFFF	00000000	to	FFFFFFFF
b	BCD	0000	to	9999	00000000	to	99999999
d	decimal	0	to	65535	0	to	4294967295
s	signed decimal	-32768	to	32767	-2147483648	to	2147483647
f	OMRON floating point				0.0000001e-7	to	0.9999999e+7
i	IEEE floating point				+/-1.2e-38	to	+/-3.4e+38
"abcd" - direct ANSI text input							

APPENDIX C - FILE FORMATS

PMF Files

PMF is a text-based interchange format of SYSWIN program files and is used for conversion between SYSWIN and other packages.

A PMF file consists of a header giving information regarding the basis of the file, followed by any or all of the following sections:

- Program information
- Structured statement list code
- Address symbols
- CV series PLC setup data
- CV series I/O table
- C series expansion function mapping table

Address Formats

Addresses within the file are in a standard format, and follow the standard SYSWIN conventions especially with the format of bit addresses. All constants are in hexadecimal or BCD and are preceded by the hash (#) symbol.

Word addresses consist of a prefix specifying the memory area and an address. Indirect DM/EM consists of a leading asterisk (*) followed by the DM/EM address.

Bit addresses consist of a prefix followed by a word address, a dot (.) and a two digit bit number. Typical examples of the data representation are shown in the table.

Text Fields

All descriptive text is contained with quotes ("). If the text needs to continue on to a new line in the .PMF file then the text will need to be closed with a quote ("), followed by a comma (,) used at the end of a line. The next line will start with a quote (") and the text will continue. For example:

```
"This is one",  
"line of text"
```

APPENDIX C - FILE FORMATS

Area	Word			Bit		
Internal Relays	0	253		0.00	0.15	253.15
Link Relays	LR0	LR63		LR0.00	LR54.12	
Holding Relays	HR0	HR99		HR0.00	HR99.15	
Auxiliary Relays	AR0	AR27		AR0.01	AR27.09	
Timers	TIM123	T12		TIM123	T12	
Counters	CNT15	C250		CNT15	C250	
DM/EM memory	DM0	D123	E32000			
Indirect DM/EM memory	*DM12	*D1234	*E5423			
CV Aux Relays	A240	A511		A500.13	A200.07	
CV CPU Data area	G1	G127		G3.01	G90.15	
CV Step/Transition				ST0	TN511	
Constant	#1234	#89ED	#11223344			
Temporary Relays	TR0			TR7		
CV Registers	IR0	DR1				
CV Indexed Addresses	IR0	+31,IR1	-30,IR2			

Return characters that may appear at the end of a paragraph in the Network Symbol Editor comment must be entered as ‘\n’, for example:

“End of paragraph \n”

Quote (”) and (\) characters are always preceded by a slash (\), for example:

“he said \”hello\” to me”
“this is a slash character \\\”

Section Types and Descriptions

Refer to the PMF file example shown overleaf whilst reading this section.

HEADER Section

The HEADER section must always be present and must be the first section of the PMF file.

Version field

This specifies the file format version and should be set to 1.0.

Character field

This specifies the character set used for strings in the file. It should be set to ANSI.

PROGRAM Section

The program section begins a program description and must be followed by one or more BLOCK sections. Attributes include program description strings and the PLC model and CPU.

PLC type

This specifies the PLC model for the file. Typical examples of this are:

C20, CxxK, CxxH, C500, C200H, CQM1, C200HS, C200HX, CV500, CV2000, CVM1, CVM1-V2.

CPU Type

This information is optional and specifies the CPU number. It will be in a format ‘CPUnn’. IF the specified CPU-number is not supported, the closest supported one should be selected.

Memory Allocation

This identifies the memory-allocation value and should be present for example on the C2000HS and C200Hx family of PLCs.

Editor

This specifies the editor used to generate and display networks. It can have the value of either LADDER or FUNCTION.

Project Description

This information (Company, Plant, Project, Version, Author, Date and Promotion) describes the project. It is in string form and is between quotes (").

BLOCK section

A BLOCK section must come after a PROGRAM section. A main program BLOCK section must appear first, followed by the NETWORK sections that it contains. This may be optionally followed by additional main program BLOCK sections, which are then followed by any interrupt BLOCK sections.

Type

This identifies the block type. It may be one of the following:

MAIN	Main program block
INTnn	CV interrupt program block (nn=0 to 31)
CYCLICn	CV cyclic interrupt program block (n=0 to 2)
POWERON	CV power on interrupt program block
POWEROFF	CV power off interrupt program block

Name

This optional attribute gives a block name of up to 15 characters in length.

Comment

This optional attribute gives a block comment. It can be up to approximately 32,000 characters in length.

NETWORK Section

One or more NETWORK sections must appear after a BLOCK section. A STATEMENTLIST section must appear directly after a NETWORK section.

Name

This is optional and gives a network name of up to 15 characters in length

Comment

This optional attribute gives a block comment. It can be up to approximately 32,000 characters in length.

STATEMENTLIST Section

A STATEMENTLIST section consists of lines of statement list code, one statement on each line. The sequence of statements should constitute a logical network or rung of ladder. Parameters should be separated by one or more spaces or tabs.

ADDRESSES Section

The ADDRESSES section contains lines which map symbols and comments to addresses. The format is in the form of an assignment to the address. Each line of information consists of the address, followed by an equals sign and a string, enclosed in quotes, of up to 15 characters in length. This is the symbol used for that address. This may be optionally followed by a comma and a comment of up to 59 characters in length.

EXPANSIONFUNCTIONS Section

The EXPANSIONFUNCTIONS section, where applicable, consists of a sequence of lines of the form *number = function*, where the number identifies an expansion slot and the function mapped into that slot.

APPENDIX C - FILE FORMATS

```
[HEADER]
  Version=1.0
  CharacterSet=ANSI

[PROGRAM]
  Model=C200HS
  CPU=CPU31
  MemoryAllocation=1000

  Editor=LADDER

  Company="OMRON Electronics"
  Plant="etc-uk"
  Project="Syswin"
  Version="V3.0"
  Date="3 June 96"
  Author="Mike Bryant"
  Promotion=""

[BLOCK]
  Type=Main
  Name="MainAction"
  Cmnt="This block has a comment which is long"

[NETWORK]
  Name="Network1"
  Cmnt="This comment line can be a " "maximum of 32000 characters long, ", "to allow long descriptions"

[STATEMENT LIST]
  LD 0.15
  AND 1.01
  OR 0.02
  OUT 3.00

[NETWORK]
  Name="Network2"

[STATEMENTLIST]
  LD 253.13
  MOV #0 DM999

[NETWORK]
[STATEMENTLIST]
  END

[ADDRESSES]
  000.00 = "Internal", "Internal relays have no prefix"
  253.13 = "AlwaysTRUE", "Symbols are case sensitive"
  HR99.0 = "Holding", "The comment can currently be up to 59 characters"
  LR63.15 = "Link Relays"
  AR24.00 = "Auxiliary", "Comments are optional"
  DM0000 = "DataMem"
  TIM123 = "Timer"
  CNT456 = "Counter"

[EXPANSIONFUNCTIONS]
  17=ASFT
  18=SCAN
  19=MCMP
  47=LMSG
  48=TERM
  60=CMPL
```

ADR Files

Address symbols can be imported from a text file. The filename extension for these files is .ADR. This identifies it as a text file containing address symbols. Data must be entered into this file in the following order:

Address <**space** or **tab**> Symbol <**space** or **tab**>
Comment.

Each line is terminated with a carriage **Return**.

Each definition must be on a new line.

Addresses must contain the dot separator if it is a bit address.

Symbols must be 15 characters long and must not contain dots, commas or spaces. Also symbols may not look like an address.

Comments can be up to 59 characters long.

Example

0.00	LightSwitch	This switches the channel
10.02	STEP	Step flag
253	FAL	Fal number
AR21	DAY	Day of the week

D APPENDIX D - SCREEN REFERENCE

Data Trace / Time Chart Monitoring Buttons / Toolbar

F2 Function Key Only cF2 Control Function Key
sF2 Shift+Function Key aF2 Alt+Function Key

Open Data File

Save Data File

Force Bits

Set Bits Channels

Choose Editor

Configure Trace

Address Symbol Editor

Go To Start

Fast Rewind

Rewind

Trigger Control

Forward

Fast Forward

Go To End

Connect/Disconnect


PLC Mode


Stop Recording


Trigger Control


Record Trace


Read Trace


sF2


sF3


cF2


cF3


cF4


aF5


cF6


F2


F3


F4


F5


F6


F7


F8


sF9

sF10

F9

F10

F11

F12

APPENDIX D - SCREEN REFERENCE

Ladder Diagram / Function Plan Toolbars and Drawing Tools

F2
sF2

Function Key Only
Shift+Function Key

cF2
aF2

Control+Function Key
Alt+Function Key

Open File

Save File

Print

Cut Selection

Copy Selection

Paste

Undo Previous

Force Bit

Set Bit/Channels

Select Editor

Select Network

Insert Network

Delete Network

Test Network

Block/Network Manager

Address Symbol Editor

Network Symbol Editor

Statement List Editor

Connect/Disconnect

PLC Mode

Monitoring

Online-Edit

Overview Mode

sF2

sF3

sF4

cX

cC

cV

cZ

cF2

cF3

cF4

sF5

sF6

sF7

sF8

cF5

cF6

cF7

cF8

sF9

sF10

cF11

sF11

sF12

Ladder Diagram

Function Plan

Selection Tool	Escape	
Draw Open Contact	" or F2	
Draw Closed Contract	/ or F3	
Draw Horizontal Short	- or F4	
Draw Vertical Short	or ! or F5	
Draw Output	O or F6	
Draw Negated Output	Q or F7	
Draw Function	F or F8	
Draw Timer	T or F9	
Draw Counter	C or F10	
Negate Existing Element	/	
Delete Element	(Del Key)	

Selection Tool	Escape	
Draw Open Contact	" or F2	
Draw Closed Contract	/ or F3	
Draw Horizontal Short	- or F4	
Draw Vertical Short	or ! or F5	
Draw Output	O or F6	
Draw Negated Output	Q or F7	
Draw Function	F or F8	
Draw Timer	T or F9	
Draw Counter	C or F10	
AND Gate	& or F11	
OR Gate	or ! or F12	
Negate Existing Elements	/	
Delete Elements	(Del Key)	

Control+N	Negate	Control+D	Differentiate Down
Control+U	Differentiate Up	Control+I	Immediate Refresh

Data Display Editor Toolbar Buttons

F2

Function Key Only

sF2

Shift+Function Key

cF2

Control+Function Key

aF2

Alt+Function Key

Open Data File

Save Data File

Print Data

Force Bits

Set Bits/Channels

Choose Editor

Select Range

Hex (BCD) Display

Decimal Display

Binary Display

ASCII Display

Long Hex Display

Long Decimal Display

Floating Point

Signed Decimal

Signed Long Decimal

IEEE Floating Point

Connect/Disconnect

PLC Mode

Read Data From PLC

Write Data From PLC

Monitoring

Abort Transfer

sF2

sF3

sF4

cF2

cF3

cF4

cF5

F2

F3

F4

F5

F6

F7

F8

F9

F10

F11

sF9

sF10

cF9

cF10

cF11

cF12

Selection Buttons - C Series

I/O	I	I/O And Internal Relays
LR	L	Link Relays
HR	H	Holding Relays
AR	A	Auxiliary Relays
T/C VAL	V	Timer/Counter Values
T/C BIT	B	Timer/Counter Bits
DM	D	Data Memory Area
EM	E	Expansion DM Memory Area

Selection Buttons - CV Series

I/O	I	I/O And Internal Relays
AUX	A	Auxiliary Relays
CPU DATA	G	CPU Data
TIM VAL	T	Timer Values
TIM BIT	M	Timer Bits
CNT VAL	C	Counter Values
CNT BIT	R	Counter Bits
DM	D	Data Memory Area
EM	E	Expansion DM Memory Area

APPENDIX D - SCREEN REFERENCE

SYSWIN Programming Keystrokes

Keystroke	Command/Function
F1	General help on menus, dialog boxes and messages
Control+F1	Quick reference on function timer and counter parameters
Movement Keystrokes	
Cursor keys	Move around the network
Home	Move to left side, then top
End	Move to right side, then bottom
PageUp	Movers up a full page
PageDown	Moves down a full page
Shift+PageUp	Move up a full page
Shift+PageDown	Move down a full page
Alt+PageUp	Change to first network
Alt+PageDown	Change to last network
Control+Shift+PageUp	Move to previous block
Control+Shift+PageDown	Move to next block
Marking Keystrokes	
Shift+Cursor keys	Mark a block
Shift+Home	Mark to left, then top
Shift+End	Mark to right, then bottom
Control+Cursor keys	Mark items
Editing Keystrokes	
Return	Edit element
Delete	Delete element
Backspace	Delete element and move left
Escape	Change to normal cursor
Alt+Right	Insert column (to network)
Alt+Down	Insert row (to network)
Alt+Left	Delete column (from network)
Alt+Up	Delete row (from network)
Spacebar	Insert row at bottom of network

Keystroke	Command/Function
Clipboard keystrokes	
Shift+Delete	
Control+X	Cut marked area to clipboard
Control+C, Control+Insert	Copy marked area to clipboard
Control+V, Shift+Insert	Paste area from clipboard
Control+Z, Alt+Backspace	Undo changes
Network Management	
Alt+Return	Test current network
Alt+Insert	Insert a new network
Alt+Delete	Delete current network
Control+PageUp	Insert new network, above current
Control+PageDown	Insert new network, below current
Address Bar Keys	
Alt+A	Enter address
Alt+S	Enter symbol
Alt+C	Enter comment
Alt+O, Return	Store details
Tab	Move to next field
Shift+Tab	Move to previous field
Escape	Return to main editor
DATA DISPLAY EDITOR	
Movement Keystrokes	
Cursor keys	Move around area
Home	Move to left column, then top
End	Move to right column, then bottom
PageUp	Move up a page
PageDown	Move down a page
Editing Keystrokes	
Return	Edit element

Menu Command Shortcuts

Keystroke	Command/Function	Menu Selection
F1	Help	Help/Index
File Functions		
Shift+F2, Control+O	Open project	File Open Project
Shift+F3, Control+S	Save project	File Save Project
Shift+F4, Control+P	Print project	File Print Project
Editing Functions		
Control+Z	Undo previous operation	Edit Undo
Control+C	Copy selection to clipboard	Edit Copy
Control+X	Cut selection to clipboard	Edit Cut
Control+V	Paste from clipboard	Edit Paste
Delete	Delete selection	Edit Delete
Alt+Right	Insert column (to network)	Edit Insert Column
Alt+Down	Insert row (to network)	Edit Insert Row
Alt+Left	Delete column (to network)	Edit Delete Column
Alt+Up	Delete row (to network)	Edit Delete Row
Spacebar	Insert row at end of network	
Block/Network Manager		
Control+F5	Block / Network Manager	Block Block/Network Manager
Shift+F5	Select network	Block Select Block/Network
Alt+Insert or Shift+F6	Insert network below current	Block Insert Network
Alt+Delete or Shift+F7	Delete current network	Block Delete Network
Alt+Enter or Shift+F8	Test current network	Block Test Network
Editor Selection		
Control+F4	Choose Editor	Editors (select from list)
Control+F6	Address Symbol Editor	Editors Address Symbol Editor
Control+F7	Network Symbol Editor	Editors Network Symbol Editor
Control+F8	Statement List Editor	Editors Statement List Editor
Connection Functions		
Shift+F9	Connector or disconnect PLC	Online Connect/Disconnect
Shift+F10	Mode change in PLC	Online Mode
Shift+F11	Online edit mode on/off	Online Online Edit
Control+F2	Force bit in PLC	Online Force
Control+F11	Monitoring on/off	Online Monitoring
Control+F3	Set bit in PLC	Online Set
Shift+F12	Overview mode on/off	Preferences Overview Mode

APPENDIX D - SCREEN REFERENCE

Data Display Editor Shortcuts

These keyboard shortcuts replace some functions and add other keys when operating the Data Display editor.

Keystroke	Command/Function	Menu Selection
File Functions		
Shift+F2, Control+O	Open data from file	File Load Data File
Shift+F3, Control+S	Save data to file	File Save Data File
Shift+F4, Control+P	Print project	File Print
Control+F4	Change to another editor	File Exit Data Display Editor
Data Formatting Functions		
F2	Display in hexadecimal format	Data Format
F3	Display in decimal format	Data Format
F4	Display in binary format	Data Format
F5	Display in ASCII format	Data Format
F6	Display in long hexadecimal format	Data Format
F7	Display in long decimal format	Data Format
F8	Display in floating point format	Data Format
F9	Display in signed decimal format	Data Format
F10	Display in signed long decimal format	Data Format
F11	Display in IEEE floating point format	Data Format
Connection Functions		
Control+F9	Read data from PLC	Online Upload Data
Control+F10	Write data to PLC	Online Download Data
Control+F11	Abort data transfer to/from PLC	Online Abort Transfer

Data Trace / Time Chart Monitoring Shortcuts

These keyboard shortcuts replace some functions and add other keys when operating the Data Trace / Time Chart Monitoring.

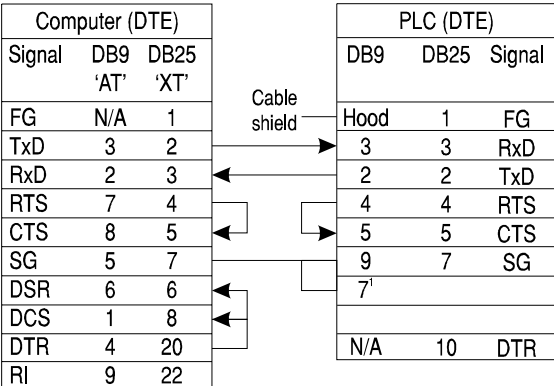
Keystroke	Command/Function	Menu Selection
Setup		
Shift+F2, Control+O	Open trace from file	File Load Trace
Shift+F3, Control+S	Save trace to file	File Save Trace
Shift+F4, Control+P	Print trace	File Print
Alt+F5	Configure trace	Trace Configure
Trace Control		
F2	Go to start of trace	
F3	Fast Rewind	
F4	Rewind	
F5	Trigger Control	
F6	Forward	
F7	Fast Forward	
F8	Go to end	
F9	Stop recording	Online Abort
F10	Pause	Online Manual Trigger
F11	Record trace	
F12	Read trace	Online Read Trace

APPENDIX E - PLC INTERFACE CABLE CONNECTIONS

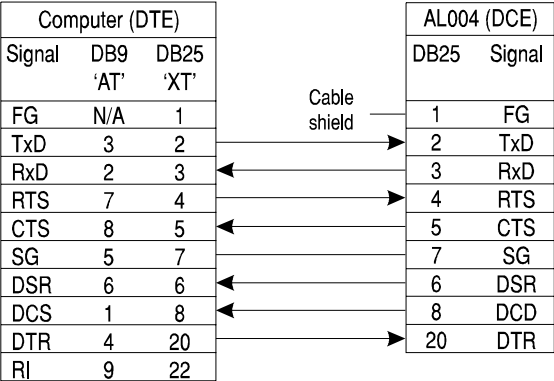
E APPENDIX E - PLC INTERFACE CABLE CONNECTIONS

This section illustrates the various cable configurations that should be used when connecting your computer or a modem to the PLC. It shows the connections for the instances where the connection is to the serial port on the PLC and also where the connection is to the peripheral port on the CV series PLC.

SYSMAC-WAY (Local) **RS232C Host Computer to PLC Serial** **Connection**



RS232C Host Computer to AL004 Connection

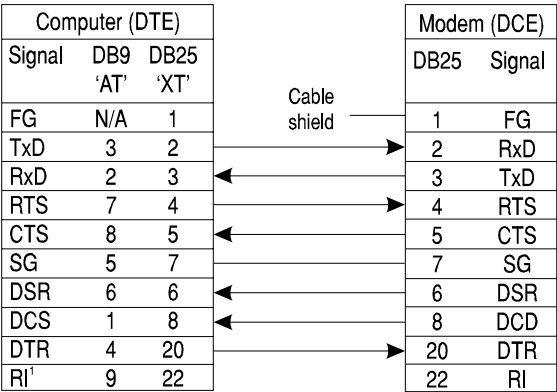


¹ Most PLC models with DB9 connectors use pin 9 for SG. However, the DB9 connector on C20H, C28H, C40H and C60H CPUs uses pin 7 for SG. Therefore when constructing an interface cable for these models, connect the SG line from the computer to pin 7 on the PLC. You may take a generic cable for all DB9 PLC sockets by connecting both pin 7 and pin 9 on the PLC to SG.

APPENDIX E - PLC INTERFACE CABLE CONNECTIONS

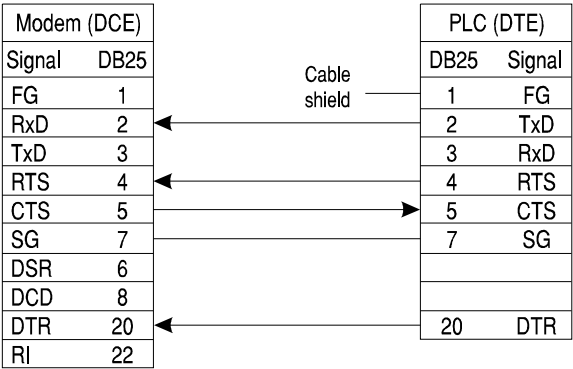
SYSMAC WAY (Modem)

RS232C Host Computer to Modem Connection

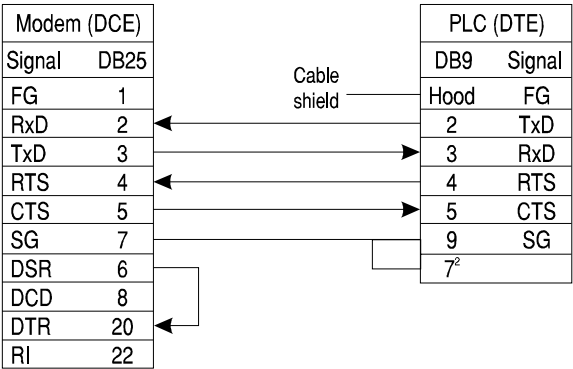


¹. SYSWIN does not use the RI signal, but other modem control software does.

RS232C Modem to PLC Connection (DB25 connector)



RS232C Modem to PLC Connection (DB9 connector)



². For C20H, C28H and C60H, use pin 7 for SG.

APPENDIX E - PLC INTERFACE CABLE CONNECTIONS

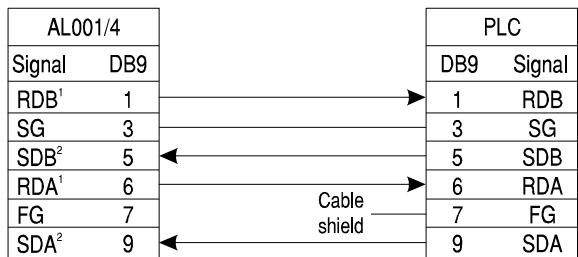
RS422 Connections

AL001/4 to C220H-LK020-V1

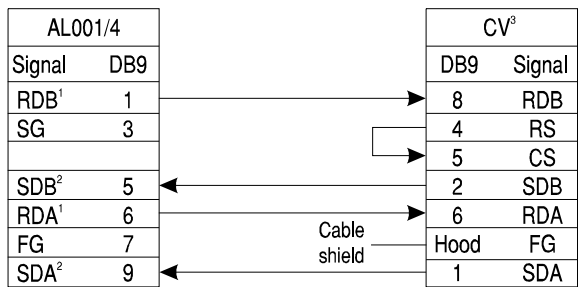
AL001/4 to C500-LK203

AL001/4 to 3G2A5-LK201-EV1

AL001/4 to 3G2A6-LK202-EV1



AL001/4 to CV500/CV1000/CVM1 Host Link Interface

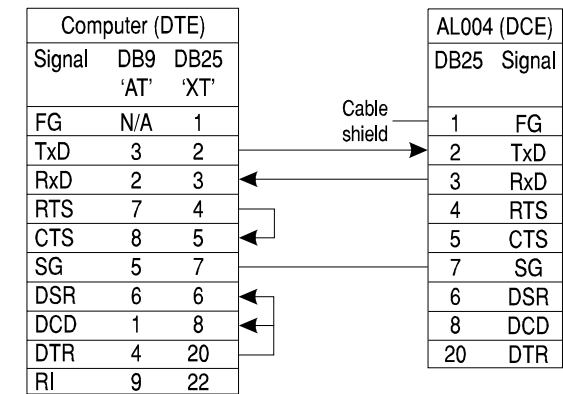


- ¹. RDx is data received *from* the host computer.
- ². SDx is data sent *to* the host computer.
- ³. Set the HOSTLINK switch to RS-422.

APPENDIX E - PLC INTERFACE CABLE CONNECTIONS

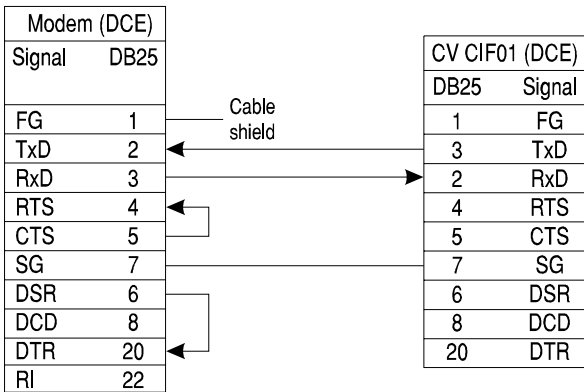
Toolbus Connections

RS232C Host Computer to CV CIF01 Toolbus Connection



When using SYSWIN, it is, however, possible to simply use a “gender-changer” instead as SYSWIN does not use the handshaking lines on the serial port.

Remote Modem to CV CIF01 Toolbus Connection



See the next page for a table describing the terminology used in these diagrams.

NOTE! A standard “Null-modem” cable is not suitable - it may damage your modem.

APPENDIX E - PLC INTERFACE CABLE CONNECTIONS

Communications Terminology

Term	Name	Alternate Names	Description	Source
DTE	Data Terminal Equipment		Originally denoted terminals/computers, etc. that would be connected to a modem. To connect DTE to DTE, the signal lines generally have to be swapped, as shown in the diagrams.	
DCE	Data Communications Equipment		Mainly modems, but note that the AL004 is also configured as DCE.	
FG	Frame Ground	PG, Positive Ground	Used to connect the shielding around the signal lines, to reduce external interference. Problems can sometimes occur if the shielding is connected to both devices.	Both
TxD	Transmitted Data	TD	Serial data sent from the DTE to the DCE.	DTE
RxD	Received data	RD	Serial data sent from the DCE to the DTE.	DCE
RTS	Request To Send	RS	DTE asserts this to allow data flow from the DCE.	DTE
CTS	Clear To Send	CS	DCE asserts this to allow data flow from the DTE.	DCE
SG	Signal Ground	GND, Data Ground	Common zero volts line for the other signals.	Both
DSR	Data Set Ready	MR, Modem Ready	DCE asserts this to indicate it is ready to operate.	DCE
DCD	Data Carrier Detect	CD, Carrier Detect RLSD, Received Line Signal Detect	Modem asserts this to indicate that the connection to a remote modem is working.	DCE
DTR	Data Terminal Ready	TR, Terminal Ready ER, Equipment Ready	The DTE asserts this when it is ready to communicate. When de-asserted, many modems will hang up the telephone line.	DTE
RI	Ring Indicator	R, Ring	Modem toggles this line when receiving incoming ringing signal.	DCE
SDA	Send Data A	SD-	Transmitted data signal is sent across those two lines. Received data signal is read across these two lines.	
SDB	Send Data B	SD+		
RDA	Receive Data A	RD-		
RDB	Receive Data B	RD+		

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