

S7 for Windows

S5 for Windows

Manual

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S5 for Windows
S7 for Windows

Technical Details

1 Installing *S5 / S7 for Windows*

This Chapter will explain how to install *S5 / S7 for Windows* on the hard disk of your personal computer. Beginning with Version 4.0, *S5 / S7 for Windows* is a 32 Bit Application and requires a 32 bit operating system from Microsoft such as Microsoft® Windows 95, Microsoft® Windows 98 or Microsoft® Windows NT (with Service Release #3 or higher).

To unlock *S5 / S7 for Windows* and the selected options, a serial number and a PIN code is required for each option. You will also need an authorization code that will be sent to you by IBH softec. The authorization code is based on the *S5 / S7 for Windows* plus the selected options installed and an identification number generated by your PC. This unique number ensures that *S5 / S7 for Windows* cannot be installed on any other PC.

You can work with the *S5 / S7 for Windows* software even though you have not installed the authorization code. During the operation of *S5 / S7 for Windows*, periodically the system checks for the existence of an authorization code and if you have not entered the code, this search takes a few seconds; the result of the search will be displayed on your CRT. The overall performance will be somewhat slower due to the search function but the full performance will be available as soon as you enter the code.

1.1 System Requirements

S5 / S7 for Windows does not require any special hardware to be executed on your PC (Personal Computer). The installation may be performed using a Notebook, a Laptop, a Desktop, or a Workstation. The installation on a File Server is also possible. To execute *S5 / S7 for Windows*, Microsoft® Windows 95, Microsoft® Windows 98 or Microsoft® Windows NT (with Service Release #3 or higher) must be installed on your PC. *S5 / S7 for Windows* Version 4.0 and higher will not run under Windows 3.1x.

Although *S5 / S7 for Windows* is fully operable without a mouse (shop floor environment) a mouse is highly recommended to take full advantage of the graphical interface.

To install *S5 / S7 for Windows*, a CD drive is required.

To work online with an external PLC the PC must have an open serial port available. (COM1 - COM4).

1.2 Installation Program

The Install program performs all the required steps to setup *S5 / S7 for Windows* on the hard drive of your PC. Follow the instructions on the screen. You will be prompted to supply the path to the directory where you want to install *S5 / S7 for Windows* and to insert the **Serial Numbers** and **PIN Codes** at the appropriate time.

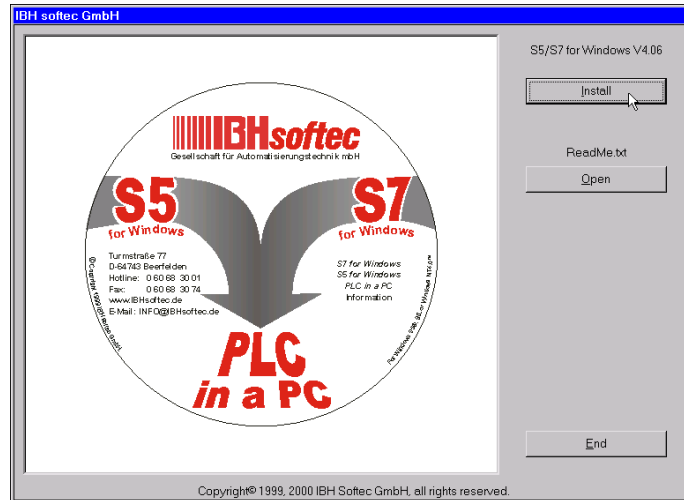


Figure 1-1 Install Start Window

The file README.TXT will provide you with the latest up-to-date information about *S5 / S7 for Windows*, which may not be included in your manual at the date of shipment. Icons will be installed in the Program Manager to start *S5 / S7 for Windows*. A folder (directory) with examples, to facilitate learning the system, will also be installed.

- ◆ If Windows is not running on your PC, start Windows 95, Windows 98, or Windows NT.
- ◆ In case the Installation Program does not start automatically you will have to start the **AUTORUN.EXE** program located on the CD in the root directory.

Insert the CD into the CD Drive. The CD will start the Installation Program automatically and display the **Setup Window**.

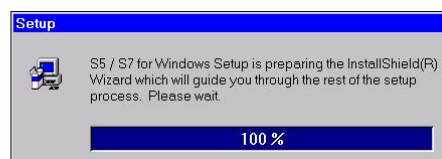
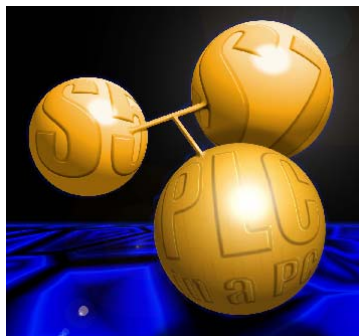


Figure 1-2 Setup Window

1.2.1 Start Installation

This manual will describe the procedures required to install *S5 / S7 for Windows* if you have a Windows NT operating system installed on your PC. For Windows 95 or Windows 98, the installation procedure is very similar to the one described in this manual. Just follow the instruction on the screen.

- ◆ Click **Start, Run**

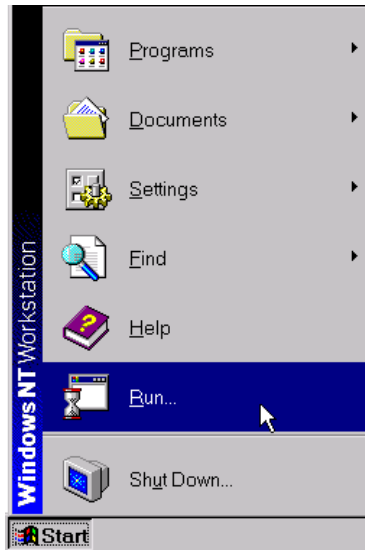


Figure 1-3 Start Menu

The **Run** dialog box opens.

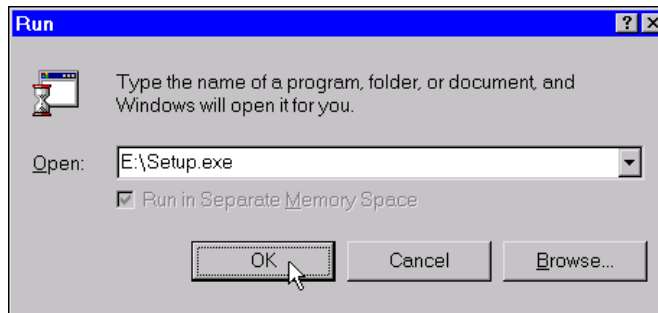


Figure 1-4 Run dialog box

- ◆ Type **E:Setup.exe** in the command line, this of course will be dependant on the designation of the CD-Drive where you inserted the program CD.

With the button **Browse**, you can search for the **Setup.exe** file on the CD-Drive.

- ◆ Click the **OK** button in the dialog box.

- ◆ Press **RETURN**.

The install program is now started.

After displaying the **Setup** Window (Figure 1-1) the **Welcome** information box is momentarily opened.

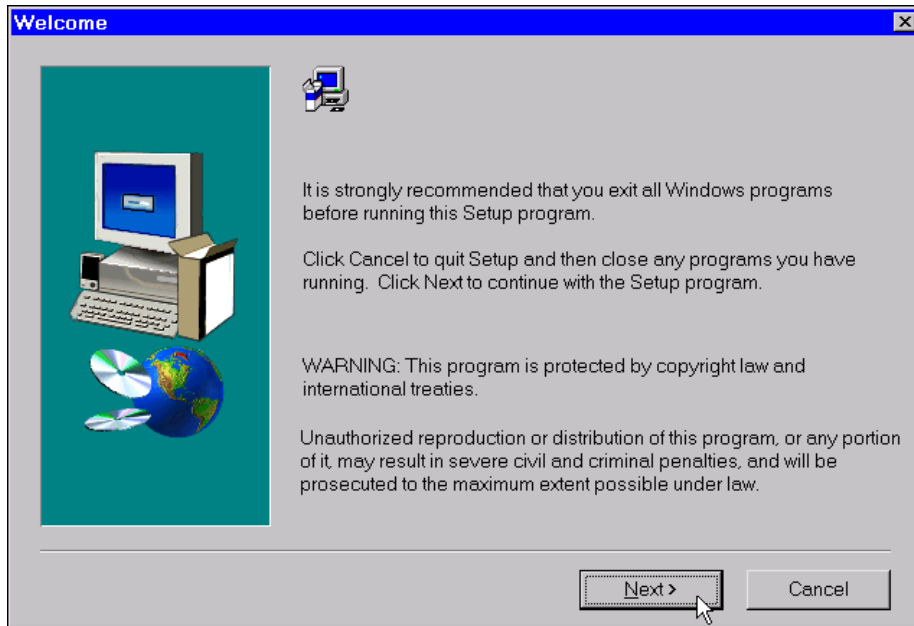


Figure 1-5 **Welcome** information box

Please follow the instructions displayed in the **Welcome** information box and close all programs.

 ◆ Click **Next**

 ◆ Press **RETURN**

The **Software License Agreement** is displayed.

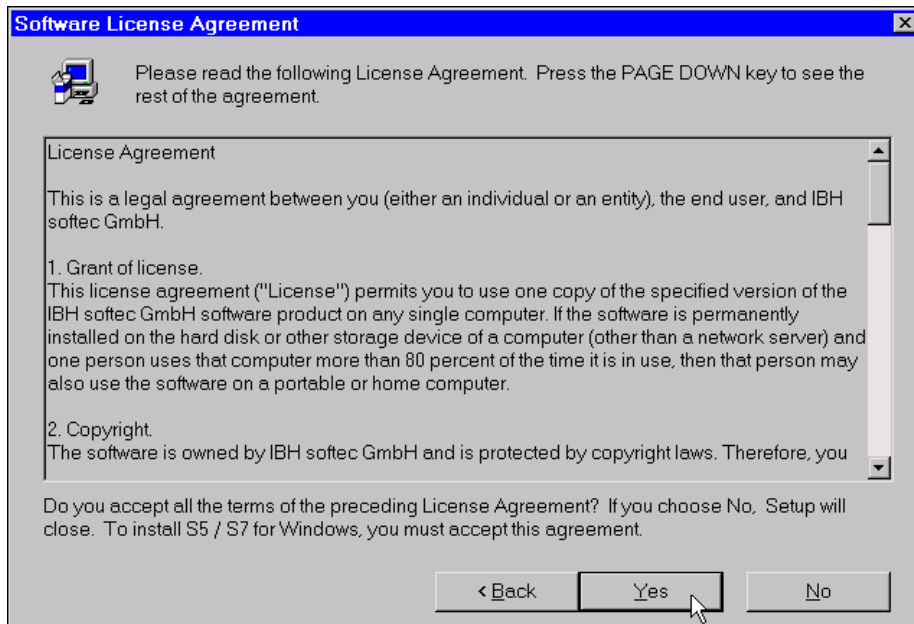


Figure 1-6 **Software License Agreement**

Please read the Software License Agreement carefully. If you agree with the Software License click the **Yes** button.

If you don't agree with the Software License click the **No** button. The installation will be aborted. Only if you agree with the Software License will the installation continue.

 ◆ Click **Yes**

 ◆ Press **RETURN**

A window is opened with additional information. To install *S5 / S7 for Windows* software and any selected software options, serial numbers and the corresponding PIN (Personal Identification Number) codes are required.

You will find the serial numbers and the corresponding PIN codes on the "Product ID Card" attached to the registration card. Both cards are enclosed with the *S5 / S7 for Windows* software package.

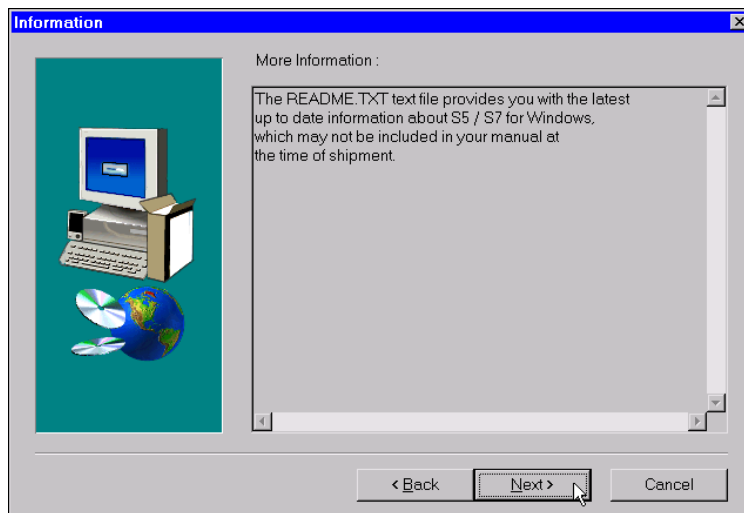


Figure 1-7 Information window

 ◆ Click **Next**

 ◆ Press **RETURN**

A window to enter information about the user is opened.

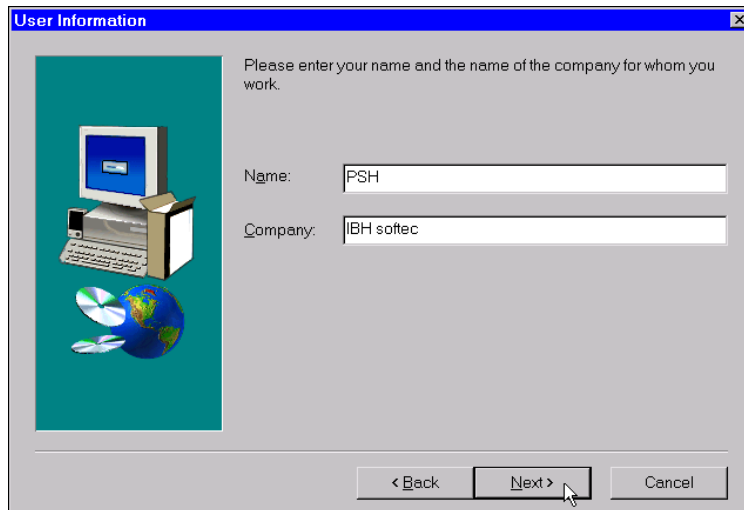


Figure 1-8 User Information window

Please enter your name and the name of your company. Both information fields must be filled in to enable the **Next** button to continue the installation.

◆ Click **Next**

◆ Press **RETURN**

A dialog box where you select the destination folder is opened.

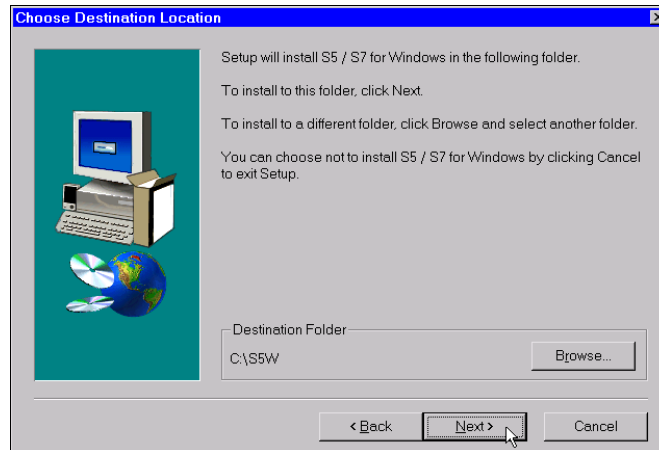


Figure 1-9 Choose Destination Location dialog box

To install *S5 / S7 for Windows* and the selected options in a folder other than the default folder **C:\S5W**, use the **Browse** button to select another destination. This could be an existing folder or a new folder.

◆ Click **Next**

◆ Press **RETURN**

A dialog box is opened where you select the *S5 / S7 for Windows* components you would like to install. Select only the options that you have purchased and want to install. Please have your serial numbers and PIN codes available that will enable those options.

A serial number and PIN code is required for each of the components you want to install. Any attempt to install an option without a serial number and a PIN code will result in an incomplete installation and you will not be able to start *S5 / S7 for Windows*.

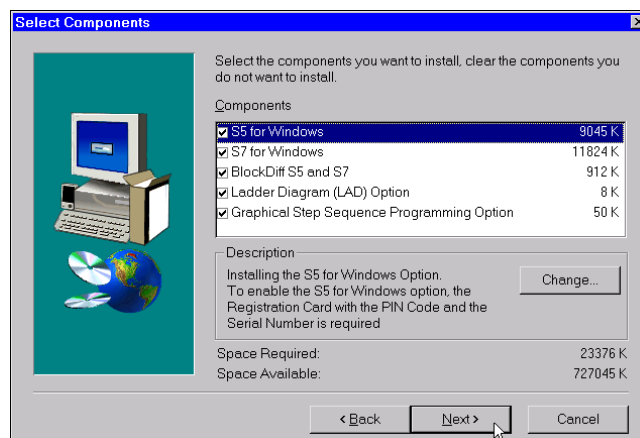


Figure 1-10 Select Components dialog box

Check all the options you want to install. Some of the components are made up of several sub-components. Clicking the **Change** button will open an additional dialog box to select (deselect) the sub-components of an option.



◆ Click **Next**



◆ Press **RETURN**

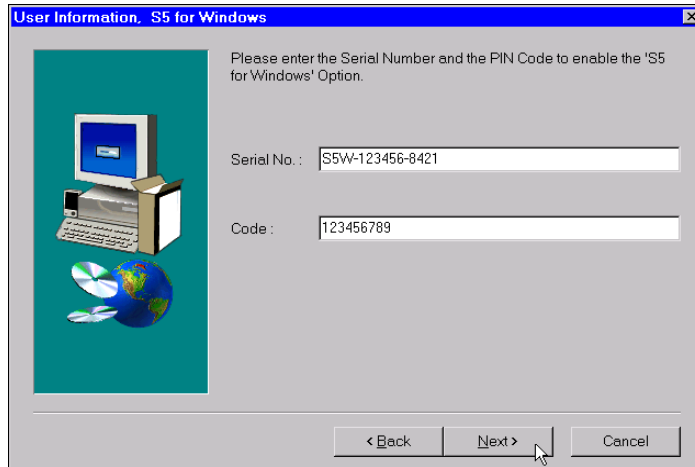


Figure 1-11 Dialog box to insert the Serial Number and PIN Code

The PIN code and the serial number can be found on the **"Product ID Card"** attached to the registration card. Both cards are shipped with the *S5 / S7 for Windows* CD.


 Gesellschaft für Automatisierungstechnik mbH Turmstraße 77 D-64743 Beerfelden/Odw. Telefon 06068/3001 und 3002 Telefax 06068/3074 http://www.ibhsoftec.de	Product ID Card Your personal identification number (PIN) entitles you to unlock one copy of the software.
	<div style="border: 1px solid black; padding: 2px;">123456789</div>
	Please keep this card in a safe place.
	It is illegal to distribute this PIN code to any other party.
<p><i>S7 for Windows</i></p> <p>Version 4.06</p> <p>Serial-No.: S7W-071299-0200</p>	

Figure 1-12 Product ID Card example (*S7 for Windows* option)

Enter the serial number and the PIN code in the corresponding line in the dialog box.



◆ Click **Next**



◆ Press **RETURN**

If you have selected more than one *S5 / S7 for Windows* option for installation (see figure 1-10), a dialog box (see figure 1-11) will be opened for each option selected where you will enter the serial number and the PIN code.

When you have entered the requested serial numbers and PIN codes correctly the dialog box to select a Program Folder is opened.

The installation program provides you the ability to add program icons to a program folder. The icons in the program folder can be reached via the **Start, Program** menu to start *S5 / S7 for Windows* and/or any additional options installed. The default folder is *S5 for Windows*. You may type in a new folder name or select an existing folder from the folder list.

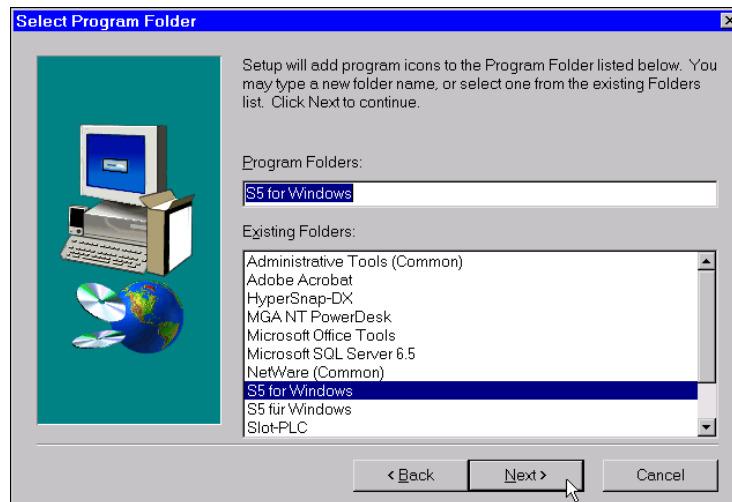


Figure 1-13 Select Program Folder dialog box

◆ Click **Next**

◆ Press **RETURN**

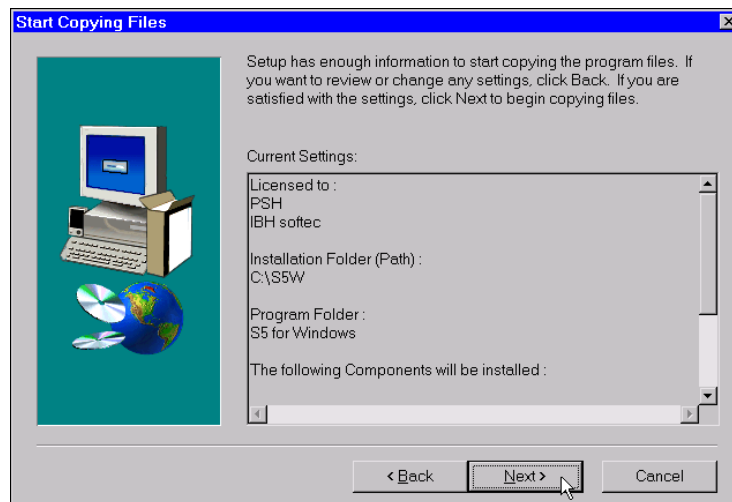


Figure 1-14 Start Copying Files window

This window displays the information you have entered plus your selections in the previous dialog boxes. If the listed information is correct you may start the copying process by activating the **Next** button. If the information is incorrect or you want to change any of the settings you have selected, you may return to the previous dialog boxes by activating the **Back** button.

◆ Click **Next**

◆ Press **RETURN**

The installation program indicates which file is being copied to the selected directory and the progress of the installation. With the indication, 100%, all the *S5 / S7 for Windows* files and the selected options have been installed. The installation will take a few minutes.

The successful setup is indicated with the **Setup Complete** information window.

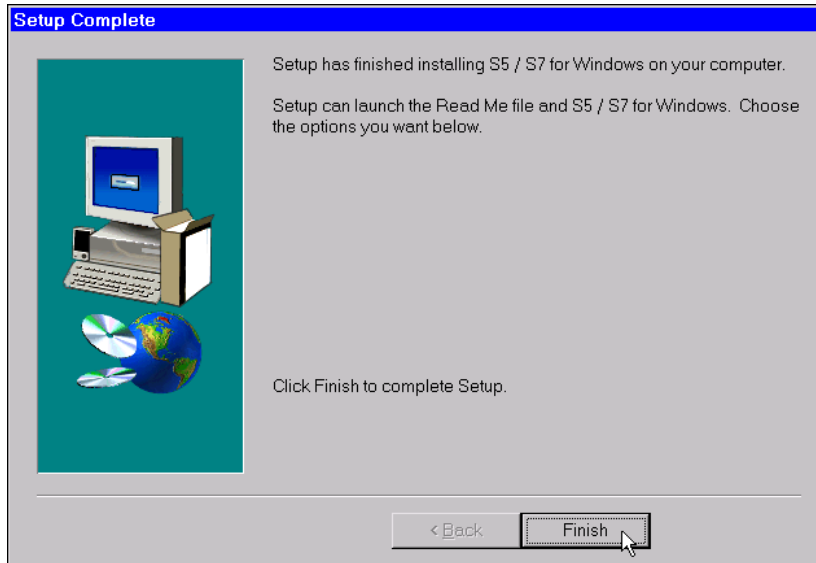


Figure 1-15 Setup Complete



◆ Click **Finish**



◆ Press **RETURN**

The *S5 / S7 for Windows* software installation is now completed.

1.3 Running S5 / S7 for Windows the First Time

When starting *S5 / S7 for Windows* for the first time, an information box is opened requesting the **Authorization Code**.



Figure 1-16 Authorization Code request

Confirm with the OK button. A text box is opened which provides the information on how to request the Authorization Code from IBH softec (see figure 1-17).



You may request the Authorization Code via e-mail, fax or phone. The request form may be printed out to send a fax or may be saved on disk as a text file. The default file

name of the request form is **IBH.TXT**. The text file may be opened with any text editor (e.g. notepad) or any word processing program.

Open the **IBH.TXT** text file and fill in the requested information. You may then send the authorization request form as an E-mail attachment to IBH softec.

When using the phone to request the Authorization Code make sure that you have the installed Serial Numbers, the PIN Codes, and the Code provided on the **Authorization Request Form** ready to give to the IBH softec hotline.

```

Installed Serial Number(s)
S5W-123456-8421
S7W-123456-8421
K0P-123456-8421
G5W-123456-8421
S5B-123456-8421

Code :
IBH-2850340465-66844-124-19177

```

The **Authorization Code** is based on the **Code** provided on the **Authorization Request Form**. This **Code** is only valid for the PC (hard drive) where you have installed the product serial numbers provided on the authorization request form. If you want to install *S5 / S7 for Windows* on another PC, another authorization code

is required. You may only install *S5 / S7 for Windows* in accordance with IBH software license agreement.

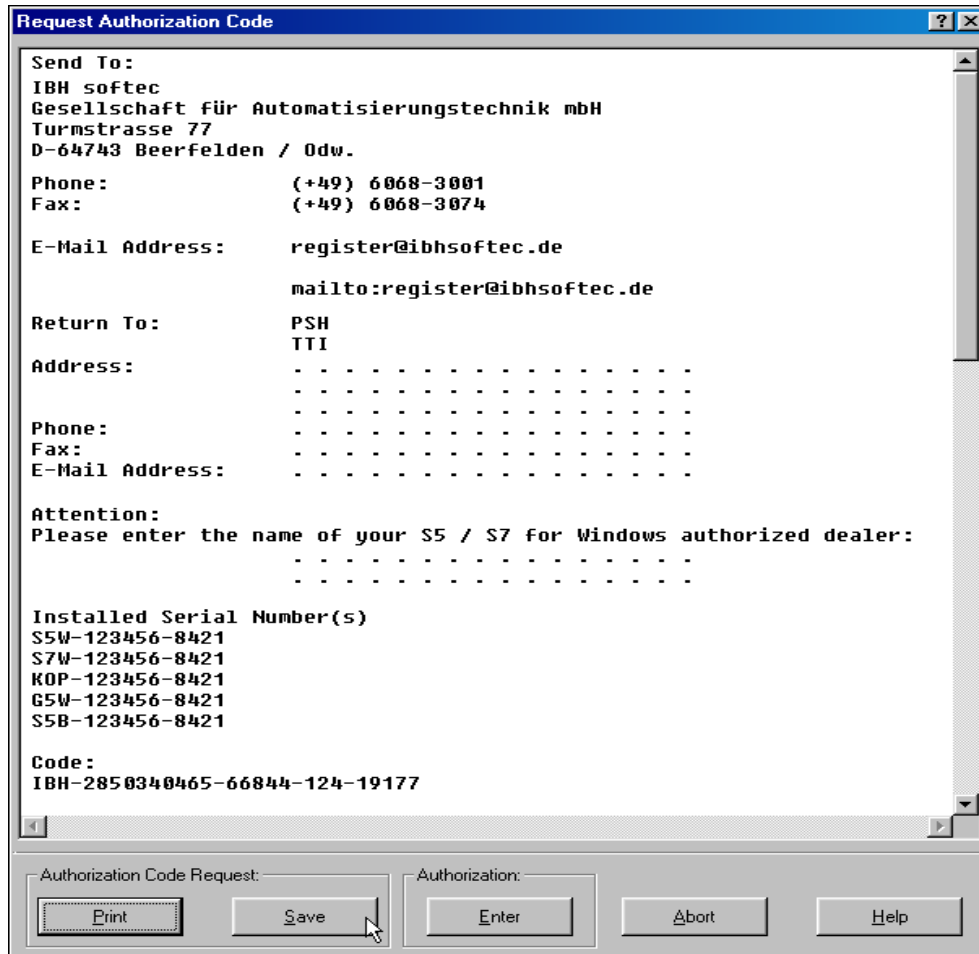


Figure 1-17 Authorization Request Form

1.3.1 Entering the Authorization Code

After you receive the **Authorization Code**, to enter the code start *S5 / S7 for Windows* in the normal way. A dialog box requesting the Authorization Code is opened (see figure 1-16 and 1-17).

The Request Authorization Code dialog box provides a button to open the **Enter Authorization Code** dialog box.

- ◆ Click the **Enter** button in the Authorization field.
- ◆ Press **E**.

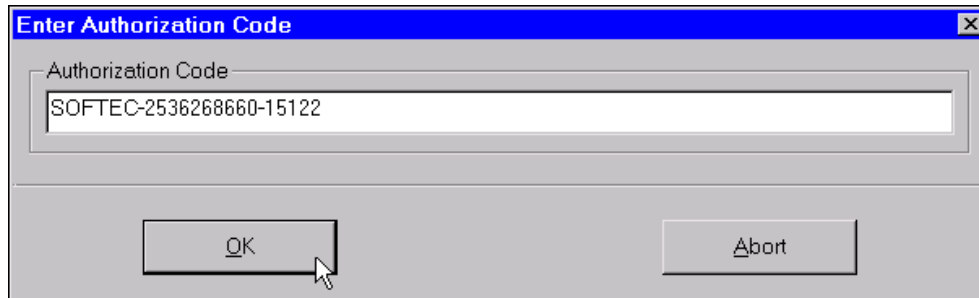
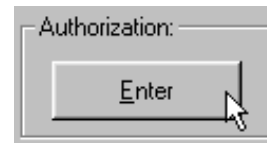
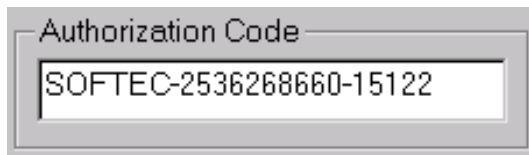


Figure 1-18 Enter Authorization Code dialog box

In the Authorization Code text field enter the code provided by IBHsoftec.



A screenshot of a text input field with a light gray border. The field is labeled "Authorization Code" in a dark gray font at the top left. Inside the field, the text "SOFTEC-2536268660-15122" is entered in a black, monospaced font.

The Authorization Code always starts with the name SOFTEC (must be in upper case letters) followed by a hyphen (-) a ten (10) digit number, another hyphen (-), and a five (5) digit

number. Confirm the Authorization Code entered with the **OK** button. *S5 / S7 for Windows* is now authorized and ready to use.

Note:

If you are personally using a **PC** and a **Notebook** and you are the **only user for both**, the PC and the Notebook, IBH softec will issue an additional authorization code on request.

INFORMATION:

To install *S5 / S7 for Windows* and any selected options, each option requires a serial number and its corresponding PIN code. The serial number and the PIN code can be found on the "Product ID Card" attached to the registration card. Both cards are shipped with the *S5 / S7 for Windows* CD.

To make full use of *S5 / S7 for Windows* and any selected options, you have to authorize the installation (see chapter 1.3). The Authorization Code will be issued by fax, phone, or e-mail.

If the Authorization Code is not entered, *S5 / S7 for Windows* reminds you frequently that you are working with a non-authorized version. This "Reminder" is displayed after *S5 / S7 for Windows* searches for the Authorization Code. This search will take some time otherwise there are no limitations.

2 Introduction

Two software packages are available. With *S5 for Windows* you can program the complete S5 PLC series and use the on-line functions when connecting the PC (serial port COM1 – 4), via a current loop converter cable, with an S5 PLC

With the *S7 for Windows* software you can program the S7 300 / 400 series of PLC's from Siemens. When the PC is connected (serial port COM1 – 4), via a PC-MPI cable, with an S7-300 / 400 PLC's, you will have full use of the on-line functions.

With the software package *S7 for Windows* and *S5 for Windows* installed on one PC, you may program the S7 300 / 400 series of PLC's from Siemens as well as the S5 series of PLC's, using the same editor. Also the on-line functions are provided when the PC is connected (serial port) with the PLC via an adapter (S7 PC-MPI cable or S5 Current loop converter) with a S7-300 / 400 or a S5 series PLC.

Of course if only one of the software packages (*S7 for Windows* or *S5 for Windows*) is installed on your PC you will only be able to program either the Siemens S7-300 / 400 series of PLC or the S5 series of PLC and make use of the on-line functions.

S5 for Windows provides an editor that understands the STEP® 5 PLC language for programming the S5 series of PLC's. *S7 for Windows* uses an editor that understands the STEP® 7 PLC language and can generate PLC programs for the S7-300 / 400 series of PLC's. If both software packages, *S7 for Windows* and *S5 for Windows*, are installed on one PC you may also use the STEP® 5 PLC language to generate PLC blocks for an S7-300 / 400 PLC. These Blocks may be converted into STEP® 7 PLC language and back into STEP® 5 code. Some restrictions apply when converting a PLC program from the STEP® 5 code into STEP® 7 code (see chapter 3.3.6).







It is also possible to download a PLC program, written in the STEP® 5 PLC language, to an S7-300 / 400 PLC. During the transfer of the programmed data to the S7 PLC, the *S7 for Windows* software package translates the program so the S7 CPU can understand the data.

If data is transferred from an S7 PLC to *S7 for Windows* the data is displayed in the STEP® 7 PLC language. In case the PLC program opened with *S7 for Windows* has the STEP® 5 PLC language format, the PLC Blocks are converted back to display it in the STEP® 5 PLC language format. In other words, you can program and test (on-line) an *S7 for Windows* PLC without changing to the S7 programming language. In this mode only the instructions provided by the STEP® 5 PLC language may be used. Additional STEP® 7 functions can only be used in conjunction with the STEP® 7 PLC language editor.

The following chapters explain how to handle *S5 / S7 for Windows*. Also the conversion functions used to convert S5 code to S7 code and S7 code to S5 code are explained.

2.1 Notation and Conventions


To help you locate and interpret information in the *S5 / S7 for Windows* manual, use the following notations and conventions:

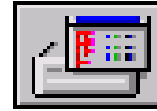
Font, Symbol	Explanation
CAPITAL LETTERS	Folder names (Folders), File names
SMALL CAPS	Names of Keys on your keyboard – Example: ALT, RETURN
◆	Filled diamonds indicate the steps you should follow.
	An operational procedure executed with the mouse. All mouse clicks refer to the left mouse button (right mouse button clicks are specifically indicated).
	An operational procedure executed with the keyboard.
KEY1+KEY2	When two keys are connected with a plus sign (+), press and hold down the first key, and then press the second key.
KEY1, KEY2	When two keys are separated by a comma (,), press down the first key, release it, and then press the second key.
KEY1+ KEY2, KEY3	The Key 1 and the Key 2 are pressed simultaneously. Then they are released and Key 3 is pressed.
Bold type	indicates important terms.
⏎ or RETURN	These symbols are used to indicate the RETURN key.
⇧ or SHIFT	These symbols are used to indicate the SHIFT key.
   	These symbols represent the ARROW keys.
Bold	Command from a menu (e.g. " New Block... ").
<i>Bold Italic</i>	Names of dialog boxes, windows, buttons etc.(e.g. <i>Run</i> dialog box).

3 PC Block List

The PC block list window will be opened when ever you start *S5 / S7 for Windows*. If *S5 / S7 for Windows* displays another window you may open the PC block list window as followed.

 ◆ Click the **PC Block List** icon in the tool bar.

 ◆ Press **ALT + W, 1**.



3.1 PC Block List Window

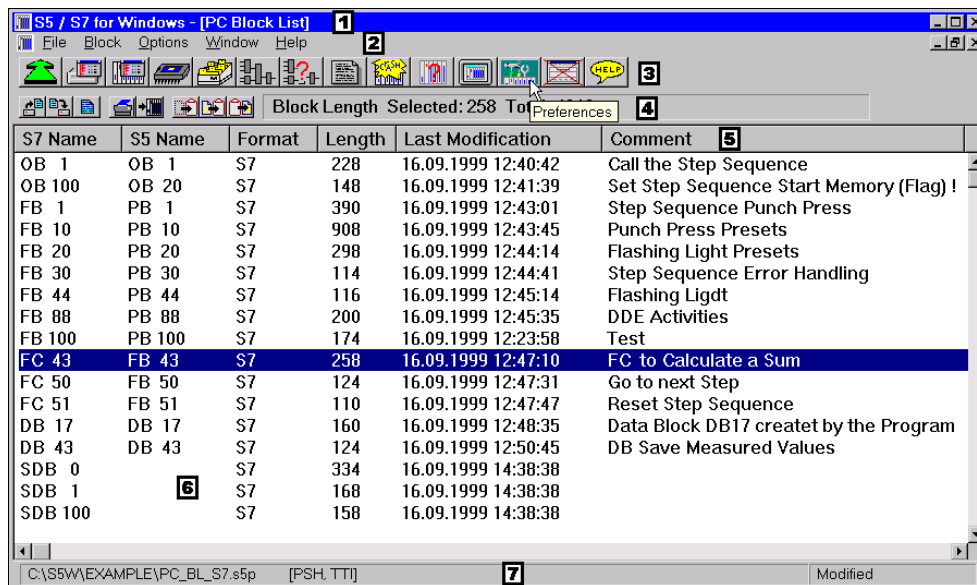


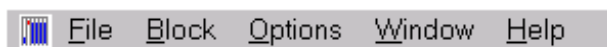
Figure 3-1 PC Block List window

1 Title Bar



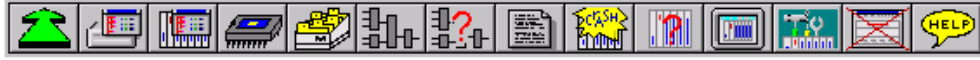
The title bar displays *S5 / S7 for Windows* and the name of the open window.

2 Menu Bar



The menu bar contains a list of menus. You open a menu by clicking the name of the menu or by pressing the keys **ALT** and then the underlined character from the menu name. All the commands from the PC Block List menus are described in this chapter.

3 Tool Bar



The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. With the keyboard you can reach these functions via the window menu and/or the function keys.



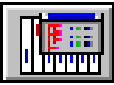
Open next Window.

This icon allows you to switch rapidly between open windows with a mouse click. The keyboard shortcut **CTRL+F6** provides the same function.



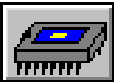
PC (Personal Computer) Block List.

This index lists all the blocks with the date and time it was created or changed and a comment. One or more blocks may be selected for further manipulation.



PLC Block List.

This index lists all the blocks stored in the PLC. One or more blocks may be selected for further manipulation in the same way it is handled in the windows file manager.



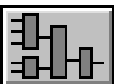
EPROM / EEPROM / Flash EPROM Burner.

This icon opens a menu to control EPROM / EEPROM / Flash EPROM burning. It is only active when the EPROM burner option has been purchased.



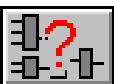
Cross Reference Display.

A click on this icon lists the appearance of operands, as a symbol or absolute, throughout the whole program. This function may be called from any window. The keyboard shortcut **F4** provides the same function.



Block Edit.

The block selected in the block listing will be displayed in the block editor and is ready for any changes. The keyboard shortcut **F10** provides the same function.



Block Status Display.

The status of signals within a block is displayed. The status of the signals can be displayed online or from the internal simulation PLC. The keyboard shortcut **CTRL+F10** provides the same function.



Symbolic Table Editor.

With this easy to use integrated editor you can write, cut, copy and paste text to create and modify the symbol table. The symbol table may be tested for multiple use of addresses or symbols. The symbol table can also be sorted by addresses or symbols. The keyboard shortcut **F6** provides the same function.

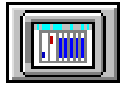


PLC Error Display (I-Stack, B-Stack, Diagnostic Buffer)

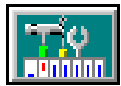
This icon enables you to view the program interrupt information stored in the PLC (I-Stack, B-Stack, Diagnostic Buffer). The information is displayed in real language with the faulty portion of the program.

**On-line PLC Status.**

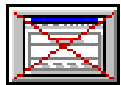
The status of flags, inputs, outputs, timers, counters, comparators, data words, and peripheral words are displayed and can be modified.

**Integrated S5 Simulation PLC.**

This icon selects the integrated S5 Simulation PLC for testing the S5 PLC program. The access to hardware (ports) is also possible.

**Preferences**

This icon opens dialog boxes to customize the appearance of *S5 / S7 for Windows*. The settings of the serial port, the editors, the indexes, the display font and other (miscellaneous) settings are saved and are reloaded whenever a new PLC project is opened.

**Closing Open Windows.**

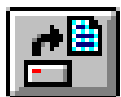
The *S5 / S7 for Windows* active window is closed by clicking this icon. The keyboard shortcut **CTRL+F4** provides the same function.

**Help Function.**

An integrated, subject related help file with an index and a list of keyboard shortcuts for easy operation is available. The keyboard shortcut **F1** provides the same function.

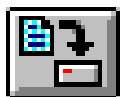
4**Tool Bar II**

The tool bar II provides instant access to frequently used PC block list commands. Click an icon with the mouse and the command is executed. With the keyboard you can reach these functions via the file menu and the Block menu. Also the total length and the length of the selected blocks are displayed.

**Open Project.**

A project file management system is integrated in *S5 / S7 for Windows*. For more details see chapter 3.2.2.

The keyboard shortcut **F11** provides the same function.

**Save Project.**

A project file management system is integrated in *S5 for Windows*. For more details see chapter 3.2.3.

The keyboard shortcut **F12** provides the same function.

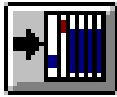
**Project Name Text Field.**

The name of the files belonging to a project are displayed (*S5 / S7 for Windows* project file ***.S5P**, program file ***.S5**, and symbolic file ***.SEQ**; *S7 for Windows* hardware configuration file ***.CFG**). For more details see chapter 3.2.5.

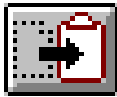
The keyboard shortcut **SHIFT+F11** provides the same function.

**Print Block.**

The marked block is printed. For more details see chapter 3.3.7.
The keyboard shortcut **ALT+B, R** provides the same function.

**Transfer Block to PLC.**

The marked block is transferred to the PLC. For more details see chapter 3.3.10.
The keyboard shortcut **ALT+B, T** provides the same function.

**Cut Block.**

The marked blocks are transferred to a temporary buffer and are removed from the Block List. For more details see chapter 3.3.18.

The keyboard shortcut **CTRL+X** or **Shift+BACKSPACE** provides the same function.

**Copy Block.**

The marked block are transferred to a temporary buffer and are remained in the Block List. For more details see chapter 3.3.16.

The keyboard shortcut **CTRL+C** or **CTRL+INSERT** provides the same function.

**Paste Block.**

The blocks currently in the temporary buffer are transferred to the PC block list. The blocks remain in the temporary buffer. For more details see chapter 3.3.17.

The keyboard shortcut **CTRL+V** or **Shift+INSERT** provides the same function.

5 Workplace Column Title Bar

S7 Name	S5 Name	Format	Length	Last Modification	Comment
---------	---------	--------	--------	-------------------	---------

The Workplace Column Title Bar can be customized by selecting the items to be displayed from the *Preferences* dialog box. For more details see chapter 3.2.11.3

Note:

Double Clicking the title of a column will sort the PC Block List information displayed by this column in an ascending order. Double Clicking the title an other time will sort the information in a descending order.

6 Workplace

In the PC block List all the blocks of an open PLC program file are listed. The information listed depends on the settings in the *Preferences* dialog box.

7 Status Bar

C:\S5W\EXAMPLE\PC_BL_S7.s5p	[PSH, TTI]	Modified
-----------------------------	------------	----------

The status bar may displays one ore more of the following information :

- The name and the path of the active PLC program or the opened PLC project.
- Information about the active command.

- Name and organization of the registered user.
- Status of the project (modified).
- Information about the command the mouse is pointing to.

Note:





The **right mouse button** may be used within the *PC Block List Workplace*.

If the **right mouse button** is clicked, the menu with the commands to manipulate the selected (marked) Block is opened.







3.1.1 Marking Blocks

Marked blocks in the PC block list have a blue background. You can mark one or several blocks. A marked block may be “unmarked” by marking the block again.







Marking a single Block:

-  ◆ Click the block. The background of the marked block changes to blue.
-  ◆ Select the block using the   keys. The background of the marked block changes to blue.

Marking several Blocks in row:

-  ◆ Click the first block and drag (hold down the left mouse button while you move the mouse). Release the mouse button when the desired blocks are marked.
-  ◆ Select the first block using the   keys. Press and hold the **SHIFT** key while using the   keys to mark the desired blocks. Release **SHIFT**.

Marking several Blocks independently:

-  ◆ Press and hold the **CTRL** key. Click the first block and then all the other desired blocks. Release the **CTRL** key.
-  ◆ Select the first block using the   keys. Press the key combination **SHIFT+F8**. The marked block starts to blink. Using the   keys to move to the next Block. Mark the block with the **SPACE** key. Repeat the last two steps. Press the key combination **SHIFT+F8** to finish the operation.

Note:

You may print, transfer, cut, copy, past, delete, or convert (S5 ↔ S7) selected (marked) Blocks.

A marked Block (Line) is indicated by white writing on a blue background.

If a command to manipulate a Block is called, the marked Block is selected for the manipulation.

Double clicking a Block opens the editor window and the first segment is ready for modifications.

3.2 File (File Menu - PC Block List)

The commands from the *File* menu control the opening and saving of files. An import and export function to handle SIEMENS PLC files are available. Your personnel preference settings as well as the printing and the documentation layout is also controlled by the commands from this menu.

A list of the previously opened projects are displayed and to be compatible with other Windows applications a command to terminate *S5 / S7 for Windows* is provided.

◆ Click **File** in the menu bar.

◆ Press **ALT + F**.

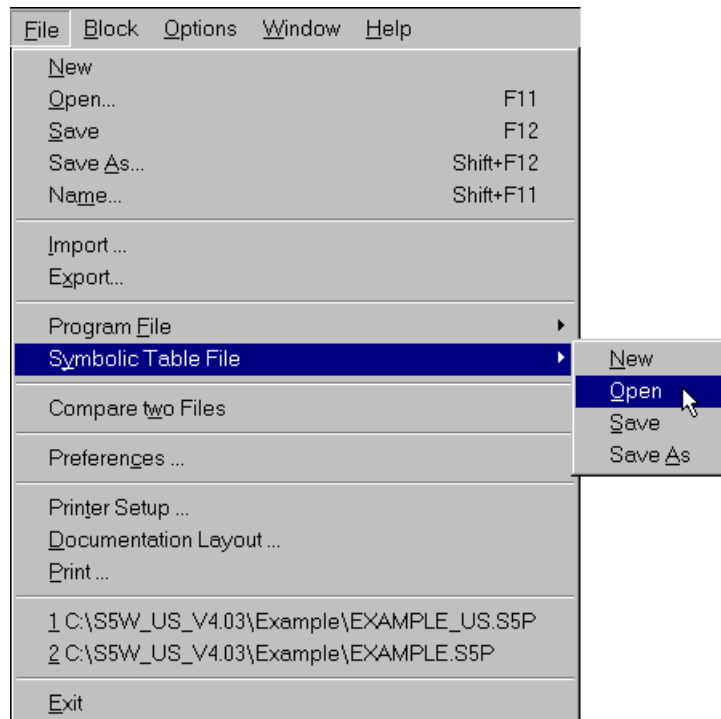


Figure 3-2 File menu, PC Block List

3.2.1 New (New Project)

The **New** command is used to create a new project.

The **PLC Block List** workplace is cleared. If a modified project (file) has been opened, *S5 / S7 for Windows* prompts you to save the project (file).

◆ Click **New** in the project menu.

◆ Press **ALT + F, N**.

The PC block list workplace is cleared. You may non start to program a new project. A *S7 for Windows* project is made out of four (4) files and a *S5 for Windows* project is made out of three (3) files.

Project File (*S5 / S7 for Windows*)

The project related data (header, footer, document and display settings, preferences, Block information, etc.) are saved in this file. When opening the project at a later time, the project settings are active again. The project file name is made out of the project name and the file name extension **.s5p**. The project file also holds the information about the program file and the symbolic file belonging to the project

Usually the project file, the program file, the symbolic file and the hardware configuration file (*S7 for Windows* only) have the same file name and different file name extensions. It is also possible to have a program file and / or symbolic file, hardware configuration file with different names assigned to a project.

S5 / S7 for Windows supports long file names with up to eighty (80) characters including the file name extension. The following characters are not permitted in a file name: / \ : * ? " ' > < |

Program File (*S5 / S7 for Windows*)

The actual PLC program is saved in the program file. *S5 / S7 for Windows* uses its own file format. The program file name is made out of the program name and the file name extension **.s5**.

Symbolic File (*S5 / S7 for Windows*)

The symbolic definitions and the comments appointed to the absolute operands in the symbolic table are saved in the symbolic file. The file name is made out of the name and the file name extension **.seq**. The file is saved in ASCII text format. It is the identical format used by the SIEMENS S5 symbolic file. This file format can directly be imported by the S7 programming software.

Hardware Configuration File (*S7 for Windows*)

The S7 Hardware Configuration generated with the *S7 for Windows* Hardware Configuration is saved in a file with the file name extension **.cf7**. The configuration data is stored in the SDB format (Special Data Blocks). These Blocks are displayed in the PC Block List and the PLC Block List.

Note:

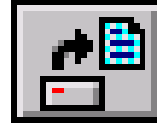
Program, Symbolic, and / or Hardware Configuration files may be assigned to one or more project files.

Special care must be taken when modifying a file (Program, Symbolic, Hardware Configuration) being assigned to more than one (1) project. Any modification will effect **all** projects.

3.2.2 Open (Open Project)

The command **Open Project** opens the dialog box **Open File**. With this dialog box you may select a project file out of a list. With this command you may only open files in the *S5 / S7 for Windows* project file format. The program file (*.s5) and the symbolic file (*.seq) specified in the project file are opened automatically. If a Hardware Configuration file (*.cf7) is specified in the project (*S7 for Windows* projects only), the corresponding SDB's are displayed in the PC Block List.

- ◆ Click the **Open Project** icon in the tool bar or **Open** in the file menu.
- ◆ Press **F11**.



The **Open File** dialog box opens (Figure 3-3).

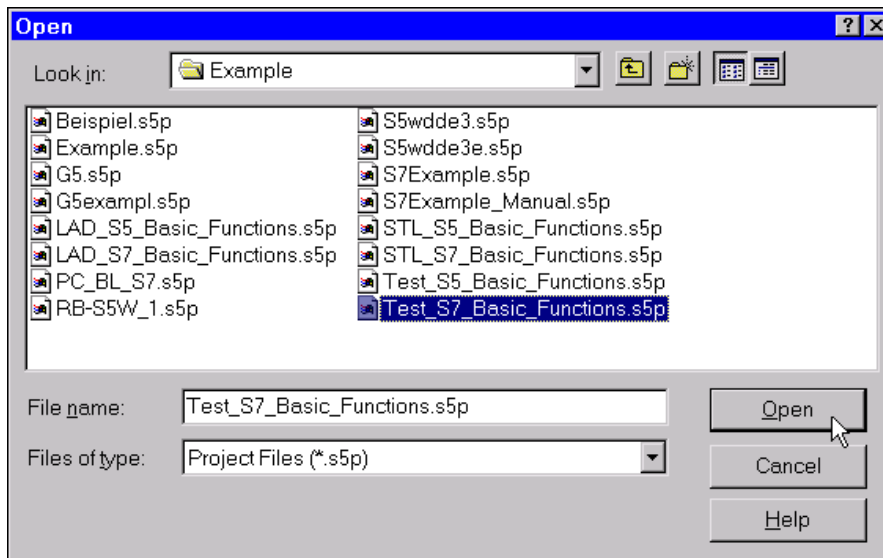


Figure 3-3 Open Project dialog box

File name

You may enter the name of the project file to be opened in the file name text field. You may also select a file from the file name list by marking the file name. *S5 / S7 for Windows* supports long file names with up to eighty (80) characters including the file name extension.

Files of type

The file name extension is defined by the file type field. *S5 / S7 for Windows* project files have the file extension **.s5p**.

3.2.2.1 Converting PLC programs into Projects

Note:

S5 for Windows version 2.1x or earlier could only handle PLC program files (*.s5) and the corresponding symbolic file (*.seq). The preset preferences (serial port settings, header, footer, document and display settings, preferences, etc.) has been saved in the initialization file (**S5W.INI**)

You may convert a PLC program saved with an earlier version of *S5 for Windows* (version 2.1x or earlier) or any other *S5 / S7 for Windows* PLC program file and its corresponding symbolic table file into a project. To do so you must open the **s5w.ini** file belonging to the program file.

- ◆ Open the program file (and its symbolic table file) you want to convert into a project by using the **Open** command from the **Program File** menu (see chapter 3.2.8.2).

Opening an initialization file (S5W.INI)

From the drop down list box **Files of type** of the **Open** dialog box (Figure 3-3 Open Project dialog box) you can select the **S5W.INI** file to be opened .

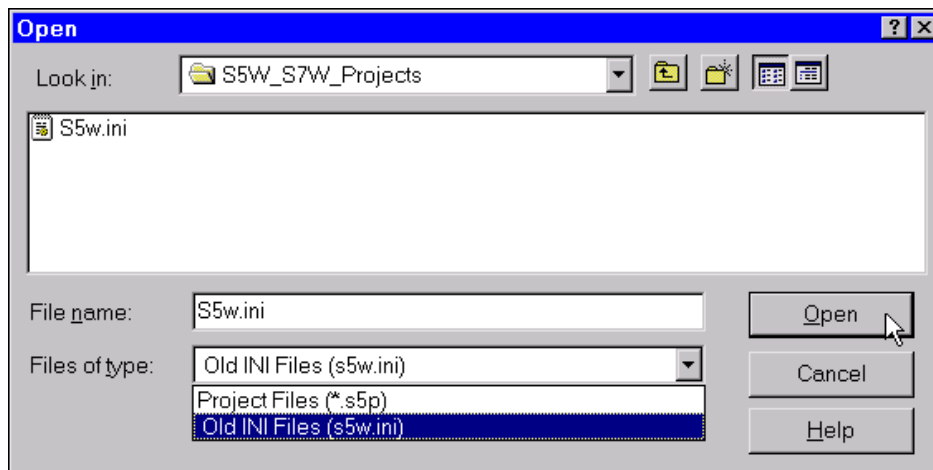


Figure 3-4 Drop down list box **Files of type** (Old INI Files (s5w.ini))

- ◆ Mark the **s5w.ini** file belonging to the program file and activate the **Open** button.

S5 / S7 for Windows prompts you to save the project file.

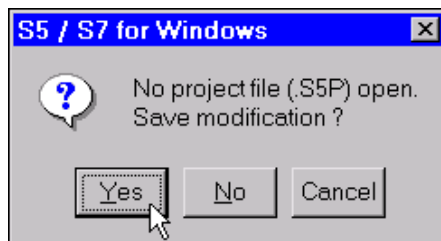


Figure 3-5 *S5 / S7 for Windows* prompt to save the new project.

- ◆ Activate the **Yes** button to save the modified project file.

The **Save File As** dialog box opens.

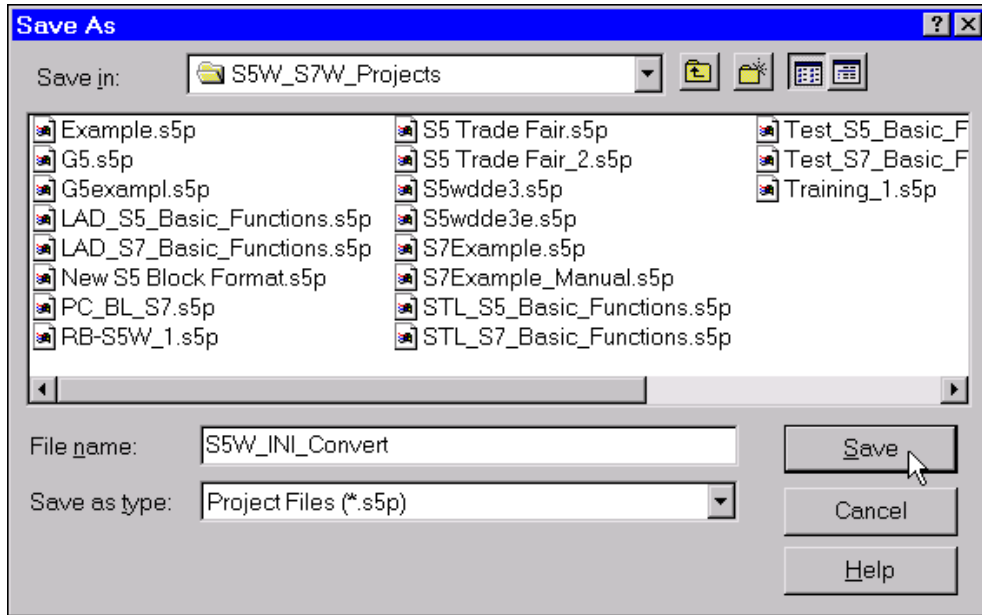


Figure 3-6 **Save File As** dialog box to save the new project

- ◆ Enter the name of the project file to be saved in the file name text field.

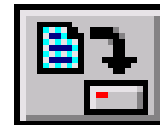
When saving the project, the settings from the **S5W.INI** file are transferred into the new generated project file ([project name].**s5p**).

3.2.3 Save (Save Project)

The *S5 / S7 for Windows* project from your system's RAM are saved on disk under their current file names.

The project file is saved with the file name extension **.s5p**. The program file is saved with the file name extension **.s5**. An existing symbolic table is also saved under its file name with the file name extension **.seq**. Also the S7 hardware configuration file is saved under its current file name with the file name extension **.cf7**.

- ◆ Click the **Save Project File** icon in the tool bar or **Save** in the file menu.
- ◆ Press **F12**.



The project and its corresponding files are saved.

Note:

Starting with *S5 / S7 for Windows* version 4.0 additional information (PLC Block Properties) are saved in the program file (*.s5).

- ◆ If a project exclusively contains S5 Blocks, *S5 / S7 for Windows* generates a *.s5 file having the additional information included. The additional information (e.g. author, name, etc.) are integrated in the *.s5 file in such a matter that older *S5 / S7 for Windows* versions may open the program file. If the program is edited with an older *S5 / S7 for Windows* version (prior 4.0) the additional information is lost.
- ◆ If a S7 Block is entered into an existing S5 project or an existing S5 Block is converted into an S7 Block the program file (*.s5) is saved in its new format. Was the file original saved in the old S5 format a warning (figure 3-4) is displayed that the program file can not be opened with an older *S5 for Windows* version (prior 4.0).
- ◆ If all S7 Blocks of a project are converted back into S5 Blocks the program is saved in a format that older *S5 for Windows* version (prior 4.0) can open. A corresponding warning (figure 3-5) is displayed.

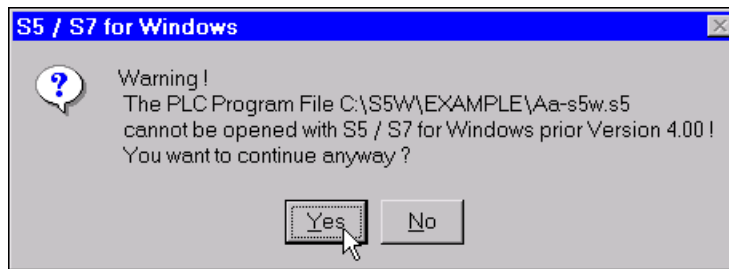


Figure 3-7 New S5 file format warning

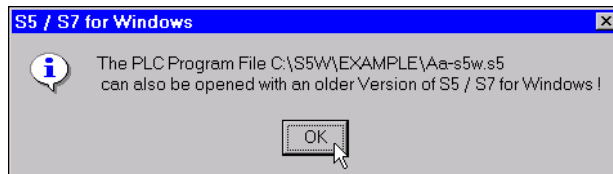


Figure 3-8 New S5 file format warning

3.2.4 Save As (Save Project As)

The *S5 / S7 for Windows* project files from your system's RAM are saved on disk. You have to select the project file name.

The project file is saved with the file name extension **.s5p**. The program file is saved with the file name extension **.s5**. An existing symbolic table is also saved under its file name with the file name extension **.seq**. Also the S7 hardware configuration file is saved under its current file name with the file name extension **.cf7**.

◆ Click **Save As** in the Project menu.

◆ Press **SHIFT+F12** or **Alt+F, A**.

The **Save As** dialog box opens.

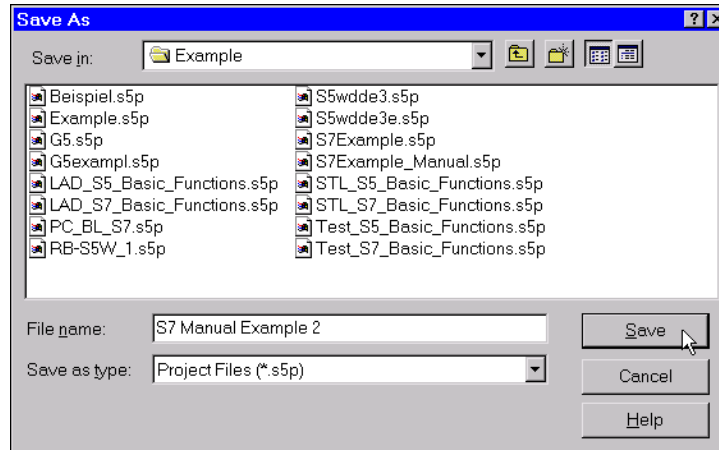


Figure 3-9 Save As dialog box.

File name

You may enter the name of the project file to be saved in the file name text field. You may also select a file from the file name list by marking the file name. This will overwrite the selected file.

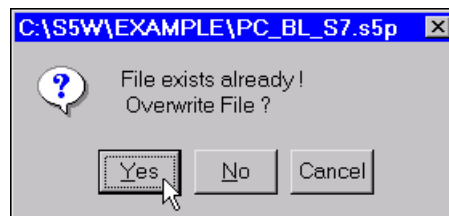


Figure 3-10 File overwrite warning.

The file to overwrite and its path is displayed in the title bar of the dialog box.

S5 / S7 for Windows supports long file names with up to eighty (80) characters including the file name extension. The following characters are not permitted in a file name: / \ : * ? " > < |

You do not have to enter the file name extension while entering the file name. The file name extension is inserted automatically when saving the file.

Save as type

The file name extension is defined by the file type field. *S5 / S7 for Windows* project files have the file extension **.s5p**.

- ◆ Activating the **Save** button will start the saving process. The project file is saved immediately.

You are prompted prior saving all the other files belonging to the project.

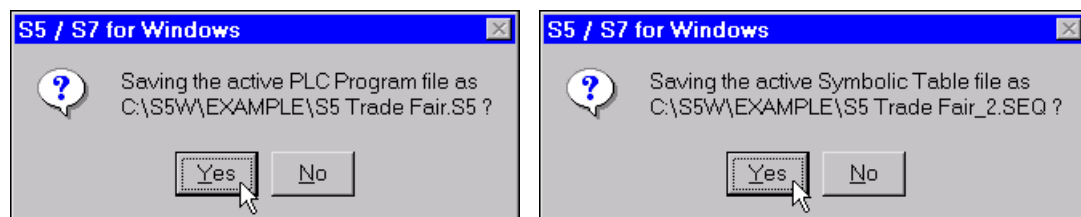


Figure 3-11 File generation warning

3.2.5 Name (Project File Names)

The command **Name** opens the dialog box **Project Files**. The dialog box lists the existing files of the project. The **Select** buttons may be used to open dialog boxes to select different files for the open project.

To open the dialog box **Project Files** do one of the following steps.

- ◆ Click the open project names icon in the tool bar or **Name** in the file menu.
- ◆ Press **SHIFT+F11**.

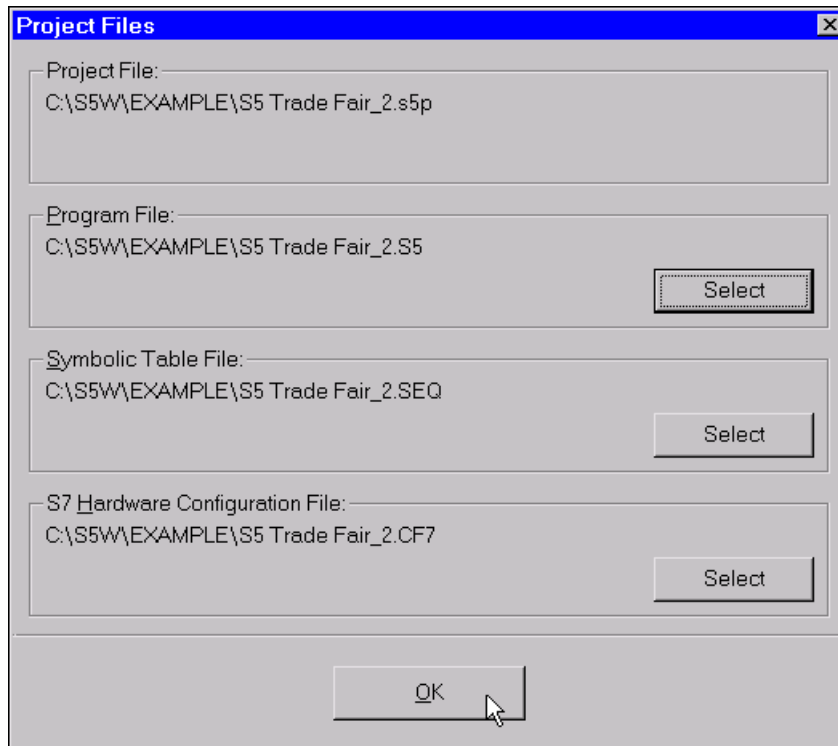
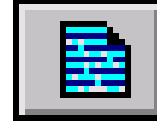


Figure 3-12 Project file selection dialog box

3.2.5.1 Assigning Files to a Project

With *S5 / S7 for Windows* you may select already existing files to built a new project and save it under a new name. Also it is possible to assign a different program file, symbolic file, and / or S7 hardware configuration file to an existing project.

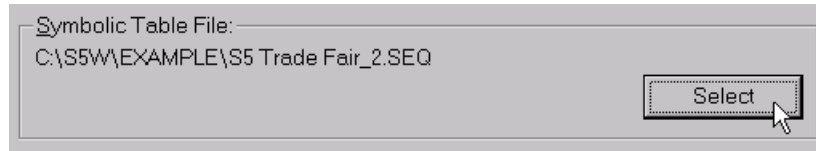
With the different **Select** command buttons from the project file selection dialog box you can open dialog boxes to select a file to be assigned to the open project.



Example:

An existing Symbolic Table File file should be assigned to an already built project.

1. Open the project file selection dialog box (see chapter 3.2.5).
2. Activate the **Select** command button in the Symbolic Table File display box



The Open dialog box to select a **Symbolic Table File** is displayed.

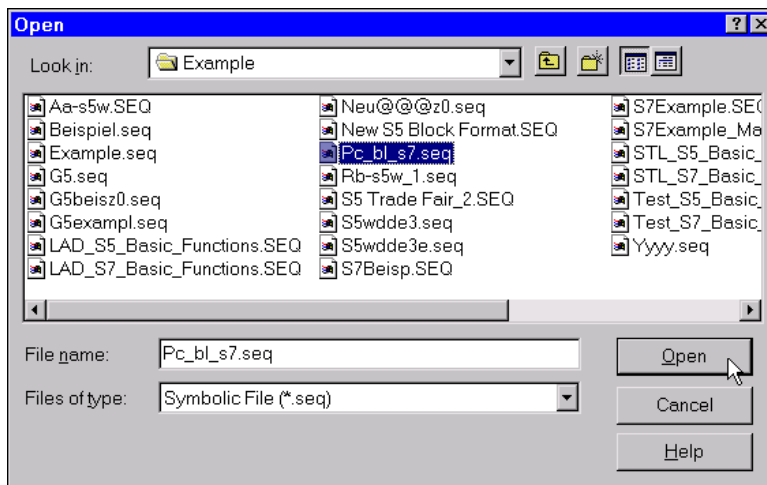


Figure 3-13 Select **Symbolic Table File** dialog box

3. Mark the **Symbolic Table** file (*.seq) you want to insert into the project and activate the **Open** command button (**RETURN** key).

The inserted **Symbolic Table** file (Pc_bIS7.seq) is listed in the project file selection dialog box.

- **Saving the Project with the newly assigned Symbolic Table file**

Saving the modified Project under a new name :

If the **modified project** is saved with the **Save As** command (see chapter 3.2.4) all project files will be saved under the new name entered in the text field **File name** of the **Save As** dialog box.

The files assigned to the project are copied and saved under the new name. The original files are not modified or renamed.

Saving the modified Project under its same name :

If the **modified project** is saved with the **Save** command (see chapter 3.2.3) the project files will be saved under the names listed in the **Project Files** selection dialog box.

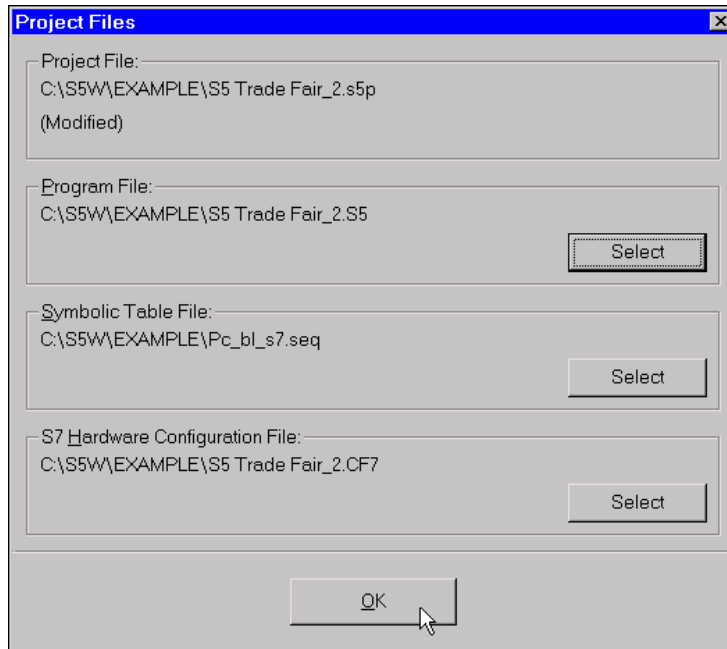


Figure 3-14 **Project Files** selection dialog box (modified project)

Note:

If a project saved using different names for the files within the project, it is possible that these files are assigned to other projects as well.

Files assigned to more than one project can be modified from any of the projects they are assigned to.

3.2.5.2 Assigning a Hardware Configuration File to a Project

With the **Select** command button in the S7 Hardware Configuration File display box the project file selection dialog box you can open the dialog box to select a hardware configuration file you may assign to the currently open project.



If an existing S7 hardware configuration file should be assigned to currently open project the System Data Blocks (e.g. SDB 0, SDB 1 etc.) are listed in the PC Block List.

In the System Data Block SDB 0 the project specific CPU parameters are saved. The System Data Block SDB 1 contains the assignment list of the central peripheral modules.

S7 Name	S5 Name	Format	Length	Last Modification	Comm
OB 1	OB 1	S7	124	01.10.1999 15:12:01	
FC 10	FB 10	S7	88	01.10.1999 15:12:26	
SDB 0		S7	336	01.10.1999 16:15:25	
SDB 1		S7	118	01.10.1999 16:15:25	

Block Length Selected: 118 Total: 666

C:\S5W\EXAMPLE\S5 Trade Fair_2.s5p [PSH, TTI] Modified

Figure 3-15 System Data Blocks containing S7 hardware configuration data

If hardware configuration parameters for decentralized peripheral modules, communication modules, signal modules, etc. are needed in a specify a S7 application additional System Data Blocks (e.g. SDB 100 etc.) are used to save other (e.g. Profi Bus) project specific parameters.

Note:

A double click on one of the System Data Blocks containing hardware configuration parameters will open the *S7 for Windows* Hardware Configuration Window.

3.2.6 Import (Import a PLC Program)

The *S5 / S7 for Windows* has an integrated import filter to read files generated with a Siemens programming unit (PU). PLC programs created with the basic PLC programming package STEP® 5 from SIEMENS with a DOS operating system (or S5-DOS) as well as PLC programs and libraries created with the programming package STEP® 7 from SIEMENS may be imported.

◆ Click **Import...** in the File menu.

◆ Press **ALT+ F, I**.

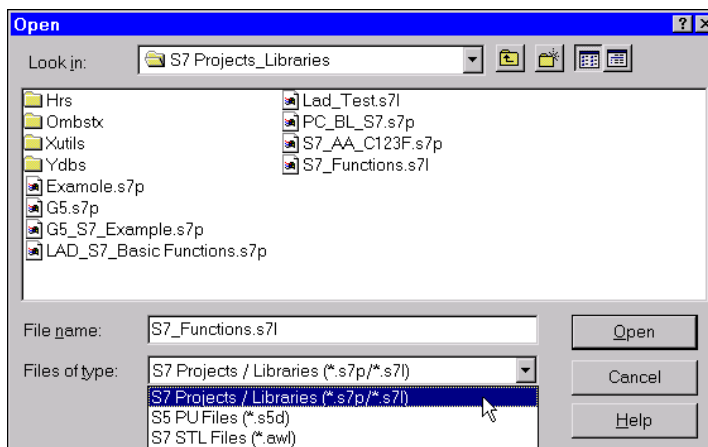


Figure 3-16 Import (Open) dialog box

3.2.6.1 S5 for Windows Import Filter

S5 for Windows has an integrated import filter. PLC programs created with the basic PLC programming package STEP® 5 from SIEMENS with a DOS operating system (or S5-DOS) may directly be imported.

The import function converts a *.**S5D** program file into the *S5 for Windows* file format by reading the data from the disk into the memory of your personal computer.

Files created with the SIEMENS STEP® 5 software have a file name with six (6) freely selected characters plus the characters **ST**. The characters **.S5D** are used as the file name extension.

Example: **DEMO12ST.S5D**

At the same time the PLC program file is converted, the symbolic table file is read into the memory of your personal computer. This file has the same name than the PLC program file (the first six characters), followed by the characters **Z0** and the file name extension **.SEQ**.

Example: **DEMO12Z0.SEQ**

The original files on disk are not touched by the conversion program. They remain in their original format.

Note:

If your PLC programs have been created with one of the following SIEMENS programming units (PU), PG-685, PG-675 or PG-635 in CPM, they must be converted in DOS disk format. The converted files may be imported by *S5 for Windows*.

During conversion, each blocks a creation date and time is assigned. This is the date and time the original program was last saved (DOS file date).

Note:

S5 / S7 for Windows (version 4.0 and higher) supports long file names up to 80 characters including the file name extension.

The dialog box gives you the possibility to select a PLC program file in the SIEMENS S5D format (PU format) out of a list for opening. The corresponding symbolic file is loaded automatically.

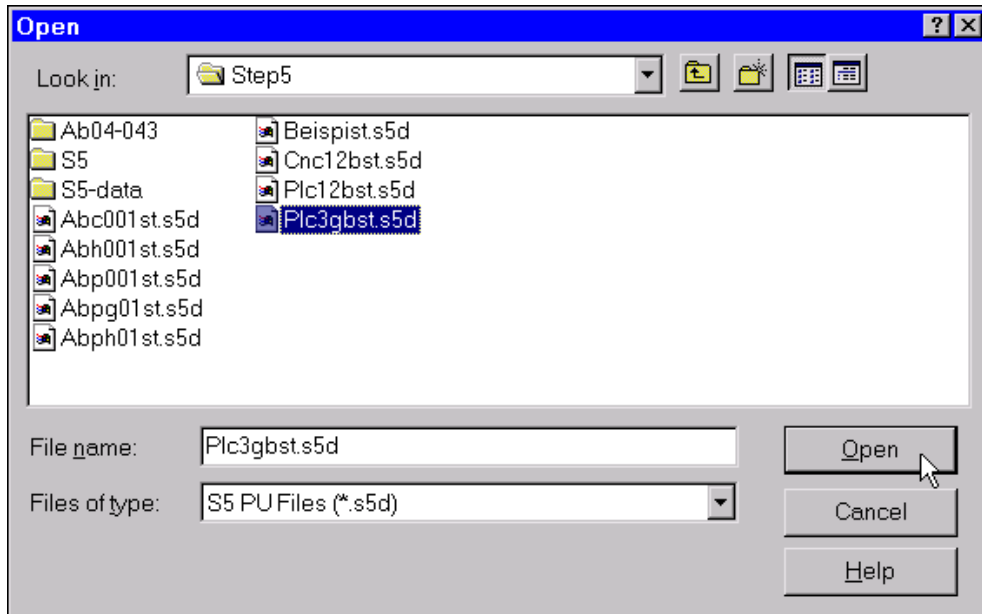


Figure 3-17 **Open** dialog box to select a S5 File (*.s5d) to import

Files of type

The file name extension is defined by the **Files of type** text box. The SIEMENS programming devices using the file type **.s5d**. If S5 Files (*.s5d) is selected in the **Files of type** text box only files created with a SIEMENS programming device are listed.

3.2.6.2 S7 for Windows Import Filter

S7 for Windows has an integrated import filter. S7 PLC projects (*.s7p), S7 source code programs saves as a Statement List text file (*.awl) and S7 libraries (*.s7l) created with the basic PLC programming package STEP® 7 from SIEMENS can be imported.

The import function converts the S7 data into the *S7 for Windows* file format by reading the data from the disk into the memory of your personal computer. To import a S7 Project (*.s7p) or a S7 library (*.s7l) the file and the folders belonging to the project or library must be present in their unpacked form. The number of folders belonging to a project or library depends of the number of objects belonging to the project or library.

Import a S7 Project

If a project is archived using the Siemens STEP® 7 PLC programming software all the files and folders belonging to a project are packed into one file (*.arj). When unpacking the archive file, the folders and files must be put into its original order on a hard disk. ARJ Packing / Unpacking programs are available as shareware and freeware programs from the internet.

◆ Click **Import...** in the File menu.

◆ Press **ALT+ F, I**.

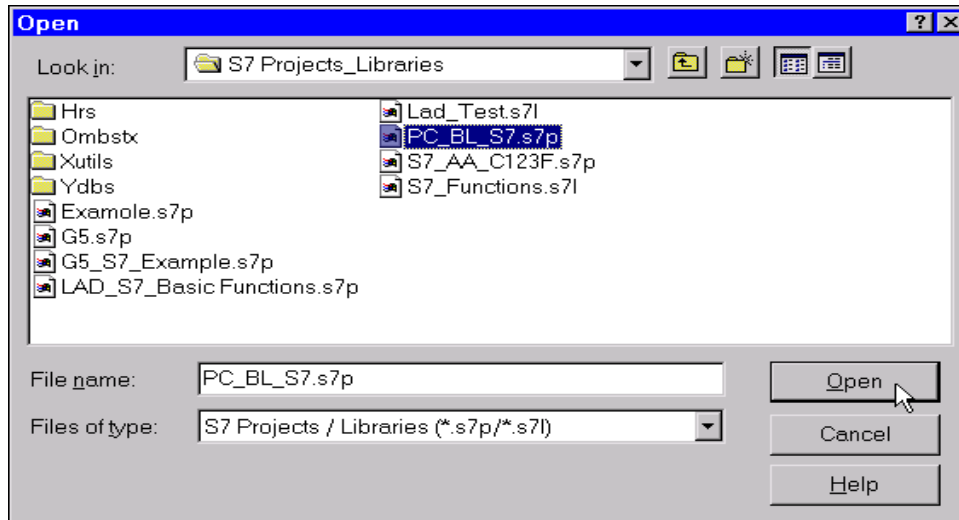


Figure 3-18 **Open** dialog box to select a S7 Project (*.s7p) to import

Files of type

The file name extension is defined by the **Files of type** text box. To import a S7 project select S7 Projects / Libraries (*.s7p / *.s7l) from the **Files of type** pull down text box. A S7 project is made out of the actual project file and a number of folders associated to the project. All these folders must be present to allow *S7 for Windows* to import the project.

◆ Click the command button **Open** from the dialog box.

◆ Press **ALT+ O**.

The Project Selection dialog box opens.

Note:

A S7 project may contain several PLC programs for different CPU's and / or PLC's. *S7 for Windows* projects are always made out of a single PLC program with the associated hardware configuration.

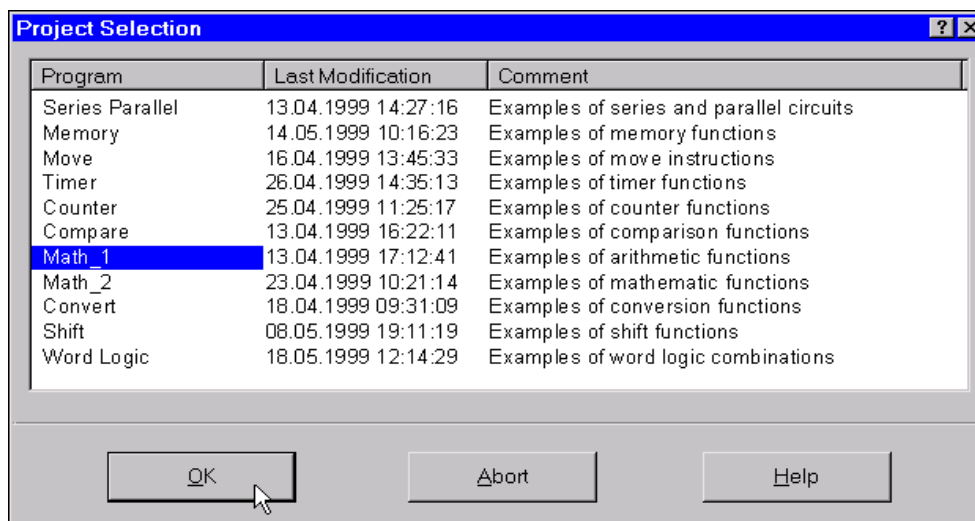


Figure 3-19 **Project Selection** dialog box

The **Project Selection** dialog box lists the PLC programs (objects) stored in a project container. *S5 / S7 for Windows* will generate out of each object a separate project containing a single PLC program.

Mark the program you would like to open and click the command button **OK**. The dialog box **Block Select** opens.

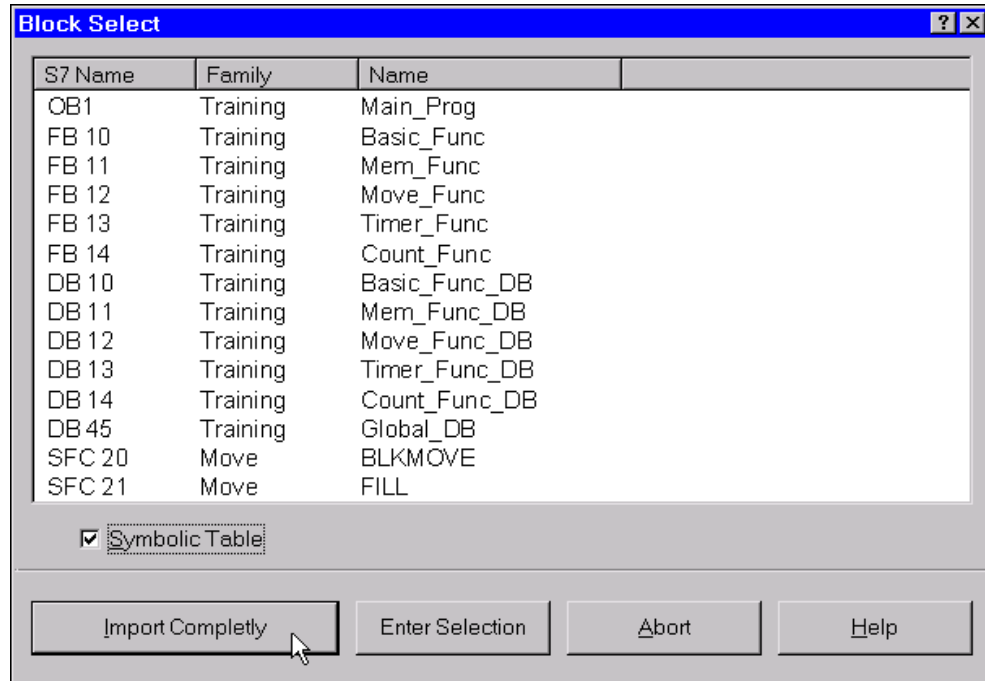


Figure 3-20 **Block Select** dialog box

Clicking the command button **Import Completely** will transfer all the PLC Blocks listed in the **Block Select** dialog box into the **PC Block List**. These Blocks are added to the Blocks already present in the **PC Block List**. A dialog box is opened in case a Block with the same name already exists in the **PC Block List**.

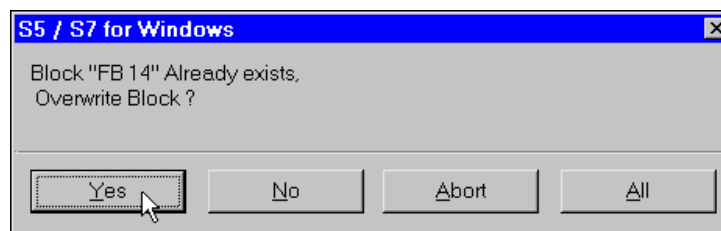


Figure 3-21 Block overwrite warning

Click the corresponding command button to overwrite one or all Blocks. You may also keep the existing Block (click command button **No**) or terminate (click command button **Abort**) the import procedure.

You may import a selection of Blocks into the **PC Block List**. To do so mark one or several Blocks at the **Block Select** dialog box. Clicking the **Enter Selection** command button will transfer the selected Blocks into the **PC Block List**. These Blocks are added to the Blocks already present in the **PC Block List**. A dialog box (see figure 3-21) is opened in case a Block with the same name already exists in the **PC Block List**.



In addition you may import the **Symbolic Table** with selected Blocks or just by itself into *S7 for Windows*. If the check box **Symbolic Table** is marked the **Symbolic Table** is transferred into *S7 for Windows* whenever the **Enter Selection** command button is clicked.



Import Objects out of a S7 Library

If a library is archived using the Siemens STEP® 7 PLC programming software all objects (files and folders) belonging to a library are packed into one file (*.arj). When unpacking the archive file, the objects (files and folders) must be put into its original order on a hard disk. Single objects from a S7 library may be added to a *S7 for Windows* project.

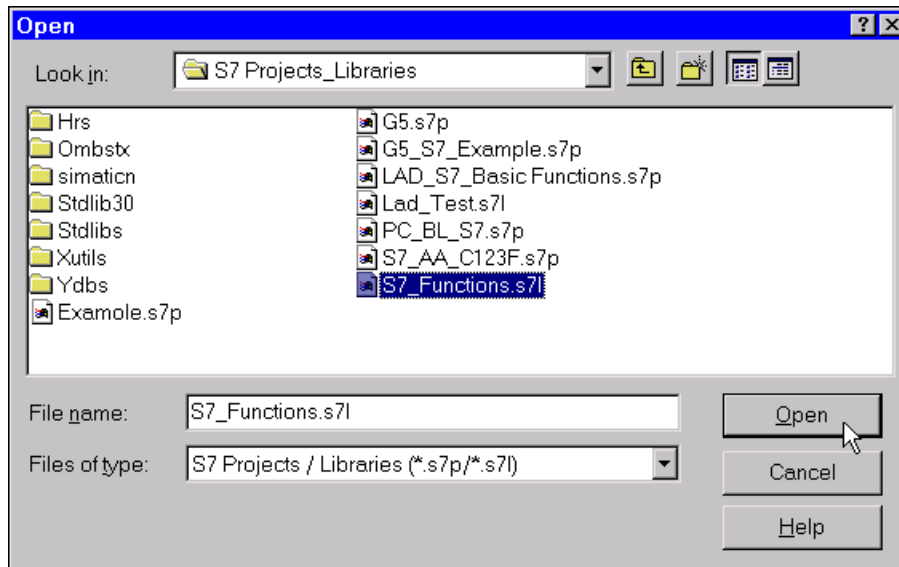


Figure 3-22 **Open** dialog box to select a S7 Library (*.s7p) to import objects from

Files of type

The file name extension is defined by the **Files of type** text box. To import an object from a S7 library select S7 Projects / Libraries (*.s7p / *.s7l) from the **Files of type** pull down text box. A S7 library If is made out of the actual library file and a number of folders associated to the library. All these folders must be present to allow *S7 for Windows* to import from the p library.

◆ Click the command button **Open** from the dialog box.

◆ Press **ALT+ O**.

The **Library Selection** (Project Selection) dialog box opens.

Note:

A S7 library may contain several objects (PLC blocks, PLC projects etc.). *S7 for Windows* understands S7 projects and handles S7 libraries in the same matter.

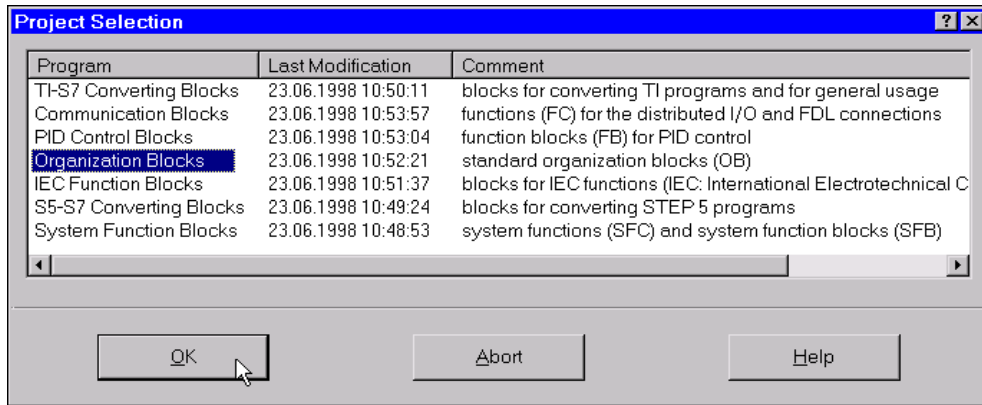


Figure 3-23 **Library Selection** (Project Selection) dialog box

The **Library Selection** dialog box lists the objects stored in a library container. *S5 / S7 for Windows* has the capability to import single or multiple items out of each object.

Mark the object you would like to open and click the command button **OK**. The dialog box **Block Select** opens.

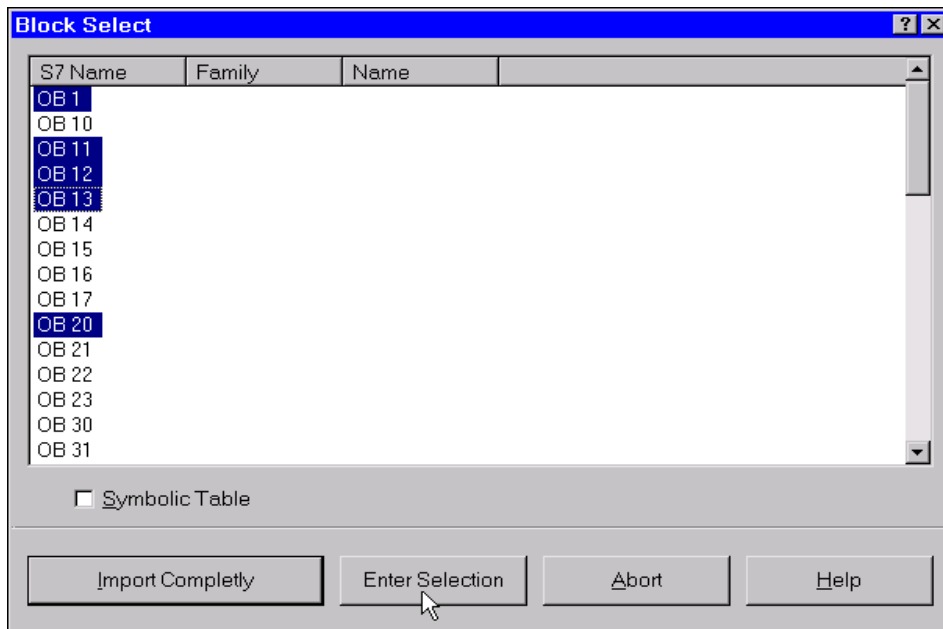


Figure 3-24 **Block Select** dialog box

Clicking the command button **Import Completely** will transfer all the PLC Blocks listed in the **Block Select** dialog box into the **PC Block List**. These Blocks are added to the Blocks already present in the **PC Block List**. A dialog box is opened in case a Block with the same name already exists in the **PC Block List**.

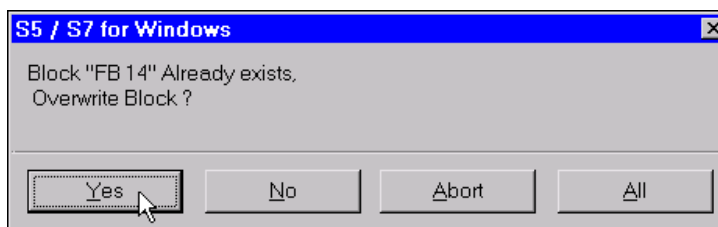


Figure 3-25 **Block overwrite warning**

Click the corresponding command button to overwrite one or all Blocks. You may also keep the existing Block (click command button **No**) or terminate (click command button **Abort**) the import procedure.

You may import a selection of Blocks into the **PC Block List**. To do so mark one or several Blocks at the **Block Select** dialog box. Clicking the **Enter Selection** command button will transfer the selected Blocks into the PC Block list. These Blocks are added to the Blocks already present in the **PC Block List**. A dialog box (see figure 3-21) is opened in case a Block with the same name already exists in the **PC Block List**.



In addition you may import the **Symbolic Table** with selected Blocks or just by itself into *S7 for Windows*. If the check box **Symbolic Table** is marked the **Symbolic Table** is transferred into *S7 for Windows* whenever the **Enter Selection** command button is clicked.



3.2.7 Export (Export a PLC Program)

S5 / S7 for Windows has an integrated Export filter. The filter converts *S5 / S7 for Windows* project files into the file format the Siemens programming units (PU) can read (import).

◆ Click **FILE, EXPORT**.

◆ Press **ALT + F, X**.

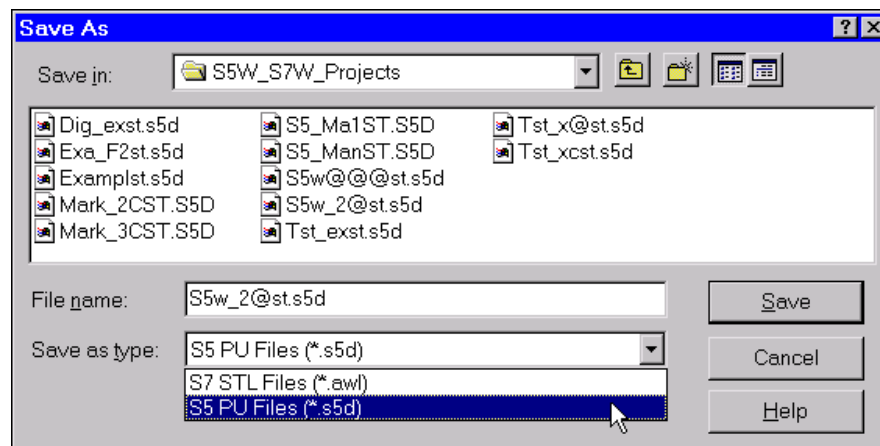


Figure 3-26 Export a PLC Project (Save As dialog box)

During the conversion the comments and symbolic names are also transferred. Due to the not always downward compatibility of the Siemens programming units (PU) some restrictions apply. *S5 / S7 for Windows* allows to preset the length of the comments so they are not truncated when exported to an specific PU software version.

3.2.7.1 Export *S5 for Windows* → S5 PU Files (*.s5d)

The export filter converts *S5 for Windows* PLC projects in the Siemens Programming Unit (PU) format **.S5D**.

The file to be exported should have a file name following the Siemens programming unit (PU) name format. A name has up to six (6) freely selected characters plus the characters **ST**. The characters **.S5D** are used as the file name extension.

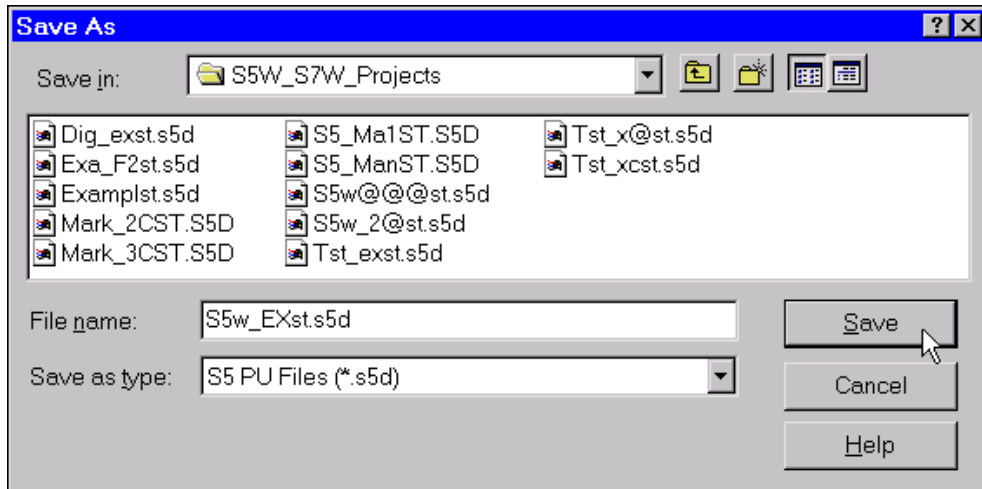


Figure 3-27 Export a *S5 for Windows* PLC Project (Save As dialog box)

The symbolic table relating to the PLC program is also stored on disk during the export process. The symbolic table file gets the same file name as the program file (the first six characters) followed by **Z0** and the file name extension **.SEQ**. The file format of the symbolic table are for *S5 for Windows* and the Siemens programming unit (PU) identical.

If you select a filename with less than six (6) characters, the missing characters must be replaced with **@**.

Example: **TEST@@ST.S5D**

File Name

You may enter the name of the file to be exported in the file name text field. You may also select a file from the file name list by marking the file name.

The file name may have up to six (6) freely selected characters plus the characters **ST**. The characters **.S5D** are used as the file name extension. The file name extension is defined by the file type field. Siemens programming unit (PU) files have the file extension **.s5d**

Do not enter the file name extension while entering the file name. The file name extension is inserted automatically when exporting the file.

An existing symbolic table is also saved under the same file name with the file name extension **.seq**. The file format of the symbolic table are for *S5 for Windows* and the Siemens programming unit (PU) files identical.

3.2.7.2 Export *S7 for Windows* → S7 PU Files (*.awl)

The export filter converts *S7 for Windows* PLC projects into an ASCII text format (Block Statement List – STL). This file format defined in compliances with IEC 1131 is also supported by the Siemens programming units (PU) for the S7-300/400 PLC series. The ASCII files to exchange S7 PLC programs must have the file extension ***.awl**. The Siemens PU software (starting with version 3) can insert the ASCII text in an already opened project.

The symbolic table relating to the PLC program is also stored on disk during the export process. The format stays the same (ASCII text). The symbolic table file gets the same file name as the program file and the file name extension ***.seq**. The file format of the symbolic table of *S7 for Windows* can be imported by the Siemens programming unit (PU).

To open a project generated with the *S7 for Windows* programming system with the Siemens programming units (PU) for the S7-300/400 PLC series, the program file (*.awl) must be inserted as an external source and the symbolic table file (*.seq) must be imported by the symbolic editor. This procedure has to be done into two steps (see appendix). This procedure even allows the PLC program exchange with PU software versions having a not downward compatible project file structure.

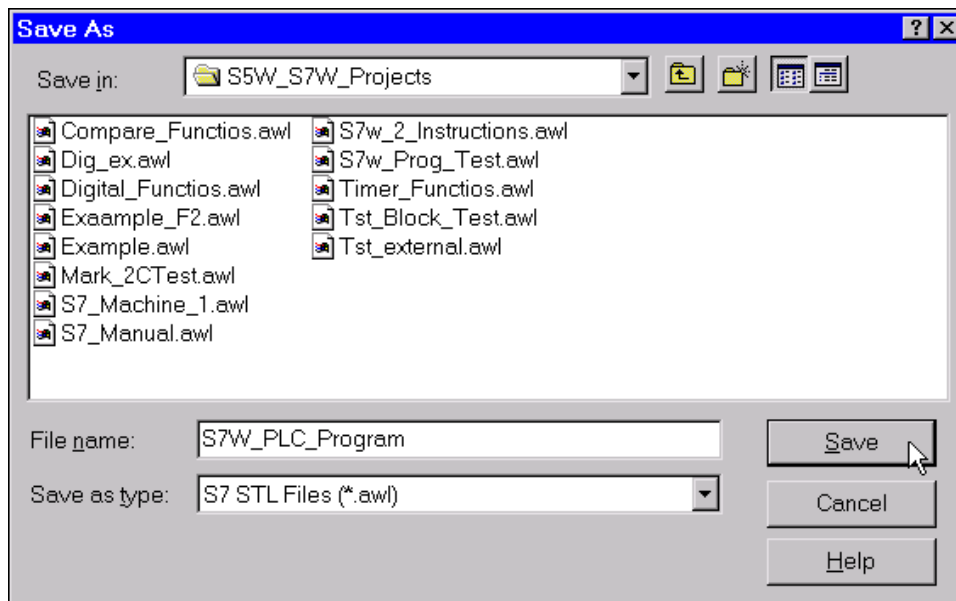


Figure 3-28 Export a *S7 for Windows* PLC Project (Save As dialog box)

File Name

You may enter the name of the file to be exported in the file name text field. You may also select a file from the file name list by marking the file name.

The file name may have up to seventy six (76) freely selected character. The characters **.awl** are used as the file name extension. The file name extension is defined by the file type field. Siemens S7-300/400 programming unit (PU) can open files with the extension **.awl**.

Do not enter the file name extension while entering the file name. The file name extension is inserted automatically when exporting the file.

Example: S7W_PLC_Program

An existing symbolic table is also saved under the same file name with the file name extension **.seq**. This file format of the symbolic table can be imported by the Siemens programming unit (PU) symbolic editor.

3.2.8 Program File

To manage the *S5 / S7 for Windows* PLC program files (*.s5) independently from a project commands in a separate menu are provided. The commands from this menu allow you to generate, modify, open, and save *S5 / S7 for Windows* PLC programs.

Note:

The commands from the menu **Program File** bypassing the *S5 / S7 for Windows* project management. Project depending settings (e.g. fonts, headers, footers, presentations, etc) are not saved due to the missing **Project-File**.

Only when you have a special reason you should use the commands from the **Program File** menu. We recommend that you always use the *S5 / S7 for Windows* **Project Management**.

◆ Click **File, Program File**

◆ Press **ALT + F, F**

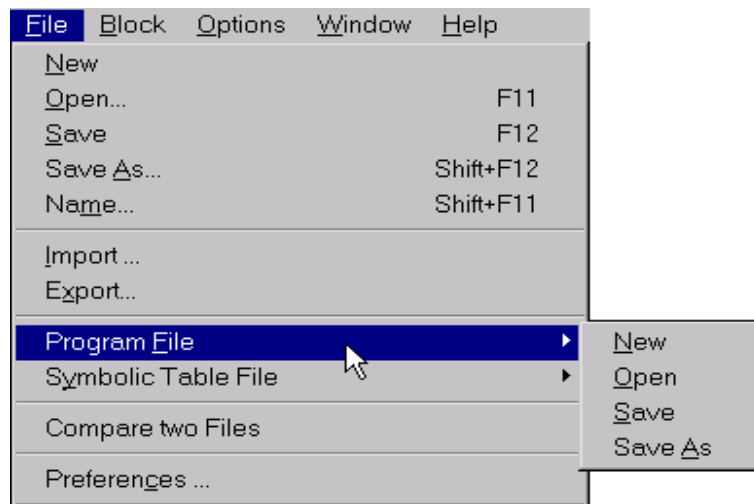


Figure 3-29 **Program File** menu

3.2.8.1 New (New Program File)

The **New** command clears the workplace. If a modified file has been in the workplace, *S5 / S7 for Windows* prompts you to save the file. *S5 / S7 for Windows* is ready to create a new PLC program.

◆ Click **New** in the **Program File** menu.

◆ Press **ALT + F, F, N**.

3.2.8.2 Open (Open Program File)

The dialog box **Open** gives you the possibility to select a PLC program file out of a list for opening. With this command you may only open files in the *S5 / S7 for Windows* program file format (*.s5). The corresponding symbolic file is opened automatically.

◆ Click **Open** in the **Program File** menu.

◆ Press **ALT + F, F, O**.

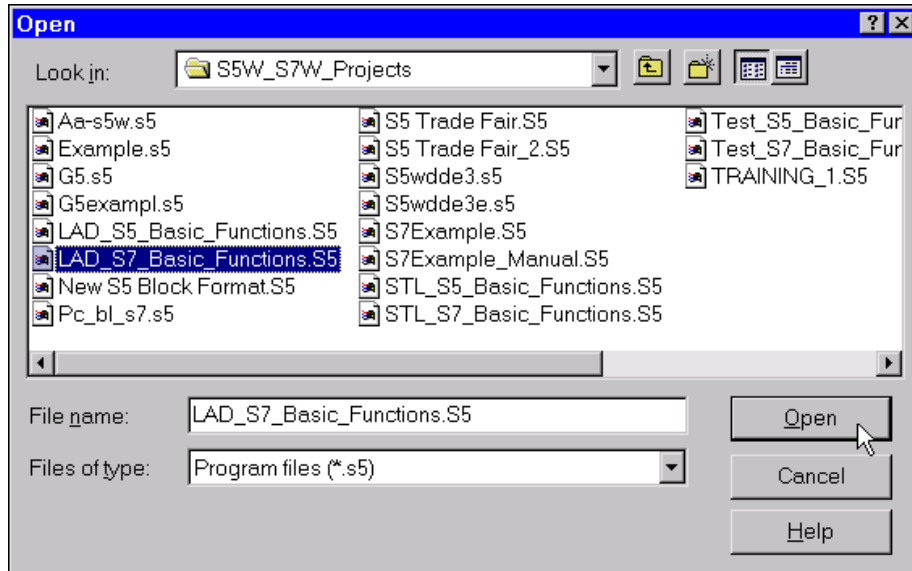


Figure 3-30 **Open Program File** (Open dialog box)

File name

You may enter the name of the program file to be opened in the file name text field. You may also select a file from the file name list by marking the file name. *S5 / S7 for Windows* supports long file names with up to eighty (80) characters including the file name extension.

Files of type

The file name extension is defined by the file type field. *S5 / S7 for Windows* program files have the file extension **.s5**. *S5 / S7 for Windows* does not have different file extension names for a S5 program file or a S7 program file.

3.2.8.3 Save (Save Program File)

The *S5 / S7 for Windows* program from your PC workplace is saved on disk under its current file name.

The program file is saved with the file name extension **.s5**. An existing symbolic table is also saved under its file name with the file name extension **.seq**.

◆ Click **Save** in the **Program File** menu.

◆ Press **ALT + F, F, S**.

The program and its corresponding symbolic table are saved.

3.2.8.4 Save As (Save Program File As)

The *S5 / S7 for Windows* program from your PC workplace is saved on disk. . You have to select the file name.

The program file is saved with the file name extension **.s5**. An existing symbolic table is also saved under the same file name with the file name extension **.seq**. *S5 / S7 for Windows* supports long file names with up to eighty (80) characters including the file name extension. The following characters are not permitted in a file name: / \ : * ? " > < |

◆ Click **Save As** in the Program File menu.

◆ Press **ALT + F, F, A**.

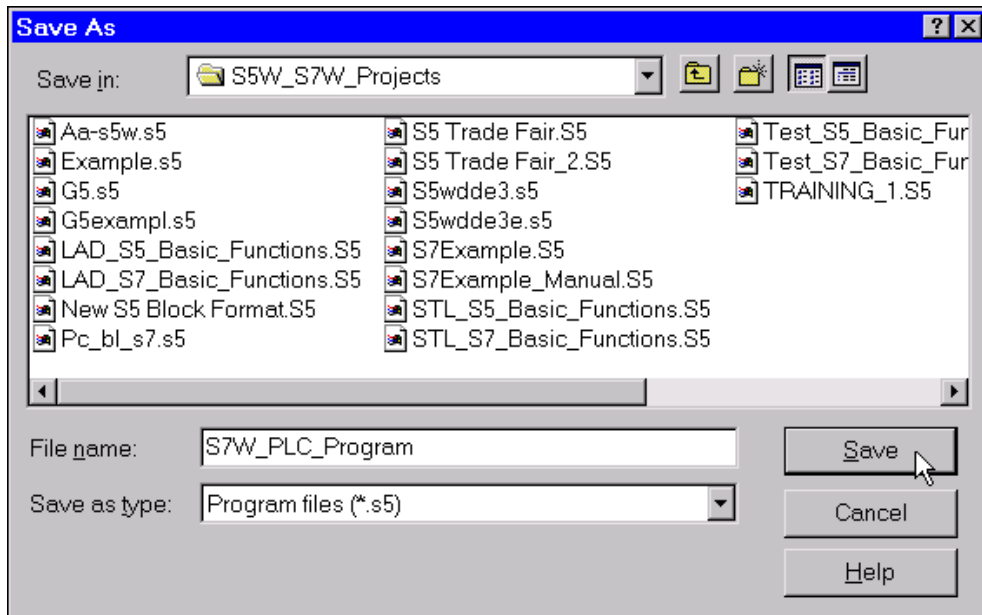


Figure 3-31 Save program file as (**Save As** dialog box)

File Name

You may enter the name of the program file to be saved in the file name text field. You may also select a file from the file name list by marking the file name. This will overwrite the selected file.

The file to overwrite and its path is displayed in the title bar of the dialog box.

You do not have to enter the file name extension while entering the file name. The file name extension is inserted automatically when saving the file.

Save as type

The file name extension is defined by the file type field. *S5 / S7 for Windows* program files have the file extension **.s5**.

◆ Activating the **Save** button will start the saving process. The project file is saved immediately. An existing symbolic table is also saved under its file name with the file name extension **.seq**.

The saving process is displayed in the Status Bar.

3.2.9 Symbolic Table File

An additional menu to manage the symbolic table files are available. These commands allow you to create, modify, open, and save symbolic tables separately from PLC project or program files.

S5 for Windows uses the same file format than Siemens S5 programming units (PG). If you maintain the Siemens PU file names format you can work on these files without conversion. A Siemens PU symbolic table file has six (6) freely selected characters plus the characters **Z0** as a file name. The characters **.SEQ** are used as the file name extension.

S7 for Windows uses the same file format and the same file extension name (***.seq**) than *S5 for Windows* to save the symbolic table. This file format of the symbolic table can be imported by the Siemens S7-300/400 programming unit (PU) symbolic editor.

S5 / S7 for Windows supports long file names with up to eighty (80) characters including the file name extension. The following characters are not permitted in a file name: / \ : * ? " ' > < |

◆ Click **Symbolic Table** in the Symbolic Table File menu.

◆ Press **ALT + F, Y**.

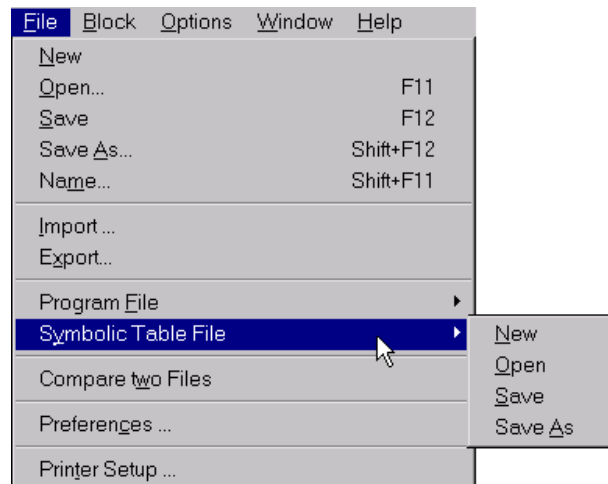


Figure 3-32 Symbolic Table File menu

3.2.9.1 New (New Symbolic Table File)

The **New** command clears the workplace. If a modified file has been in the workplace, *S5 / S7 for Windows* prompts you to save the file. *S5 / S7 for Windows* is ready to create a new symbolic table.

◆ Click **New** in the Symbolic Table File menu.

◆ Press **ALT + F, Y, N**.

3.2.9.2 Open (Open Symbolic Table File)

The command **Open** from the Symbolic Table File menu gives you the possibility to select a symbolic table file out of a list for opening. With this command you may only open files in the *S5 / S7 for Windows* symbolic table file format (*.seq).

◆ Click **Open** in the **Symbolic Table File** menu.

◆ Press **ALT + F, Y, O**.

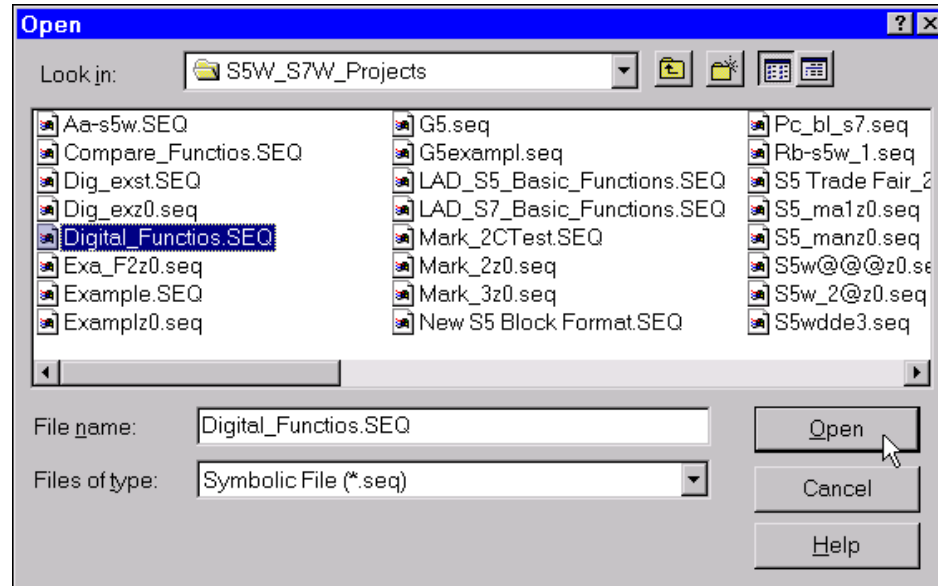


Figure 3-33 Open Symbolic Table File (**Open** dialog box)

File name

You may enter the name of the symbolic table file to be opened in the file name text field. You may also select a file from the file name list by marking the file name. *S5 / S7 for Windows* supports long file names with up to eighty (80) characters including the file name extension.

Files of type

The file name extension is defined by the file type field. *S5 / S7 for Windows* symbolic table files have the file extension **.seq**. *S5 / S7 for Windows* does not have different file extension names for a S5 symbolic table file or a S7 symbolic table file.

3.2.9.3 Save (Save Symbolic Table File)

The *S5 / S7 for Windows* symbolic table from your PC workplace is saved on disk under its current file names with the file name extension **.seq**.

◆ Click **Save** in the **Symbolic Table File** menu.

◆ Press **ALT + F, Y, S**.

The symbolic table is saved.

3.2.9.4 Save As (Save Symbolic Table File As)

The *S5 / S7 for Windows* symbolic table from your PC workplace is saved on disk. . You have to select the file name.

The symbolic table file is saved with the file name extension **.seq**.

S5 / S7 for Windows supports long file names with up to eighty (80) characters including the file name extension. The following characters are not permitted in a file name: / \ : * ? " ' > < |

◆ Click **Save As** in the Symbolic Table File menu.

◆ Press **ALT + F, Y, A**.

The **Save As** dialog box opens.

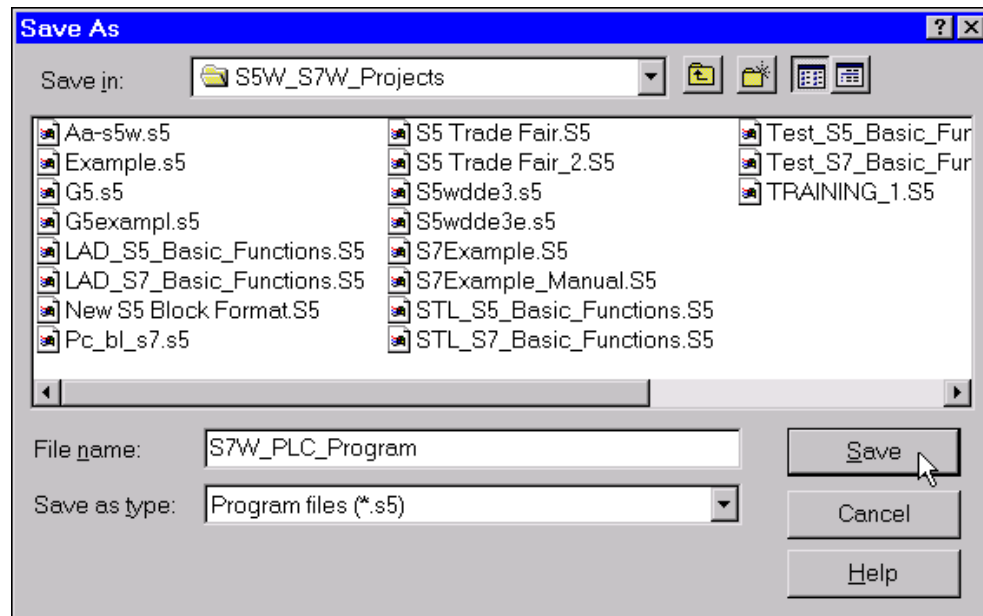


Figure 3-34 Save symbolic table file as (**Save As** dialog box)

File Name

You may enter the name of symbolic table file to be saved in the file name text field. You may also select a file from the file name list by marking the file name. This will overwrite the selected file.

The file to overwrite and its path is displayed in the title bar of the dialog box. You do not have to enter the file name extension while entering the file name. The file name extension is inserted automatically when saving the file.

Save as type

The file name extension is defined by the file type field. *S5 / S7 for Windows* symbolic table files have the file extension **.s5**.

- ◆ Activating the **Save** button will start the saving process. The symbolic table file is saved immediately. The saving process is displayed in the Status Bar.

Note:

The saving process does not generate or modify any **Project File**.

3.2.10 Compare two Files

As an additional option *S5 / S7 for Windows* offers powerful software package *BlockDiff* to compare PLC Blocks and PLC Programs. The use of the *BlockDiff* software option is described in the manual belonging to the *BlockDiff* option.

3.2.11 Preferences

The command **Preferences** opens the dialog box **Preferences**. The dialog box is designed as a card file with tabs to separate the different subjects. Each dialog box card offers buttons and command fields to setup the appearance of *S5 / S7 for Windows* and the communication with a PLC connected via a serial link.

◆ Click **Preferences** in the File menu.

◆ Press **ALT + F, C**.

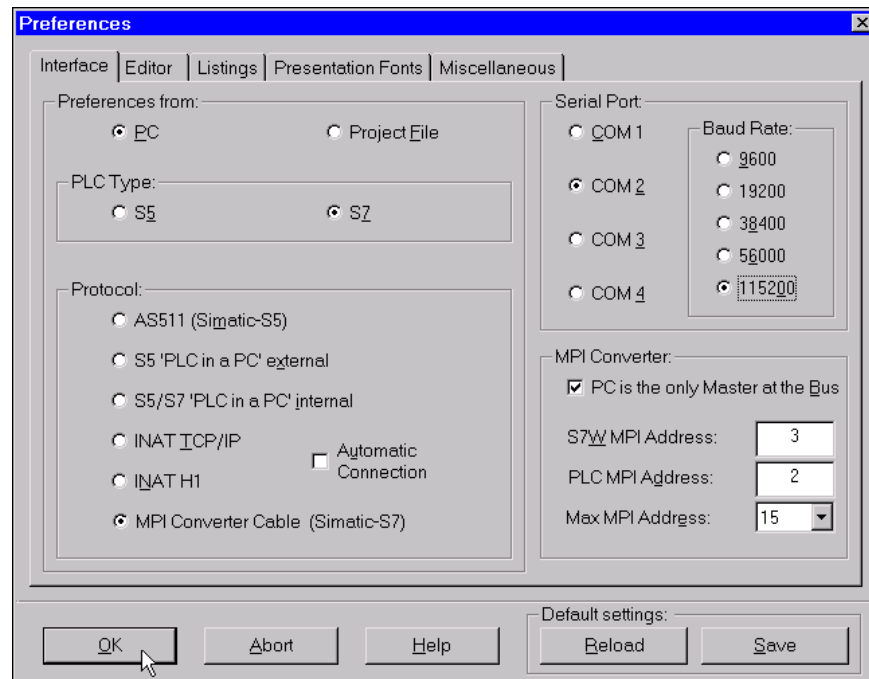


Figure 3-35 Preferences dialog box

The settings from the preferences dialog box related to a project are saved in the project file **[project name].s5p**.

You can select where you want to save the settings related to the hardware of your PC (Interface tab). The settings may be saved globally in the **s5wg.ini** file located in the windows folder. It is also possible to save these settings in the project file.

The **s5wg.ini** file is created when you first open *S5 / S7 for Windows* and is updated whenever you change the settings at the Interface Tab and you selected to save these settings in the PC.

Whenever *S5 / S7 for Windows* is started the settings from the project file are used to set the preferences for this project. Only if *S5 / S7 for Windows* cannot find hardware related settings it will get this data out of the **s5wg.ini** file.

The following buttons are assigned to all the cards of the preferences dialog box.

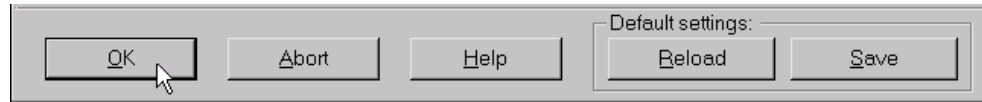
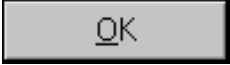






Figure 3-36 Preferences dialog box general buttons

	When clicking the button OK the current setting of the preferences dialog box is saved. Depending on the type of preferences the settings are saved in the project file (*.s5p) or the s5wg.ini file and the dialog box is closed.
	When clicking the button Abort all the not saved settings are canceled and the dialog box is closed.
	The integrated Help with the topics about the preference settings is opened.
	Clicking the Reload button will load the last saved default settings into the preference dialog box. The current changes are canceled.
	Clicking the Save button will save the current settings to be the new preference dialog box default settings.

3.2.11.1 Interface (Preference Dialog Box)

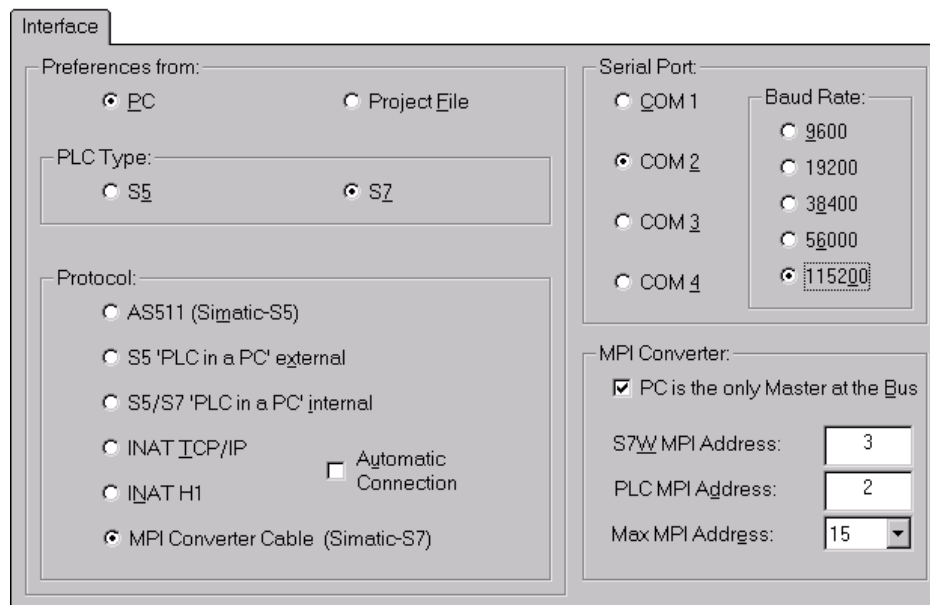


Figure 3-37 Interface settings (Preference dialog box)

To increase the readability of the settings the card is separated into fields.

The settings from the fields **Serial Port** and **MPI Converter** are saved in the **S5 / S7 for Windows** initialization file **S5WG.INI**.

The location (file) the settings from the field **Preferences from** are saved in depends on your selection. If **PC** is marked the settings are saved in the *S5 / S7 for Windows* initialization file **S5WG.INI**. If **Project File** is marked the settings are saved in the project file **[project name].s5p**.

- **Preferences from:**

Preferences from:

PC Project File

PC

The settings from the fields **PLC Type** and **Protocol** are saved in the *S5 / S7 for Windows* initialization file **S5WG.INI**.

Project File

The settings from the fields **PLC Type** and **Protocol** are saved in the project file **[project name].s5p**. The default setting is **Project File** marked.

- **PLC Type:**

PLC Type:

S5 S7

S5

If **S5** is marked all the settings of the dialog box card Interface refer to the communication with a PLC executing a PLC program using the Step® 5 instruction set. The actual PLC to communicate with and/or the communication link are selected with the settings from the **Protocol** field. You can only select **S5** if the *S5 for Windows* software package is installed on your PC.

S7

If **S7** is marked all the settings of the dialog box card Interface refer to the communication with a PLC executing a PLC program using the Step® 7 instruction set. The actual PLC to communicate with and/or the communication link are selected with the settings from the **Protocol** field. You can only select **S7** if the *S7 for Windows* software package is installed on your PC.

- **Protocol:**

Protocol:

AS511 (Simatic-S5)

S5 'PLC in a PC' external

S5/S7 'PLC in a PC' internal

INAT ICP/IP

INATH1

MPI Converter Cable (Simatic-S7)

Automatic Connection

S5 / S7 for Windows only allows you to select the protocol the PLC type you selected can handle.

AS511 (Simatic-S5)

If a Simatic S5 PLC is connected to one of the serial ports (COM 1 – COM 4) of your PC via a 20mA current loop converter you must select the **AS511 (Simatic-S5)** protocol for the communication. The Simatic S5 can only handle a Baud Rate of 9600 Baud. *S5 / S7 for Windows* allows you to select higher baud rates for the communication with compatible PLC's. You can only select the **AS511 (Simatic-S5)** protocol if the *S5 for Windows* software package is installed on your PC.

S5 'PLC in a PC' external

If the PC running *S5 / S7 for Windows* is connected via a serial port (COM 1 – COM 4) to an other PC executing the software PLC **PLC in a PC** (PLC S5-943, PLC S5-945) you have to select **S5 'PLC in a PC' external** to be the communication protocol. Baud Rates up to 38,400 baud are possible. A **Null Modem** cable is used to connect the external PLC with the PC executing *S5 / S7 for Windows*.

You also have to select the **S5 'PLC in a PC' external** to be the communication protocol if you connect the **LAN-PLC** (PLC S5-943, PLC S5-945) via a serial port with the PC running *S5 / S7 for Windows*.

Note:

It is also possible to run the **S5 Extended Simulation PLC** on an external PC. If you want to communicate with the external **S5 Extended Simulation PLC** you must select **S5 'PLC in a PC' external** to be the communication protocol. Baud Rates up to 38,400 baud are possible.

S5 / S7 'PLC in a PC' internal

If the PC running *S5 / S7 for Windows* is also the host of the software PLC **PLC in a PC** (PLC S5-943, PLC S5-945, PLC S7-315, PLC S7-416) you have to select **S5 / S7 'PLC in a PC' internal** for the communication.

Note:

It is also possible to run the **S5 Extended Simulation PLC** or the **S7 Simulation PLC** on the same PC than *S5 / S7 for Windows*. If you want to communicate with one of these **Simulation PLC's** you must also select **S5 / S7 'PLC in a PC' internal** to be the communication protocol.

INAT TCP/IP

S5 / S7 for Windows opens up the possibility to communicate with an external PLC (software PLC or hardware PLC) via the TCP/IP (Internet, Intranet) protocol. The PC running *S5 / S7 for Windows* must have an Ethernet network capable to handle the TCP/IP protocol. If one of the following PLC's is connected to your PC, running *S5 / S7 for Windows*, via an Ethernet connection you have to select **INAT TCP/IP** to be the communication protocol:

- *PLC in a PC* (PLC S5-943, PLC S5-945) (direct, via Ethernet controller at the external PC)
- *LAN-PLC* (PLC S5-943, PLC S5-945) (direct)
- Siemens S5 (via INAT TCP/IP - H1 module)

The actual communication is started (selecting the IP address) with the settings from the dialog box opened with the command **Building an TCP/IP connection** from the Options menu (see chapter 3.4.4). It is also possible to build the connection automatically. To do so the button **Automatic Connection** must be marked.

INAT H1

With *S5 / S7 for Windows* and an optional H1 software driver it is possible to communicate with an external PLC (software PLC or hardware PLC) via the Siemens H1 (Industrial Ethernet) protocol. The PC running *S5 / S7 for Windows* must have the Ethernet network capability and the additional H1 driver installed. If one of the following PLC's is connected to your PC, running *S5 / S7 for Windows*, via an H1 (Industrial Ethernet) connection you have to select **INAT H1** to be the communication protocol:

- *PLC in a PC* (PLC S5-943, PLC S5-945) (direct, via Ethernet controller and the H1 driver installed at the external PC)
- *LAN-PLC* (PLC S5-943, PLC S5-945) (direct)
- Siemens S5 (via INAT TCP/IP - H1 module)

The actual communication is started with the settings from the dialog box opened with the command **Building an H1 connection** from the Options menu (see chapter 3.4.3). It is also possible to build the connection automatically. To do so the button **Automatic Connection** must be marked.

Automatic Connection

If **INAT TCP/IP** or **INAT H1** you may select **Automatic Connection**. With this button marked, the TCP/IP or H1 connection is automatically established whenever you open a project.

MPI Converter Cable (Simatic S7)

The button **MPI Converter Cable (Simatic S7)** has to be marked if one of the following PLC's is connected to your PC:

- *PLC in a PC* (PLC S7-315, PLC S7-416) direct via Null Modem cable
- *LAN-PLC* (PLC S7-315, PLC S7-416) direct via Null Modem cable
- Siemens S7-300/400 via MPI Converter cable

Depending on the MPI Converter cable Baud Rates up to 115,200 baud are possible. Also with the Null Modem cable up to 115,200 baud are possible.

● Serial Port:

The image shows a dialog box with two main sections: 'Serial Port' and 'Baud Rate'. Under 'Serial Port', there are four radio buttons labeled COM 1, COM 2, COM 3, and COM 4. The COM 2 radio button is selected. Under 'Baud Rate', there are five radio buttons labeled 9600, 19200, 38400, 56000, and 115200. The 115200 radio button is selected and has a dashed border around it.

The Serial Ports have two settings. First the Port itself is selected and secondly the data exchange rate has to be set.

COM 1 ... COM 4

S5 / S7 for Windows supports the serial communication ports COM 1 up to COM 4. Select the port the external PLC is connected to.

Baud Rate

S5 / S7 for Windows supports the Baud rates between 9,600 baud up to 115,200 baud for the serial communication. Make sure that the selected baud rate does not exceed the maximum baud rate the external PLC can handle for communication. The MPI Converter may limit the maximum baud rate.

- **MPI Converter:**

If the PC running *S5 / S7 for Windows* is connected to a S7-300/400 MPI Bus additional settings are required. The same settings apply if a *PLC in the PC* or a LAN-PLC is

PC is the only Master at the Bus

The MPI Bus must know if more than one programming device is connected to the bus. If the PC running *S5 / S7 for Windows* is directly connected to a S7-300/400 PLC or the PC is the only programming device connected to the MPI Bus, this button should be marked. The default setting is **PC is the only Master at the Bus** marked.

S7W MPI Address

The MPI Bus must know if more than one programming device is connected to the bus. If the PC running *S5 / S7 for Windows* is directly connected to a S7-300/400 PLC or the PC is the only programming device connected to the MPI Bus, this button should be marked. The default address of a Programming Unit (PU) is three (3). *S5 / S7 for Windows* running on a PC sets its own MPI address by default to 3.

PLC MPI Address

You can select the MPI Address of the S7-300/400 PLC the PC running *S5 / S7 for Windows* wants to communicate with. By default the S7-300/400 PLC's are set to the MPI address 2. *S5 / S7 for Windows* running on a PC selects the MPI address 2 by default to.

Note:

The command **S7 CPU Selection** from the **Options** menu opens a dialog box to display all the devices with their MPI address connected to the bus. You may also select a device (CPU) to communicate with from the dialog box.

Max. MPI Address

Not all the devices from the S7-300/400 PLC series have the same maximum MPI address they can be set to. It is very important to limit the maximum MPI address of all devices being connected to the bus to the same value. All devices of the S7-300/400 PLC series allow the setting of 15 to be the maximum MPI address. The default setting of the maximum MPI address of *S5 / S7 for Windows* is 15.

Note:

Make sure that all devices connected to one MPI Bus having the same **Max. MPI Address** setting. If devices with different **Max. MPI Address** setting are connected on one bus, the devices are not recognized and communication can not take place.

3.2.11.2 Editor (Preference Dialog Box)

Figure 3-38 Editor settings (Preference dialog box)

All the settings from the Editor setting card are saved in the project file [**project name**].s5p. The settings are not only used to organize the layout and the presentation of the editor workplace they also are used to define the status workplace and the detail window during the step sequence programming (G5 option). To increase the readability of the settings the card is separated into fields.

- **Operands:**

The operands may be displayed on the CRT in the symbolic or the absolute form. Selecting the appearance of the operands in the printed documentation see chapter 3.2.13.2.

Symbolic

If the **Symbolic** button is marked all the operands in the PLC Blocks, Segments, Steps, Transitions, etc. are displayed in their symbolic form. To display an operand in its symbolic form, the symbol must be defined in the symbolic table.

S5 for Windows:

A symbolic operand may have up to twenty-four (24) characters. *S5 for Windows* can display up to 24 characters (without a hyphen) in all presentations. The column width to display the entire symbolic operand is adjustable. The Siemens PU can handle up to 24 characters. In CSF and LAD only the first eight (8) characters are displayed.

Example:	Symbolic Operands	Form to enter	Displayed Symbol
		-INPUT-Byte-1	INPUT-Byte-1
		-OUTPUT-2	OUTPUT-2
		-Flag-Word	Flag-Word

Note:

When entering a symbolic operand into a segment a leading hyphen must be entered to identify the input to be a symbolic operand. In the symbolic table the symbolic operands are entered without a leading hyphen.

S7 for Windows:

A symbolic operand may have up to twenty-four (24) characters.

Example:	Symbolic Operands	Form to enter	Displayed Symbol
		INPUT-Byte-1	#INPUT-Byte-1
		OUTPUT-2	"OUTPUT-2"
		Flag-Word	"Flag-Word"

Symbols defined in the symbolic table are shown in quotation marks "..." if used in the Statement List (STL), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

Symbols defined in the variable declaration are shown with the "#" character in front of name if used in the Statement List (STL), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

Usually the quotation marks and the # character need to be entered if the symbol is entered into the logic (the symbol must be present in and clearly identifiable in the symbolic table or the variable declaration).

Absolute

If the **Absolute** button is marked all the operands in the PLC Blocks, Segments, Steps, Transitions, etc. are displayed in their absolute form.

S5 for Windows:

Absolute operands have an identifier, a byte or word number, and if addressing a bit, the bit number separated by a period. The numbering of bytes and words start with zero (0). The maximum number depends on the CPU. Bits are numbered from zero (0) to seven (7).

Example: Absolute Operands

I 5.3	Input Bit 3 in the Byte 5
Q 12.7	Output Bit 7 in the Byte 12
F 33.6	Flag Bit 6 in the Byte 33
IB 2	Input Byte 2
FB 5	Flag Byte 5
FW 18	Flag Word 18 (Byte 18 and 19)
FD 22	Flag Double-Word 22 (Byte 22, 23, 24, 25)

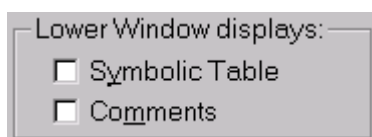
S7 for Windows:

Absolute operands have an address identifier, a byte or word number, and if addressing a bit, the bit number separated by a period. The address numbering of bytes and words start with zero (0). The maximum address depends on the CPU. Bits are numbered from zero (0) to seven (7).

Example: Absolute Operands

I 5.3	Input Bit 3 in the Byte 5
Q 12.7	Output Bit 7 in the Byte 12
M 33.6	Memory Bit 6 in the Byte 33
IB 2	Input Byte 2
QB 19	Output Byte 19
MB 5	Memory Byte 5
IW 14	Input Word 14 (Byte 14 and 15)
QW 21	Output Word 21 (Byte 21 and 22)
MW 18	Memory Word 18 (Byte 18 and 19)
ID 7	Input Double-Word 7 (Byte 7, 8, 9, 10)
QD 3	Output Double-Word 3 (Byte 3, 4, 5, 6)
MD 8	Memory Double-Word 8 (Byte 8, 9, 10, 11)

- **Display:**



An additional window may be opened in the editor and status window to display the symbolic table or the extended segment comment.

Symbolic Table

In the workplace of the block editors and the status displays, the **Symbolic Table** may be displayed simultaneously with the selected Segment (Network) or Block (STL, CSF, LAD, Block-STL or step sequence presentation). The symbolic table may be edited while the block editor is active. A marked operand in the segment (Block) display is also highlighted in the symbolic table.

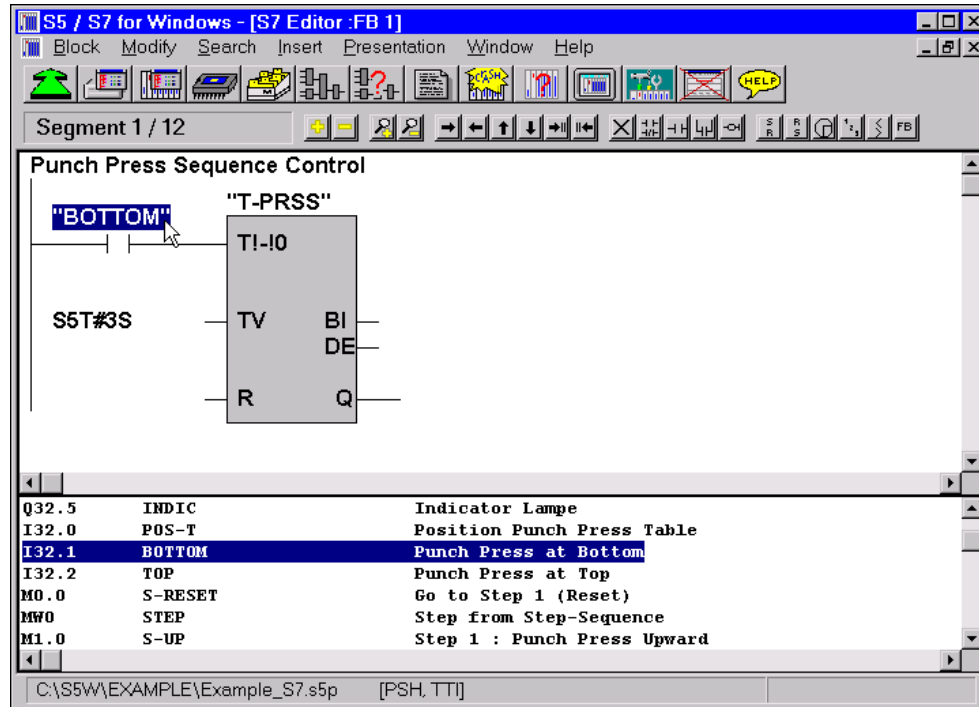


Figure 3-39 Simultaneous Symbolic Table displayed

Comments

If the button **Comments** is marked, the Extended Segment Comment will be displayed in a separate window below the segment logic. The comment display window has all the functions of a standard text editor. The windows clipboard is fully supported. You may use the cut, copy, and paste commands to exchange text within the *S5 / S7 for Windows* or any other windows application.

Note:

S5 for Windows In the Block-STL presentation the extended segment comment is displayed in front of the segment in the editor workplace. The comment may be edited directly in the workplace.

S7 for Windows In the Block-STL (Source Text) presentation the extended comment is displayed to be line comments (starting with //) directly below the segment (Network) title. The comment may be edited directly in the workplace.

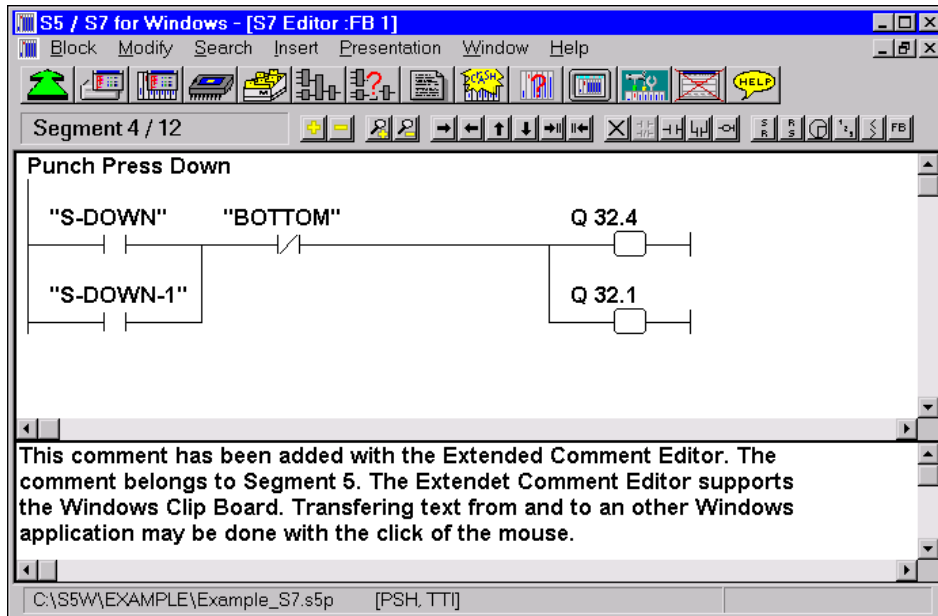
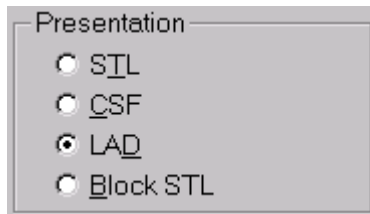


Figure 3-40 Simultaneous Extended Segment Comment displayed

- **Presentation:**



The default presentation of the PLC logic can be selected. Whenever an editor or status window is opened the PLC logic is displayed in the preset form. The presentation may be changed anytime directly out of the editor or status window.

STL Statement List

S5 for Windows In a **Statement List (STL)**, the control task is described with mnemonic abbreviations in the form of a list. The programming language is based on DIN 19239. When selected a newly opened editor or the status window displays the segment (step, transition, or SUL in the Detail Display) as a statement list.

```

;Example STL S5 for Windows
A[
O  -Upper_Limit      Axis Upper Limit
O  -Lower_Limit      Axis Lower Limit
]
AN -EM_Stop_NOT      Emergency Stop Signal
=  -Warning_1         Warning Light 1
=  -Warning_2         Warning Display Light
***

```

Figure 3-41 S5 for Windows Statement List (STL)

S7 for Windows In a **Statement List (STL)**, the control task is described with mnemonic abbreviations in the form of a list. The programming language is based on IEC 1131. When selected a newly opened editor or the status window displays the segment as a statement list.

```

//Example STL S7 for Windows
A[
O "Upper_Limit"      Axis Upper Limit
O "Lower_Limit"     Axis Lower Limit
]
AN "EM_Stop_NOT"    Emergency Stop Signal
= "Warning_1"       Warning Light 1
= "Warning_2"       Warning Display Light

```

Figure 3-42 S7 for Windows Statement List (STL)

CSF Control System Flowchart

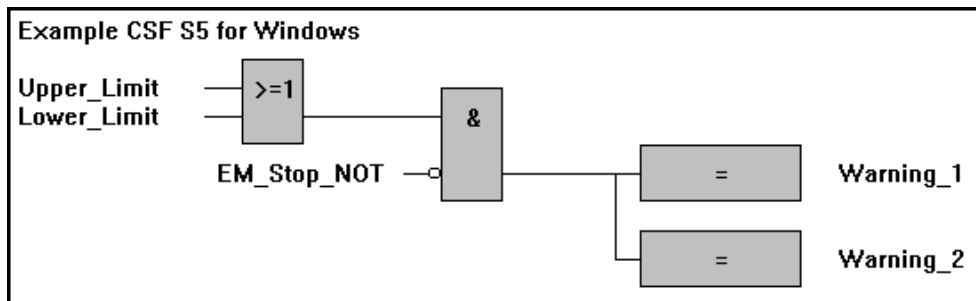


Figure 3-43 S5 for Windows Control System Flowchart (CSF)

S5 for Windows In a **Control System Flowchart (CSF)**, the control task is described with symbols based on DIN 40700. When selected a newly opened editor or the status window displays the segment (step, transition, or SUL in the Detail Display) as a control system flowchart.

S7 for Windows In a **Control System Flowchart (CSF)**, the control task is described with symbols identical to the symbols used with *S5 for Windows*. This ensures a smooth transition from *S5 for Windows* to *S7 for Windows*. When selected a newly opened editor or the status window displays the segment as a control system flowchart.

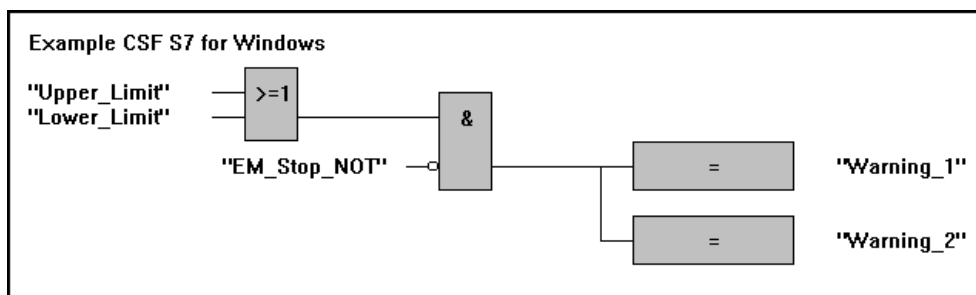


Figure 3-44 S7 for Windows Control System Flowchart (CSF)

LAD Ladder Diagram

S5 for Windows In a **Ladder Diagram (LAD)**, the control task is described with symbols similar to those used in circuit diagrams. The symbols are basically NO and NC contacts. Complex functions are displayed with symbols based on DIN 40700. When selected a newly opened editor or the status window displays the segment (step, transition, or SUL in the Detail Display) as a ladder diagram.

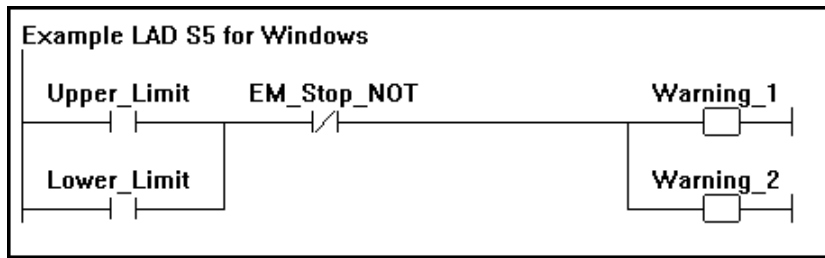


Figure 3-45 S5 for Windows Ladder Diagram (LAD)

S7 for Windows

In a **Ladder Diagram (LAD)**, the control task is described with symbols identical to the symbols used with *S5 for Windows*. This ensures a smooth transition from *S5 for Windows* to *S7 for Windows*. When selected a newly opened editor or the status window displays the network (segment) as a ladder diagram.

It is always possible to convert a network (segment) programmed in Ladder logic (LAD) into Control System Flowchart (CSF) or Statement List (STL, Block STL). In the other direction the conversion from a Statement List (STL, Block STL) into a Ladder logic (LAD) or Control System Flowchart (CSF) is not always possible. Especially the powerful *S7 for Windows* commands can only be displayed in Statement List (STL, Block STL). Number wise these are the majority of instructions.

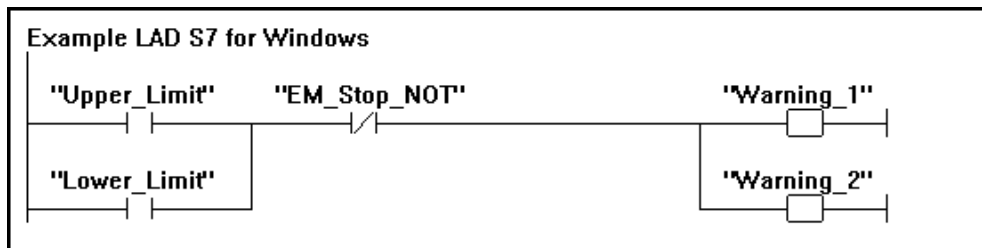


Figure 3-46 S7 for Windows Ladder Diagram (LAD)

Block STL

S5 for Windows

In a **Block Statement List (Block STL)**, the control task is described with mnemonic abbreviations in the form of a list (same as STL). The programming language is based on DIN 19239. If an editor window is newly opened a complete block is displayed using statement list presentation. Each segment is displayed with the segment number and if entered with the segment comment. The start of the segment is indicated with a bracket [followed by the segment number. The end of a segment is indicated with a closing bracket] .

An extended segment comment is displayed after the closing bracket of the previous segment and the opening bracket of the segment the comment is assigned to. In the Block-STL the search and replace functions may be used to search an entire block. Block STL is not available for step sequence programming (*G5 for Windows option*). With this option a graphical display is provided. The status window always displays one segment.

```

This is the "Extended Segment Comment" [Segment 1]
The programming example shows the Block STL
presentations S5 for Windows offers.
[1  Block STL Example Segment 1
  A{
  O  -Upper_Limit      Axis Upper Limit
  O  -Lower_Limit     Axis Lower Limit
  }
  AN -EM_Stop_NOT     Emergency Stop Signal
  =  -Warning_1       Warning Light 1
  =  -Warning_2       Warning Display Light
  ***
]
[2  Block STL Example Segment 2
  A{
  O  -Upper_Limit     Axis Upper Limit
  O  -Lower_Limit     Axis Lower Limit
  }
  AN -EM_Stop_NOT     Emergency Stop Signal
  =  -Warning_1       Warning Light 1
  =  -Warning_2       Warning Display Light
  ***
]
[3  Block STL Example Segment 3
  A{
  O  -Upper_Limit     Axis Upper Limit
  O  -Lower_Limit     Axis Lower Limit
  }
  AN -EM_Stop_NOT     Emergency Stop Signal
  =  -Warning_1       Warning Light 1
  =  -Warning_2       Warning Display Light
  BE
]

```

Figure 3-47 S5 for Windows Block Statement List (Block STL)

S7 for Windows The **Block STL** presentation is often preferred to **Source Text** presentation. If an editor window is newly opened a complete block is displayed using statement list presentation. In front of the actual logic the **Block Header** and the **Variable Declaration** are displayed.

The structure of the **Source Text** is based on the IEC 1131 standard. Files saved in the **Source Text** format with the file extension *.awl are used to exchange programs between **S7 for Windows** and the Siemens S7 programming unit (PU).

```

FUNCTION_BLOCK FB 11
TITLE=Block STL Example Segment 1
VAR_TEMP
CONV_AKKU1 : DWORD;
CONV_AKKU2 : DWORD;
CONV_STW : WORD;
CONV_INDEX : WORD;
CONV_DT : DATE_AND_TIME;
CONV_HDR : STRUCT
  TEMP17 : WORD;
  TEMP18 : WORD;
END_STRUCT;
END_VAR
BEGIN
NETWORK
TITLE=Block STL Example Segment 1
//This is the "Extended Segment Comment" (Segment 1)
//The programming example shows the Block STL
//presentations S7 for Windows offers.
//
      A;
      O "Upper_Limit";
      O "Lower_Limit";
      };
      AN "EM_Stop_NOT";
      = "Warning_1";
      = "Warning_2";
NETWORK
TITLE=Block STL Example Segment 2
      A;
      O "Upper_Limit";
      O "Lower_Limit";
      };
      AN "EM_Stop_NOT";
      = "Warning_1";
      = "Warning_2";
      ;
NETWORK
TITLE=Block STL Example Segment 3
      A;
      O "Upper_Limit";
      O "Lower_Limit";
      };
      AN "EM_Stop_NOT";
      = "Warning_1";
      = "Warning_2";
END_FUNCTION_BLOCK

```

Figure 3-48 S7 for Windows Block STL (Source Text)

- **Mnemonics:**

Mnemonic:

German

English

The language of the mnemonics you want to use can be set. The selection changes the mnemonics of the instructions (key words) and the operands in the logic and the symbolic table. The selection will not change the language of the program (menu commands, symbols, comments, etc.). The mnemonic selection for *S5 for Windows* and *S7 for Windows* works in the same way.

German

The mnemonics to identify Bit-Memory, Timers, Counters, Inputs, Outputs, and the instruction set used for Statement List (STL) programming are identified with their German syntax.

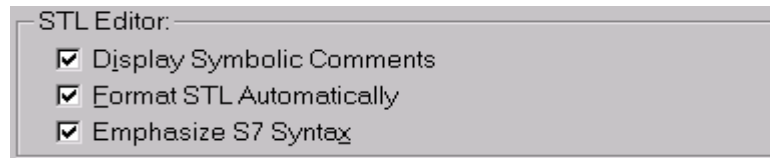
English

The mnemonics to identify Bit-Memory, Timers, Counters, Inputs, Outputs, and the instruction set used for Statement List (STL) programming are identified with their English (International mnemonics) syntax.

Example:

Name	Mnemonics		German	
	English			
	S7	S5	S7	S5
Input	I	I	E	E
Output	Q	Q	A	A
Flag	---	F	M	---
Memory	M	---	---	M
Timer	T	T	T	T
Counter	C	C	Z	Z
AND	A	A	U	U
OR	O	O	O	O
NOT	NOT	---	NOT	---
Count Down	CD	CD	ZR	ZR

● STL Editor:



The STL Editor allows settings to personalize its functions.

Display Symbolic Comments

When editing or displaying a PLC program in the statement list editor, it is possible to display the operand and the symbolic comments of the operands from the symbolic table in the same line. The symbolic comments are displayed in green. If an STL line comment is inserted, the symbolic comment of that line is automatically removed. The display of the symbolic comments works in the same way for *S5 for Windows* and *S7 for Windows*.

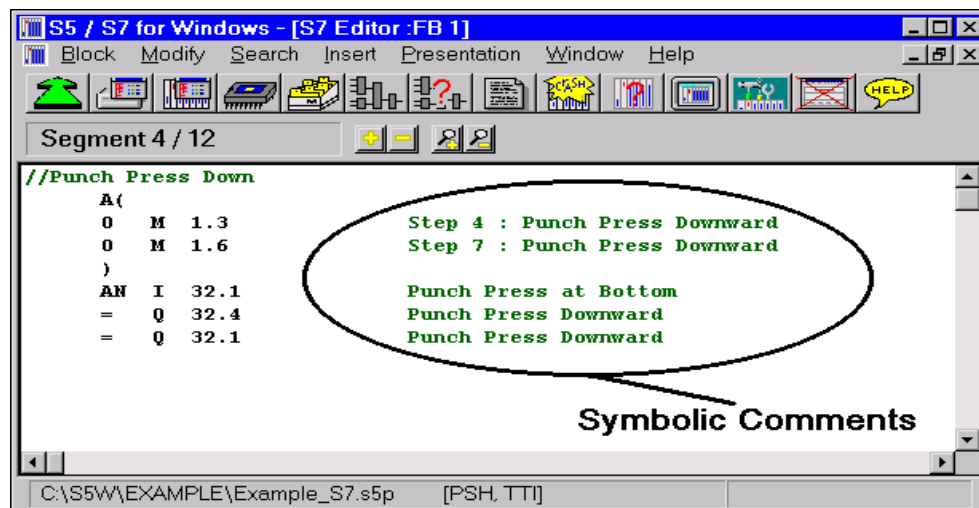


Figure 3-49 Symbolic Comment Display (STL Editor)

Format Automatically

If the button **Format Automatically** is marked, the syntax is automatically checked when the return key is pressed at the end of an edited line. The entered line is put into the correct format of the statement list only if the syntax is correct. The next line may be edited regardless if the previous line fulfills the syntax.

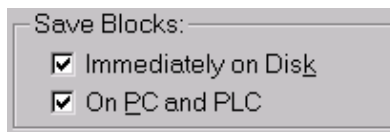
If the button is not marked the syntax check and the formatting is only done with the format command (key F9, command format from the modify menu).

The automatic format works in the same way for *S5 for Windows* and *S7 for Windows*.

Emphasize S7 Syntax

If the **Emphasize S7 Syntax** button is marked the differences between the STEP® 5 syntax and the STEP® 7 syntax is displayed in blue color on the screen. This mode works in *S7 for Windows* only.

- **Save Blocks:**



S5 / S7 for Windows allows you to select different possibilities on how to save modified blocks. Editing takes place in the RAM of your PC. Depending on the selected buttons the modified data is saved.

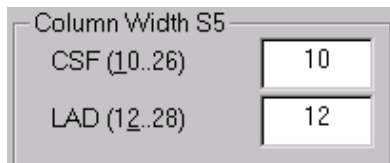
Immediately on Disk

A modified block is saved on disk whenever you select the **Save** command from the editor window or by closing the editor window. The setting works in the same way for *S5 for Windows* and *S7 for Windows*.

On PC and PLC

A modified block is saved on disk in the PC and the modified Block is transferred to the PLC whenever you select the **Save** command from the editor window or by closing the editor window. You are prompted prior the Block is transferred into the PLC. The setting works in the same way for *S5 for Windows* and *S7 for Windows*.

- **Column Width S5:**



S5 for Windows can display a symbolic operand with up to 24 characters (without a hyphen). To display symbolic operands with their full length name, the column width is adjustable. It is insured, that the operand is correctly identified even when the symbolic name is truncated in the display.

The column width is separately adjustable for the Control System Flowchart (**CSF**) and the Ladder Diagram (**LAD**) display. You can select a column width between 10 and 26 characters (including the leading hyphen) for the CSF display. LAD display allows a column width between 12 and 28 characters (including the leading hyphen).

The number entered as the column width is the number of characters spaces possible to display. The width of a character space varies with the font selected and does not always match the width of the other characters. Usually the number of space

characters is slightly higher than the number of characters possible to be displayed in a given column width.

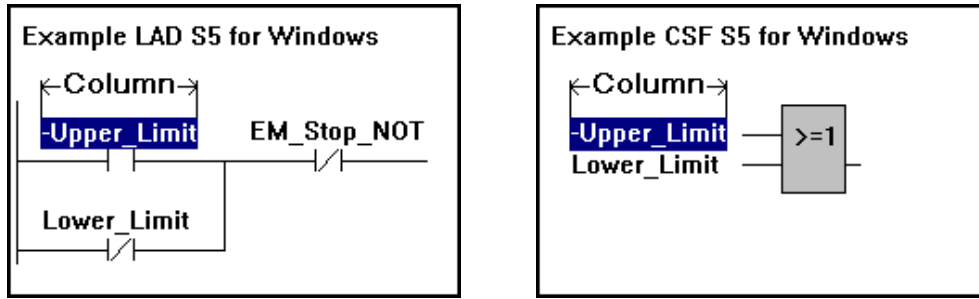


Figure 3-50 Column width example S5 for Windows

● **Column Width S7:**

Column Width S5	
CSF (10..26)	10
LAD (12..28)	12

S7 for Windows can display a symbolic operand with up to 24 characters (without the periods). To display symbolic operands with their full length name, the column width is adjustable. It is insured, that the operand is correctly identified even when the symbolic name is truncated in the display.

The column definition of S7 for Windows and S5 for Windows otherwise are equal.

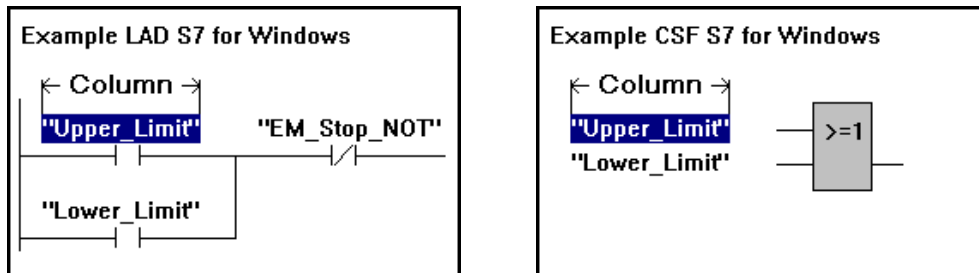


Figure 3-51 Column width example S7 for Windows

3.2.11.3 Listings (Preference Dialog Box)

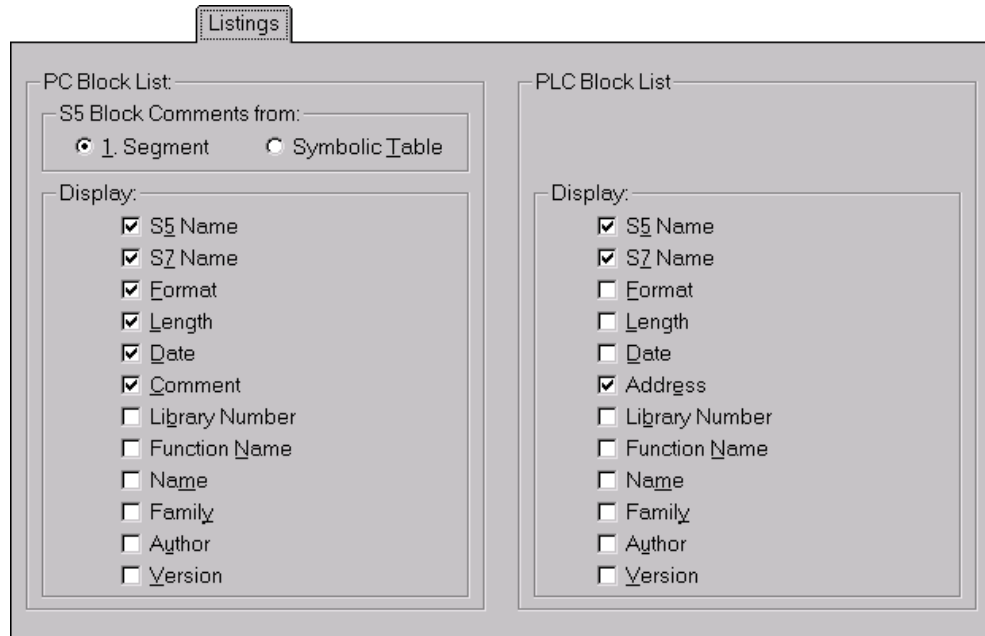
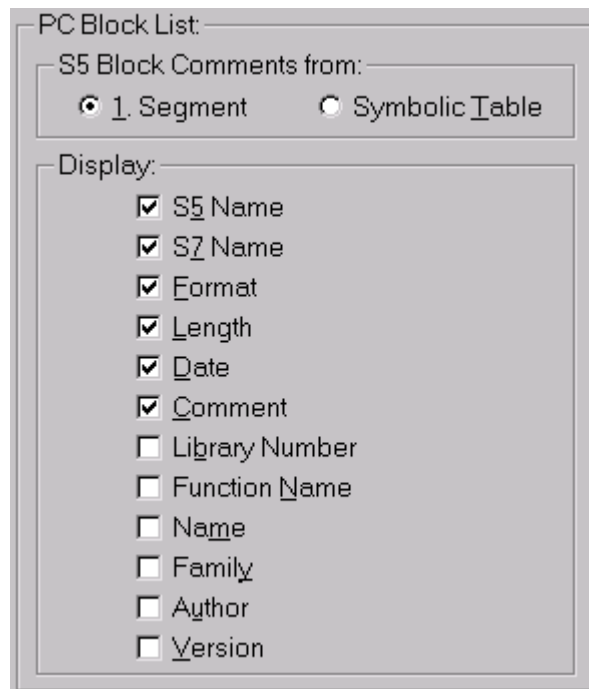


Figure 3-52 Listings settings (Preference dialog box)

The settings from the Listing setting card are saved in the project file **[project name].s5p**. The settings are used to select the data to be displayed in the PC Block List and the PLC List. For each name selected a column will be reserved to display the appropriate data. Also the comment displayed in the PC Block List is selected.

- **PC Block List:**



The PC Block List selection field is divided into two section. One section is used to select the data to be displayed in the PC Block List. The other section defines the source of the comment displayed in the PC Block List.

- **S5 Block Comments from:**

S5 Block Comments from:

1. Segment Symbolic Table

The **Block Comment** displayed in the PC block list may be selected. The settings are saved in the project file. If a comment is assigned to an S5 Block via the **Block Properties** dialog box the settings of the S5 Block Comments from section are ignored and the comment from the **Block Properties** is displayed.

1. Segment

The comment of the 1st Segment of an block may be displayed in the PC Block List as a comment. This selection applies to *S5 for Windows* only.

In *S7 for Windows* the comment displayed in the PC Block List is assigned to a Block in the **Block Properties** dialog box. If a S5 Block is converted in an S7 Block the comment of the 1st Segment is assigned to be the comment of the S7 Block.

Symbolic Table

With *S5 for Windows* it is possible to assign in the **Symbolic Table** a comment to a Block. If the **Symbolic Table** button is marked the comment to a block in the Symbolic Table is displayed as a Block comment in the PC block list window.

Note:

To display the **Block Comment** the button **Comment** in the **PC Block List Display** selection field must be marked.

- **Display (PC Block List):**

Display:

- S5 Name
- S7 Name
- Format
- Length
- Date
- Comment
- Library Number
- Function Name
- Name
- Family
- Author
- Version

The **PC Block List Display** selection field offers a number of information to be displayed in the PC Block List. The information is displayed in separate columns. The width of the columns may be changed by dragging the border with the mouse.

S5 Name

The name of a PLC Block is displayed in the STEP® 5 syntax. The S5 name of a PLC Block can only be displayed when the *S5 for Windows* option is installed.

S7 Name

The name of a PLC Block is displayed in the STEP® 7 syntax. The S7 name of a PLC Block can only be displayed when the *S5 for Windows* option is installed.

Format

The editor integrated in the *S5 / S7 for Windows* package "understands" the syntax of STEP® 7 and STEP® 5 PLC Blocks. The current syntax format of a PLC Block (S5 or S7) is displayed in the column Format. This column should always be activated when both options *S5 for Windows* and *S7 for Windows* are installed.

Length

The column displays the length of the PLC Block in byte. This information is in *S7 for Windows* and *S5 for Windows* available.

Date

The column displays the date and time the PLC Block was created or modified.

S7 for Windows

The date information is saved in each individual Block. PLC blocks and by PLC programs (libraries) imported into *S7 for Windows* also have this information available.

S5 for Windows

The date information is available in a PLC Block stored in the *.s5 file format. If a PLC program is imported into *S5 for Windows* the date of the PLC program file (DOS date) is inserted to be the PLC Block date (all Blocks have the same date). When exporting an S5 PLC program the Block date information are lost.

Comment

The column displays the PLC Block comment.

S7 for Windows

The comment displayed in the PC Block List is assigned to a Block in the **Block Properties** dialog box. PLC blocks and by PLC programs (libraries) imported into *S7 for Windows* may also have this information available (when entered). The information is not lost during the export.

S5 for Windows

The comment of the 1st Segment or the comment assign to a block in the Symbolic Table of a block may be displayed in the PC Block List as a comment. The selection which comment will be displayed depends on the selection from the **"S5 Block Comment from"** field. to a Block. PLC blocks and by PLC programs imported into *S5 for Windows* may also have this information available (when entered). The information is not lost during the export.

Note:

If a comment is assigned to an S5 Block via the **Block Properties** dialog box the settings of the S5 Block Comments from the **"S5 Block Comment from"** field section are ignored and the comment from the **Block Properties** is displayed.

Library Number

A library number to the assign block may be displayed. The library number is a five (5) digit identification number and can be saved in the PLC. Original SIEMENS blocks usually have library number assigned. The library number is assigned to an S5 Block via the **Block Properties** dialog box. Only S5 Blocks can have library numbers.

Function Name

The column displays the name of the **Function Blocks** (FB, FX) being present in the S5 format. Function names are not available with S7 Blocks.

Name

The column displays the name of an S7 Block when entered in the **Block Properties** dialog box. The name function is not available with S5 Blocks.

Family

The column displays the family name of an S7 Block when entered in the **Block Properties** dialog box. Family names are not available with S5 Blocks.

Author

The column displays the name of author who created the S7 Block when entered in the **Block Properties** dialog box. Author names are not available with S5 Blocks.

Version

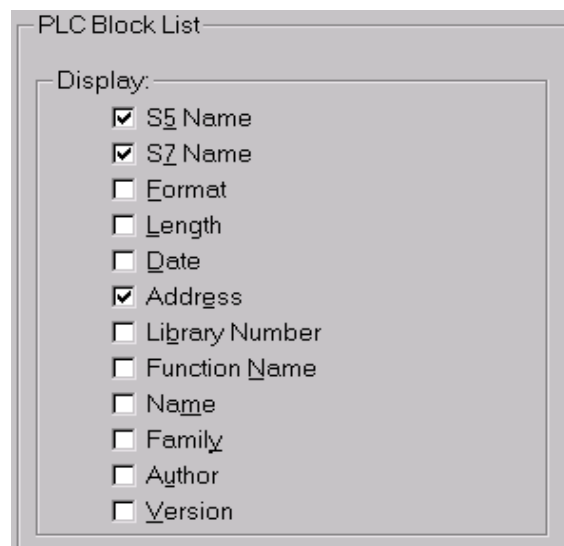
The column displays the version number of an S7 Block when entered in the **Block Properties** dialog box. Version numbers are not available with S5 Blocks.

● Display (PLC Block List):

The **PCL Block List Display** selection field offers a number of information to be displayed in the PCL Block List. The information is displayed in separate columns. The width of the columns may be changed by dragging the border with the mouse.

Note:

The more information you want to display in the **PLC Block List** the longer it takes to build up the PLC Block List window. All information being displayed have to be transferred from the PLC to the PC.



S5 Name

The PLC Block being recognized in the online PLC is displayed in the STEP® 5 name. The S5 name of a PLC Block can only be displayed online when the S5 for Windows option is installed.

S7 Name

The PLC Block being recognized in the online PLC is displayed with its STEP® 7 name. The S7 name of a PLC Block can only be displayed online when the S7 for Windows option is installed.

Format

This column indicates in which format the corresponding PLC Block is currently present in the PC Block List. Blocks being present in the S5 format may be displayed in the status display in their S5 syntax even being online with an S7-300/400 PLC. This column should always be activated when both options *S5 for Windows* and *S7 for Windows* are installed.

Length

The column displays the amount of memory the PLC Block occupies in the PLC in byte. This information is online available with an S7-300/400 as well as with an S5 PLC.

Date

The column displays the date and time the PLC Block was created or modified online. This information is only in conjunction with S7 Blocks online available.

Address

The column displays the PLC Block addresses.

S7 for Windows

The address displayed in the PLC Block List online is the relative address within the Block. The S7-300/400 PLC does not support absolute addresses.

S5 for Windows

The address displayed in the PLC Block List online is the absolute address within the PLC Memory. The addresses change whenever additional Blocks are loaded into the PLC.

Library Number

The library number is a five (5) digit identification number saved in the PLC. Only S5 PLC's know library numbers.

Function Name

The column displays the name of the **Function Blocks** (FB, FX) being present in the S5 PLC if an identical **Function Block** (FB, FX) is present in the PC Block List. Function names are not available with S7 Blocks.

Name

The column displays the name of S7 Block online when the name is saved in the S7-300/400 PLC. The name function is not available with S5 Blocks.

Family

This column displays the family name of S7 Block online when the family name is saved in the S7-300/400 PLC. Family names are not available with S5 Blocks.

Author

The column displays the name of author who created the S7 Block online when the author name is saved in the S7-300/400 PLC. Author names are not available with S5 Blocks.

Version

The column displays the version number of an S7 Block online when the author name is saved in the S7-300/400 PLC. Version numbers are not available with S5 Blocks.

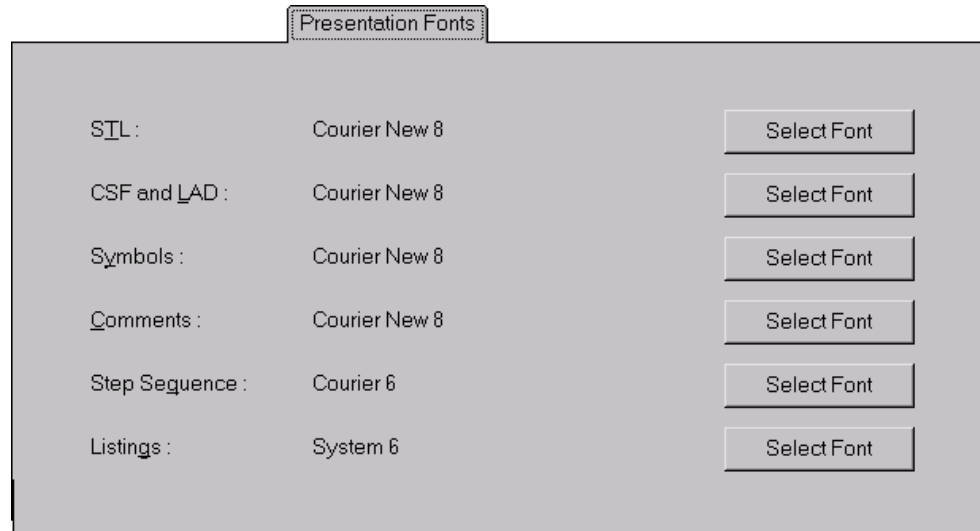
3.2.11.4 Presentation Fonts (Preference Dialog Box)

Figure 3-53 Presentation Fonts settings (Preference dialog box)

The settings from the Presentation Fonts setting card are saved in the project file **[project name].s5p**. The settings are used to select the fonts for the CRT display.

Different fonts may be assigned to various subjects for separation and a better reading. Also the font size and its style may be set.

Each **Select Font** button command opens the **Font** dialog box. The dialog for the different presentations are identical.

STL

The font selected with **Select Font** button sets the font for the Statement List (STL, Block STL) presentation for the editors, the status window, and when G5 for Windows is installed the Step Sequence detail window.

CSF and LAD

The font selected with **Select Font** button sets the font for the Control System Flowchart (CSF) and the Ladder Diagram (LAD) presentation for the editors, the status window, and when *G5 for Windows* is installed the Step Sequence detail window.

Symbols

The font selected with **Select Font** button sets the font for the text displayed in the Symbolic Table.

Comments

The font selected with **Select Font** button sets the font for the text displayed in the Comment editor window and the Comments displayed in other editor windows (STL, CFS, LAD, etc.).

Step Sequence

The font selected with **Select Font** button sets the font for the text displayed in the graphical Step Sequence overview window when *G5 for Windows* is installed.

Listings

The font selected with **Select Font** button sets the font for the text displayed in the PC Block List and the PLC Block List.

Note:

The font selection done via the **Presentation Fonts** settings is for the CRT display only. The fonts for the documentation printout are selected with the settings from the **Font Type** card of the **Documentation Layout** dialog box (see chapter 3.2.13.2).

● Font selection

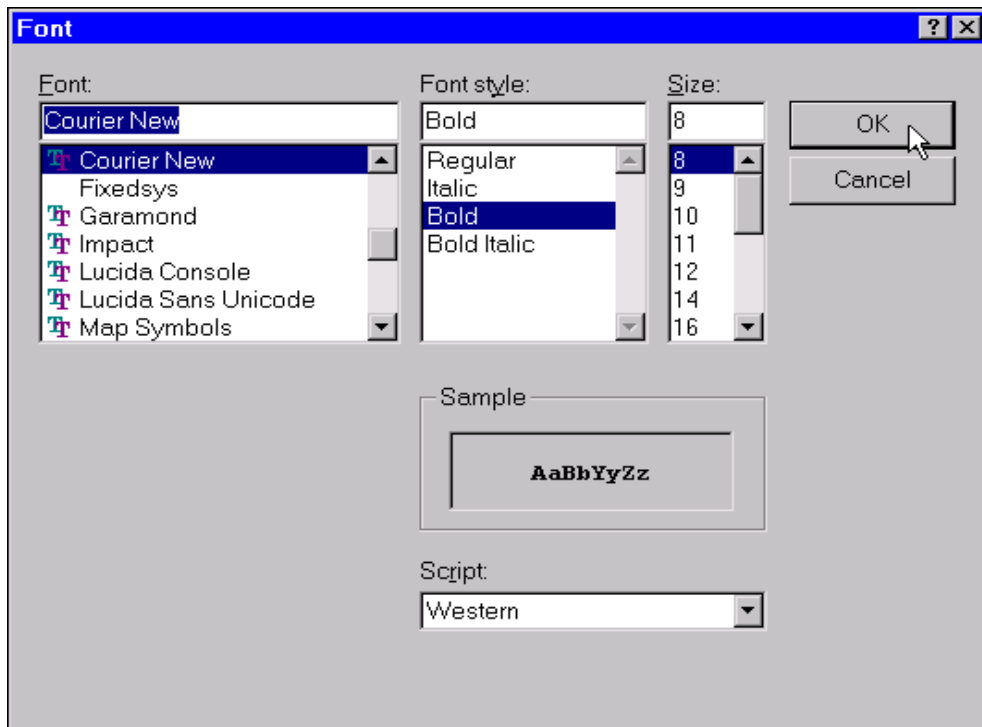


Figure 3-54 CRT font selection dialog box

Font :

Select the font from the list field. All the fonts offered by windows may be selected. If you want to enlarge or reduce the logic displayed you must select a scaleable font (true type). The width of a character depends on the font selected. You may have to adjust the column width (see chapter 3.2.11.2) for an optimized CRT display.

Font style:

The selection of the font style depends on the CRT resolution. If your monitor has a high resolution, a bold font style may improve the readability of the text.

Size:

The selection of the font size depends on the CRT resolution. If you increase the size of the font you may have to adjust the column width (see chapter 3.2.11.2) for an optimized CRT display.

3.2.11.5 Miscellaneous (Preference Dialog Box)

Additional settings are put together on the **Miscellaneous** setting card of the **Preference** dialog box.

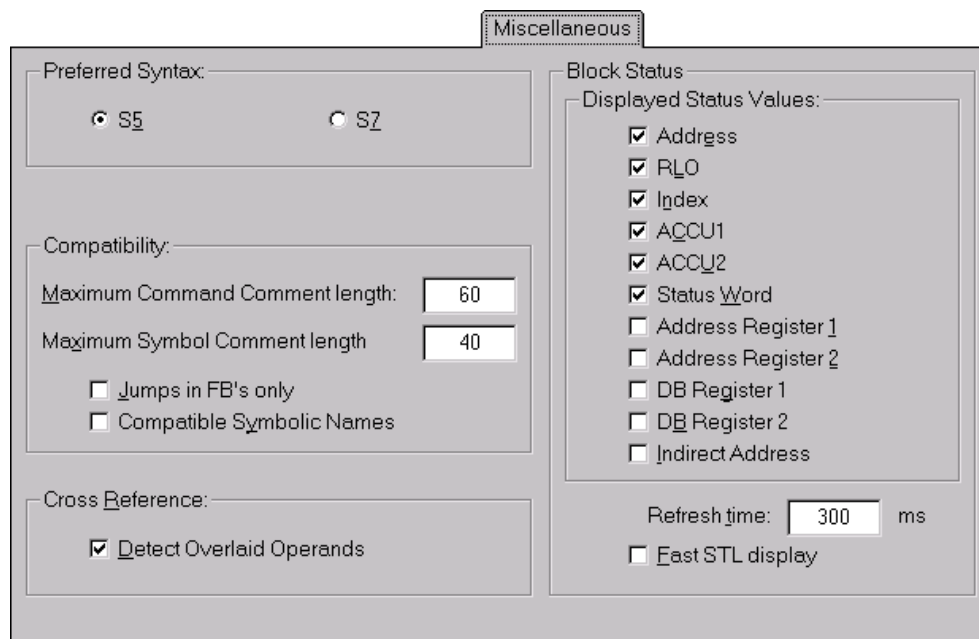


Figure 3-55 Presentation Fonts settings (Preference dialog box)

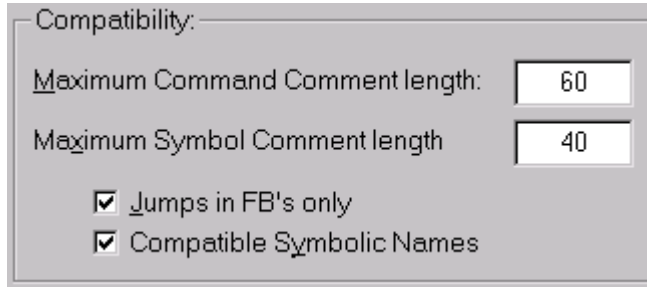
- **Preferred Syntax:**



If *S5 for Windows* and *S7 for Windows* are installed on one system you can select the syntax you want the system to start with as a default setting.

Whenever you want to create a new Block the **Enter new Block** dialog box opens with the default setting from the **Preferred Syntax** setting field. The syntax you want to use to program the new Block can always be selected directly from the **Enter new Block** dialog box when you enter the name of the new Block..

- **Compatibility:**



Compatibility:

Maximum Command Comment length: 60

Maximum Symbol Comment length: 40

Jumps in FB's only

Compatible Symbolic Names

The compatibility setting field is used with *S5 for Windows* only. The different versions of the Siemens S5 programming unit (PU) are not completely downward compatible. *S5 for Windows* gives you the possibility to adjust the system to be compatible with a specific PU version. This is only important when exporting *S5 for Windows* PLC programs to be opened with a Siemens PU.

Maximum Command Comment length

S5 for Windows allows you to set the maximum length of a comment entered in a command line when programming in Statement List (STL, Block STL) presentation. Newer Siemens PU versions allow the text of a comment in a command line to have up to 60 characters. Depending on the PU version 40 or 24 characters could be the maximum.

Whenever the comment entered in a Command Line exceeds the limit set the color of the exceeding text is displayed in red. The comment length must be shortened to allow the formatting (Key F9) of the Statement List (STL, Block STL).

Maximum Symbol Comment length

S5 for Windows allows you to set the maximum length of a comment entered in the **Symbolic Table**. Newer Siemens PU versions allow the text of a comment in the Symbolic Table to have up to 40 characters. Depending on the PU version 24 characters could be the maximum.

When formatting (Key F9) of the Symbolic Table a warning is displayed if a comment is found exceeding the limit. You may ignore the warning or automatically truncate the comment.

Jumps in FB's only

The Siemens PU allows the programming of Jumps only within a Function Block (FB, FX). Most of the S5 CPU's however support jumps in all blocks. *S5 for Windows* allows you to program jumps in all block types. If the PLC program must be compatible with Siemens PU's the **Jumps in FB's only** button should be marked.

Compatible Symbolic Names

The Siemens PU allows a limited ASCII set of characters (no "Umlaut") to be used to identify a symbolic operand. If the button **Compatible Symbolic Names** is marked *S5 for Windows* only allows the use of the same characters within the symbolic name than the Siemens PU.

Normally *S5 for Windows* allows the standard international ASCII set to be used within the symbolic name but no colon (:).

- **Cross Reference:**



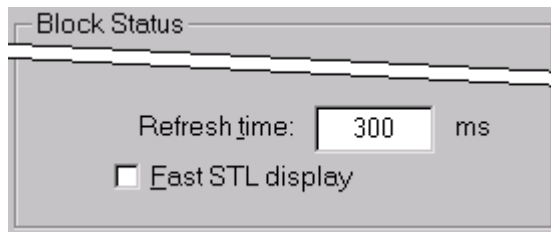
Detect Overlaid Operands

When the Detect Overlaid Operands button is marked, the specified bit to search for is not only found as a bit but also in a byte, word, or double word. A byte is also found in a word or double word and a word is also found in a double word.

If the button is not marked the specified operand will only be found in its specified format.

The function of this button is available in *S5 for Windows* and *S7 for Windows*.

- **Block Status:**



To optimize the status display to the speed of your PC the refresh timing and the type of STL presentation are adjustable. These functions of this section are available in *S5 for Windows* and *S7 for Windows*.

Refresh Time (Status Display)

The default Status Display Refresh Time is set to 300 msec. Every 300 msec the new status is fetched from the PLC to update the segment (network) displayed on the CRT. Sometimes it might be better (slow PC, fast PLC action) to adjust the refresh time for a slower or faster update.

Setting the refresh time for a much faster update may only be useful being online with an software PLC (*PLC in a PC*).

An external *S5* hardware PLC is transferring the status data with 9600 baud and a large amount of data must be transferred for the status display. The *S7-300/400* PLC is using a much faster transfer rate (depending on the MPI converter) to exchange data but the overhead of the MPI protocol requires a much larger amount of data to be transferred.

Fast STL Display

S5 / S7 for Windows normally fetches a complete network (segment) of a PLC Block for the status display in STL presentation. This has the advantage that you can see the parts of the segment being executed and the parts being jumped over (light gray). Unfortunately there is the possibility when using conditional jumps in the PLC program, that the status display needs quite a while to build up the display.

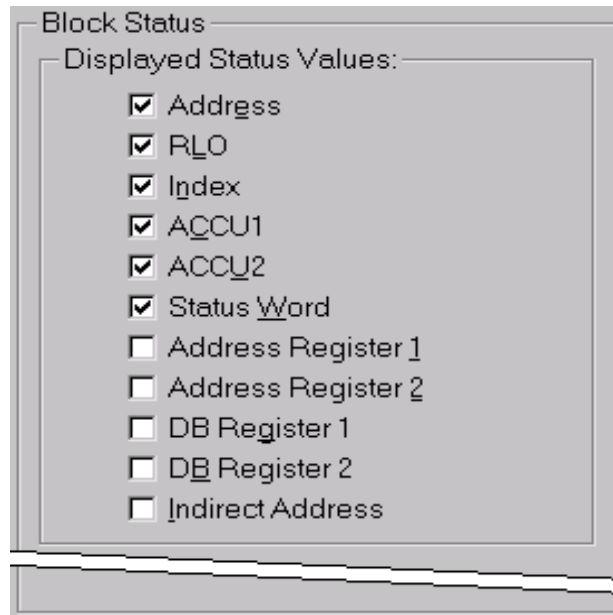
If the **Fast STL Display** button is marked only a certain portion of the network (segment) will be updated for the display. The status display starts at the current cursor position (line with a black background) and ends at the next jump label or the segment end. The parts of the segment above the cursor position and below the jump label are displayed in light gray. The status of these network (segment) parts are not updated (Siemens PU compatible status display mode).

- **Displayed Status Values:**

In Statement List (STL) presentation you can select the information to be displayed in the STL status window in columns. *S5 for Windows* displays a fixed set of information in the STL status window being online with an S5 PLC.

Note:

The more information you want to display in the **STL Status** window the longer it takes to build up the **STL Status** window. All information being displayed have to be transferred from the PLC to the PC.



Address

In this column the memory addresses of the S7 instruction is displayed. The address displayed in the **STL Status** window online is the relative address within the Block. The S7-300/400 PLC does not support absolute addresses.

RLO

In this column the **Result of a Logical Instruction (ROL)** of the instruction in that specific line is displayed.

Index

In this column the contents of the Index Register is displayed.

ACCU1, ACCU2

In these columns the contents of the **Accumulators** are displayed. The accumulators are 32 bit general purpose registers and are used to process bytes, words, and double words.

Status Word

In this column the contents of the **Status Word** is displayed. The nine (9) lower bits of the 16 bit Status Word Register are showing detailed information about the instruction.

Address Register 1, Address Register 2

The contents of the **Address Registers** (AR1, AR2) are displayed in these columns. The contents of these 32 bit register may give you valuable information when using register indirect addressing.

DB Register 1, DB Register 2

The contents of the **Data Block Registers** are displayed in these columns. These registers give you information about the shared Data Block and the Instance Data Block in use.

Indirect Address

In this column the information about the indirect addressing in use are displayed.

3.2.12 Printer Setup

The command **Printer Setup** opens the dialog box **Page Setup**.

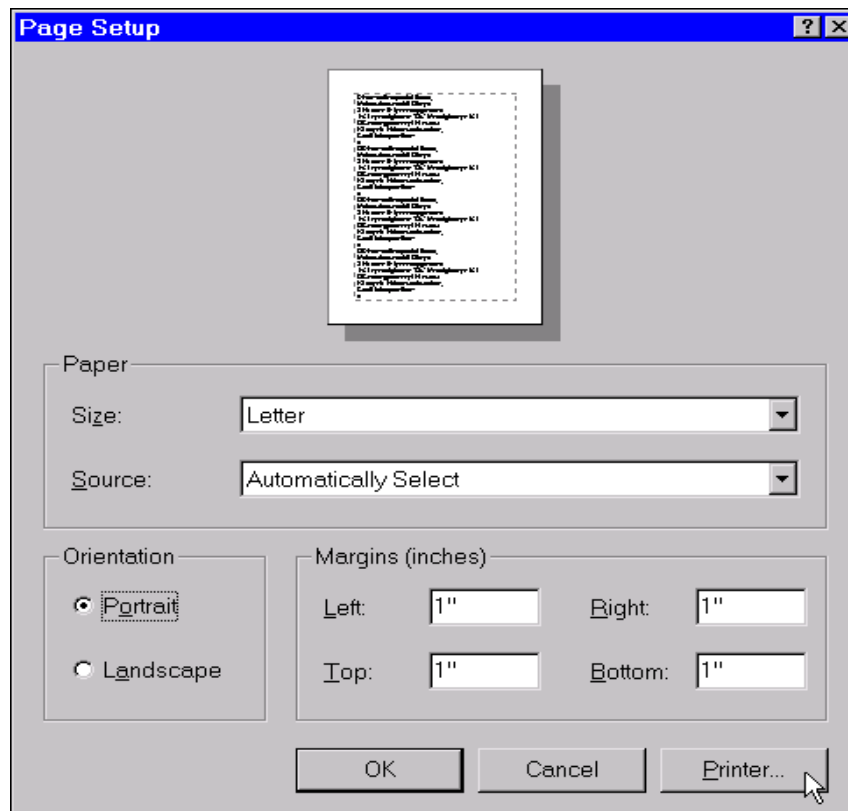


Figure 3-56 Standard Windows page setup dialog box.

◆ Click **Printer Setup** in the File menu.

◆ Press **ALT + F, T**.

The dialog box page setup allows you to select the size, the source and the orientation of the paper you want to print on. The settings of the margins are not used with *S5 / S7 for Windows*. A dialog box **Documentation Setup** provides a more powerful margin setting than the Windows standard page setup dialog box which are saved in the *S5 / S7 for Windows* project file (*.s5p).

The **Printer** button of the page setup dialog box opens up a dialog box to select a printer from the list of the printers you have installed under Windows. Additional buttons are provided to setup the printer options. The setup possibilities depend on the selected printer.

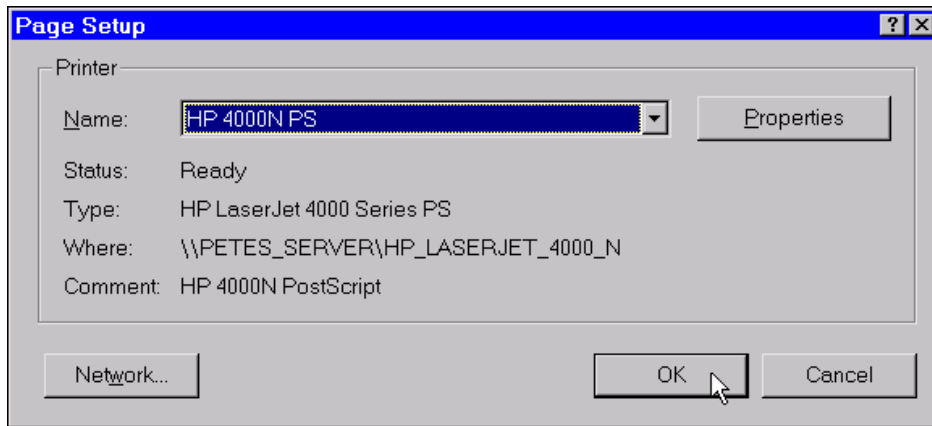


Figure 3-57 Page Setup printer selection dialog box

Note:

The settings of the **Page Setup** dialog box and the Printer selection as well as all the printer option selections are standard windows settings. These settings are saved only Windows internally. They are not saved with the project.

The settings from the Documentation Layout dialog box (see chapter xxx) are saved in the in the *S5 / S7 for Windows* project file (*.s5p).

All the selections from the **Page Setup** dialog box can be overwritten for the current print job with the settings from the **Print** dialog box opened (see chapter xxx) to start the actual print process.

3.2.13 Documentation Layout

The Documentation Layout dialog box An additional menu to manage the appearance of the documentation is available. There are commands to open dialog boxes to setup the printers, select fonts, set margins, fill out the header and footer, and select the appearance of the PLC logic.

- ◆ Click **Printer Setup** in the File menu.
- ◆ Press **ALT + F, D**.

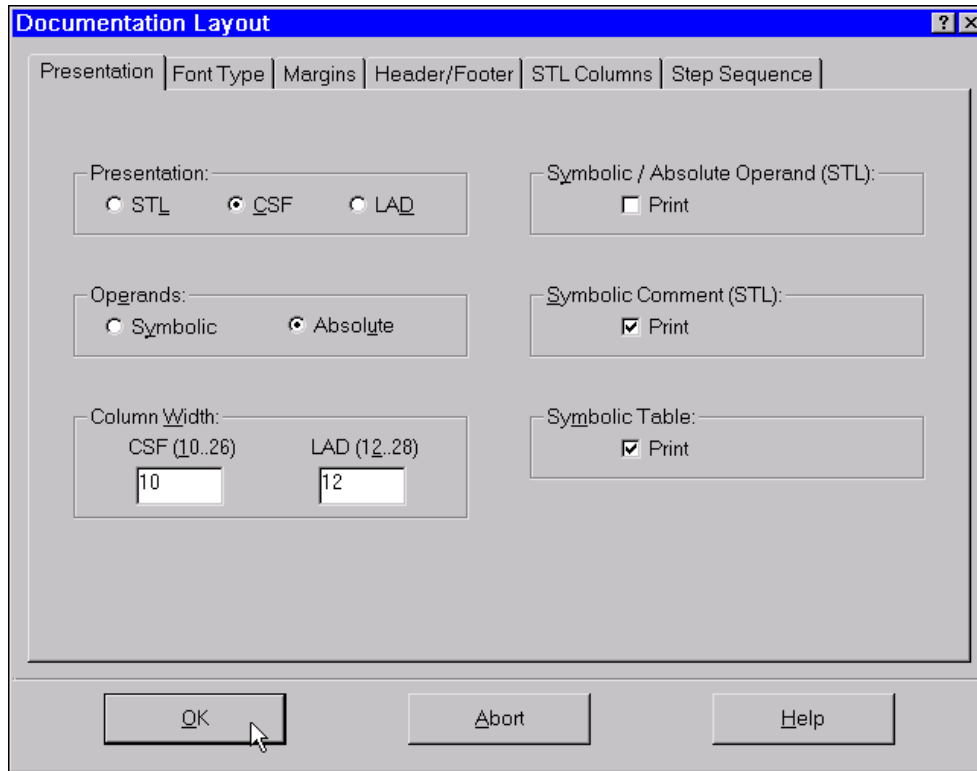


Figure 3-58 Documentation Layout dialog box

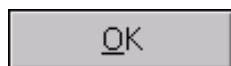
The settings from the documentation layout dialog box related to a project are saved in the project file **[project name].s5p**.

Whenever *S5 / S7 for Windows* is started the settings from the project file are used to set the documentation layout settings for this project.

The following buttons are assigned to all the cards of the documentation layout dialog box.



Figure 3-59 Documentation Layout dialog box general buttons



When clicking the button **OK** the current setting of the Documentation Layout dialog box is saved. The settings are saved in the project file (***.s5p**) and the dialog box is closed.



When clicking the button **Abort** all the not saved settings are canceled and the dialog box is closed.



The integrated Help with the topics about the Documentation Layout settings is opened.

3.2.13.1 Presentation (Documentation Layout Dialog Box)

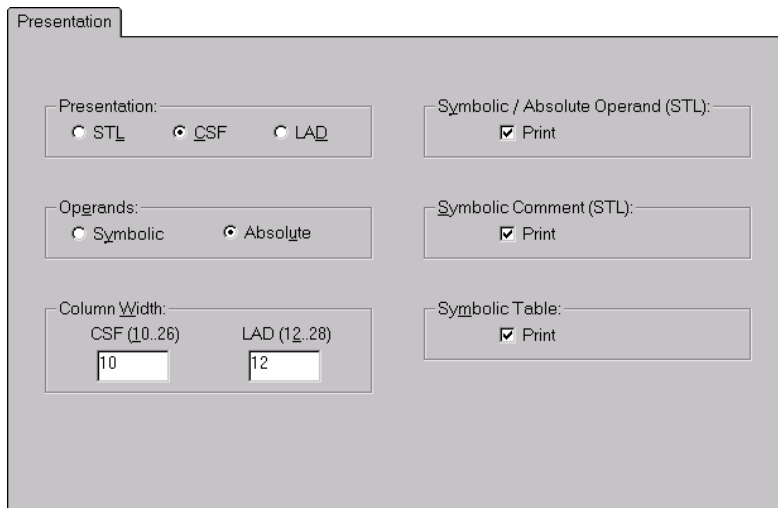


Figure 3-60 Presentation tab from the Documentation Layout dialog box

The appearance of the PLC logic in the printed documentation is setup with the Presentation Tab from the documentation layout dialog box.

● Presentation:



The *S5 / S7 for Windows* PLC Blocks may be printed in the following forms:

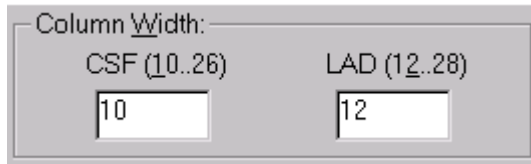
- **STL** **Statement List**
- **CSF** **Control System Flowchart**
- **LAD** **Ladder Diagram (Ladder Logic)**

● Operands:



The operands can be printed in a **Symbolic** or an **Absolute** form.

- **Column Width:**



S5 / S7 for Windows provides the ability to size the column width for operands in the LAD and CSF presentation for printing. For each presentation the column width may be set separately. This option allows the adjustment to the selected font and the number of characters used for a symbolic operand.

The number entered as the column width is the number of character spaces possible to print. The width of a character space varies with the font selected and does not always match the width of the other characters. Usually the number of character spaces is slightly higher than the number of characters possible to print in a given column width.

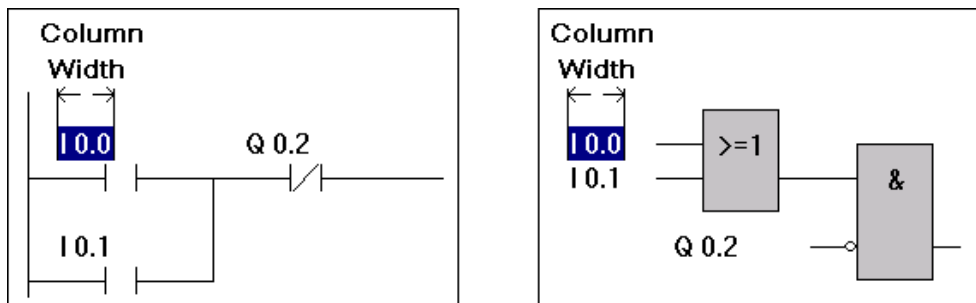
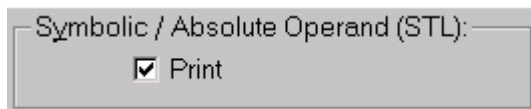


Figure 3-61 Column width in LAD and CSF presentation

- **Symbolic / Absolute Operand (STL):**



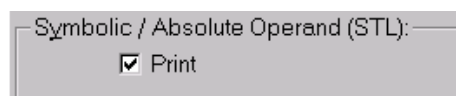
With the statement list you can print out the operands in a symbolic and absolute form (see chapter 3.2.13.5). The first operand to be printed will depend on the button marked in the **Operands** field of this dialog box.

Print

To print the operands in both forms select the print button (absolute and symbolic).

Example:

The following buttons are marked:



The statement list printout provides following information.

S5 / S7 Code	Symbolic Operand	Absolute Operand
AN	Down	I 32.0
O	S-UP-1	I 32.1
=	Out_M1	Q 17.0

Figure 3-62 STL printout with symbolic and absolute operands

When the Absolute button is marked instead of Symbolic button, the printout is changed as follows:

Operands:

Symbolic Absolute

Symbolic / Absolute Operand (STL):

Print

The statement list printout provides following information.

S5 / S7 Code	Absolute Operand	Symbolic Operand
AN	I 32.0	Down
O	I 32.1	S-UP-1
=	Q 17.0	Out_M1

Figure 3-63 STL printout with absolute and symbolic operands

- **Symbolic Comment (STL):**

Symbolic Comment (STL):

Print

With the statement list you can printout the **Comment** of an operand from the **Symbolic Table**. If a Line Comment was edited in that particular line, that comment is printed after the comment from the symbolic table.

Print

Select the print button to print the comment, from the symbolic table, in the same line with the operand.

Example:

When the print button is marked and a comment was edited in a STL line, the statement list printout provides following information:

S5 / S7 Code	Absolute Operand	Comment from the Symbolic Table	STL Line Comment
AN	I 32.1	Limit Switch Down Position	; Ram Down

Figure 3-64 Statement list printout with symbolic table and STL line comments

When the print button is marked and no comment was edited in a STL line, the statement list printout provides following information:

S5 / S7 Code	Absolute Operand	Comment from the Symbolic Table
AN	Down	Limit Switch Down Position

Figure 3-65 Statement list printout with symbolic table comment

When the print button is not marked and a comment was edited in a STL line, the statement list printout provides following information:

S5 / S7 Code	Absolute Operand	STL Line Comment
AN	Down	; Ram Down

Figure 3-66 Statement list printout with STL line comments

- **Symbolic Table**

Symbolic Table:

Print

A network (segment) may be printed with a list of the operands (part of the symbolic table) used in the network (segment).

Print

To print the symbolic table for the operands used in the network (segment) in addition to the logic, select the print button.

3.2.13.2 Font Type (Documentation Layout Dialog Box)

The settings, from the **Font Type** Tab, are saved in the project file **[project name].s5p**. The settings are used to select the fonts for the documentation printout. Different fonts may be assigned to various subjects, for separation and more comfortable reading. Also the font size and its style may be set.

Each **Select Font** button command opens the **Font** dialog box. The dialog for the different text presentations are identical.

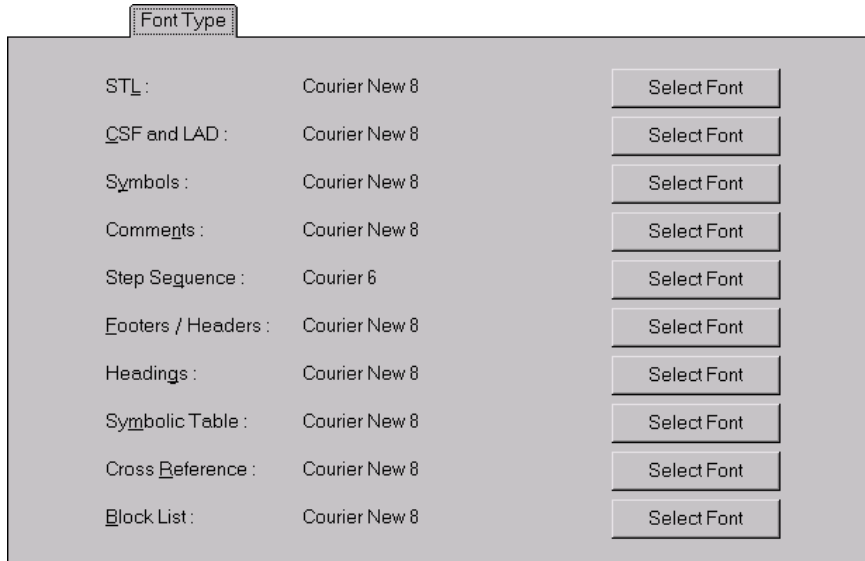


Figure 3-67 Font Type tab from the Documentation Layout dialog box

STL:

The font selected for **STL** determines the font, font style, size of the instructions, the operands (absolute and symbolic), the symbolic comments, and the STL line comment in the Statement List (STL) printout.

CSF and LAD:

The font selected for **CSF and LAD** determines the font, font style, size of the operands (absolute and symbolic), and the labels in the graphical symbols in the Ladder Diagram (LAD) and Control System Flowchart (CSF) printout.

Symbols:

The font selected for **Symbols** determines the font, font style, and size of the symbolic table portion printed out with a network (segment).

The symbolic table portion printed, as an appendix to the network, is a list of the operands (absolute and symbolic) used in the network (segment) and the symbolic comments.

Comments:

The font selected for **Comments** determines the font, font style, and size of the extended network (segment) comment printed in front of the network the comment is assigned to.

Step Sequence:

The font selected for **Step Sequence** determines the font, font style, and size of the graphical Step Sequence overview printout (*G5 for Windows* option must be installed).

Footers / Headers:

The font selected for **Footers / Headers** determines the font, font style, and size of the footer and header printed on each page of the printout.

Headings:

The font selected for **Headings** determines the font, font style, and size of the headings within the networks (segments), and the cross-reference list as well as any other heading in the printout.

Symbolic Table:

The font selected for **Symbolic Table** determines the font, font style, and size of the text within the symbolic table printout.

Cross Reference:

The font selected for **Cross Reference** determines the font, font style, and size of the of the text within the cross-reference list printout.

Block List:

The font selected for **Block List** determines the font, font style, and size of the text within the PC Block List printout.

Note:

The font selections made in the **Fonts Type** settings box, are used for printing only. The fonts for the CRT display are selected with the settings from the **Presentation Fonts** tab

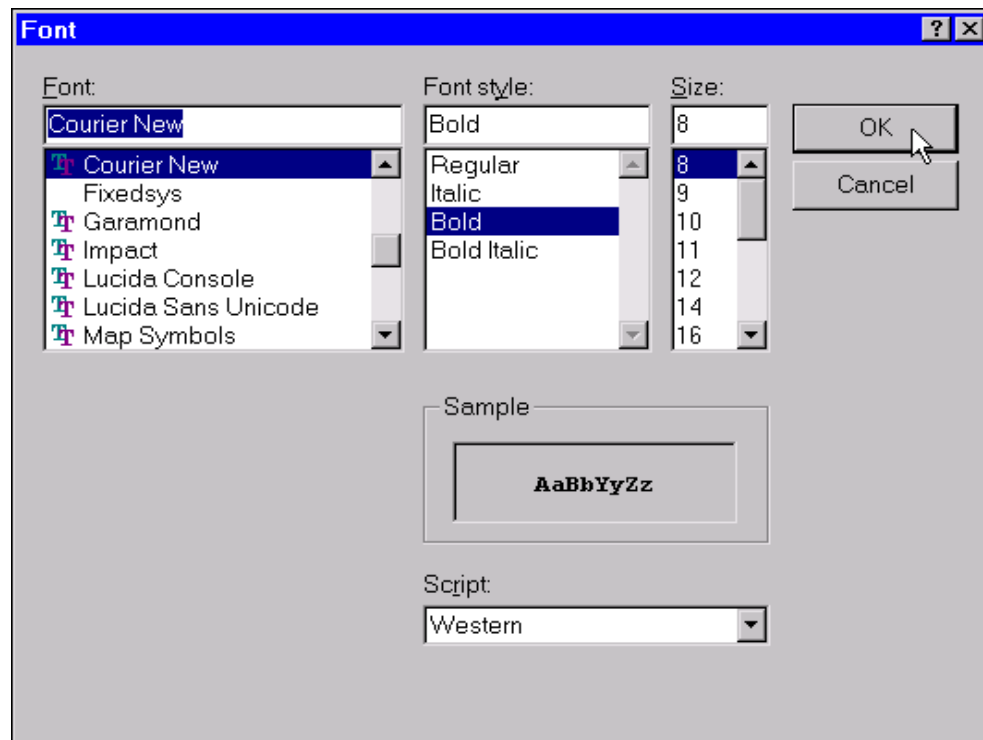


Figure 3-68 Print font selection dialog box

Font:

Select the font from the list field. All the fonts offered by windows may be selected. The width of a character depends on the font selected. You may have to adjust the column width (see chapter 3.2.13.1) for an optimized printout.

Font style:

The selection of the font style depends on the type of text to be printed (headings, body text, etc.).

Size:

The selection of the font size depends on the size of the paper used for the printout. You may have to decrease the size of the font to fit a complete network (segment) on a single sheet when printing.

If a network exceeds the horizontal or the vertical margin of a page, a list box is opened prior to printing that lists the segments (networks) that cannot be printed on a single sheet of paper.

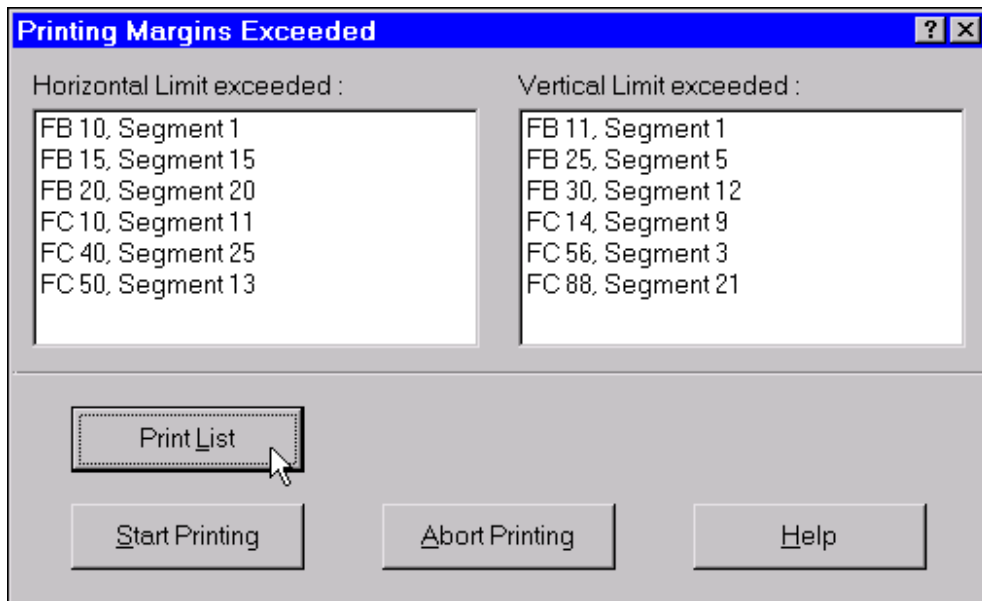


Figure 3-69 Print margins exceeded



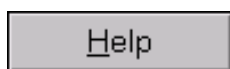
When clicking the **Print List** button the contents of the dialog box are printed out to enable you to manipulate the segments (networks), so when you print the segments (networks) at a later date, they will be printed completely.



When clicking the **Start Printing** button the documentation is printed. The segments (networks) listed may be truncated.



When clicking the **Abort** button the printing is aborted. You may now change the settings (page orientation, font size, margins) to fit the segments (networks) onto a single page.



The integrated Help with topics concerning Documentation printout is opened.

3.2.13.3 Margins (Documentation Layout Dialog Box)

The settings from the **Margins** Tab are saved in the project file **[project name].s5p**.

Select the set margins dialog box to customize the page layout. The margins of the **Main Body** (area where the PLC logic is printed) and the **Header / Footer** are set independently. The dimensions are in centimeters (cm).

The screenshot shows a dialog box titled "Margins" with two main sections: "Main Body:" and "Header / Footer:". Each section contains four input fields for Top, Bottom, Left, and Right margins, all measured in centimeters.

Section	Top	Bottom	Left	Right
Main Body:	0.50	0.50	1.60	0.50
Header / Footer:	0.10	0.10	0.10	0.10

Figure 3-70 Margins tab from the Documentation Layout dialog box

- The measurements must be entered in centimeter (cm).
- The margins for the header and the footer are measured relative to the page.
- The margins of the main body are measured relative to the header and footer (inside).

Page Layout Margins

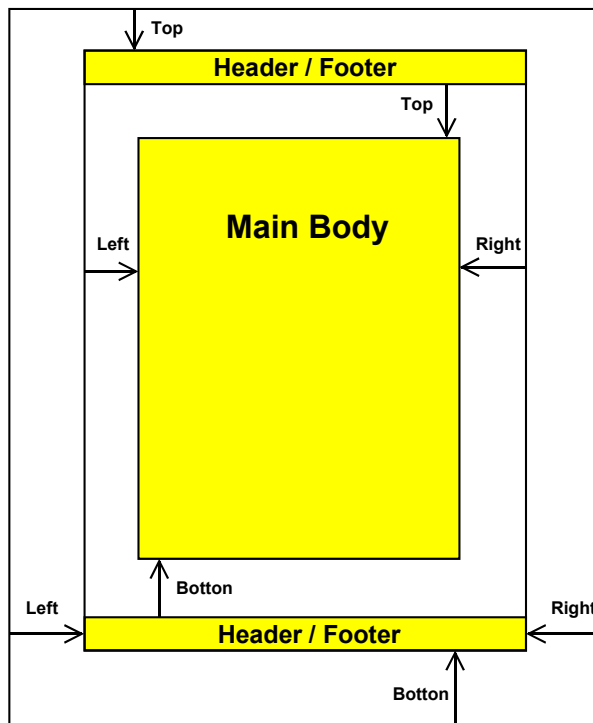


Figure 3-71 Page Layout Margins

3.2.13.4 Header / Footer (Documentation Layout Dialog Box)

The settings from the **Margins** Tab are saved in the project file **[project name].s5p**.

The tab provides fields to customize the appearance of the page of documentation for the PLC program.

You may type any text in the text fields. There are field abbreviations available to assist you when entering PLC program information and date and time information to the header and footer. Buttons are available to disable the footer or header. The font for the header and footer may also be set.

Figure 3-72 Header / Footer tab from the Documentation Layout dialog box

- **Field abbreviations:**

%f	File name of the PLC program without file name extension.	
%t	List name (Title).	
%p	Page number.	
%a	Day	Printing date
%b	Month	Printing date.
%c	Year	Printing date.
%d	Day	File creation/modification date.
%m	Month	File creation/modification date.
%y	Year	File creation/modification date.
%h	Hour	File creation/modification date.
%l	Minutes	File creation/modification date.
%s	Seconds	File creation/modification date.

Table 3-1 Footer field abbreviations

3.2.13.5 STL Columns (Documentation Layout Dialog Box)

The column positions and their width may be set individually in the **STL Columns** tab of the documentation layout dialog box to control the layout of a STL printout. The settings from the **STL Columns** tab are saved in the project file **[project name].s5p**.

Figure 3-73 STL Columns tab from the Documentation Layout dialog box

The column position defines the distance, relative to the left margin of the main body (see chapter 3.2.13.3). The fields **Additional Symbol** and **Additional Absolute Operand** are only active if the corresponding buttons in the **Presentation** tab (Documentation Layout dialog box) logic printout dialog box are marked (see chapter 3.2.13.1).

The number, entered as the column position, is the distance represented by the number of character spaces. The actual distance, in inches, depends on the font selected.

- **Symbolic Table**



Activating the **Default** button will insert the default column values as shown in figure 3-73.

Note:

The width of the characters in a proportional font (e.g. Arial, Times New Roman etc.), vary with the type of letter. Spaces do not necessarily have the same width as an equal number of other characters.

If the **Symbolic** button in the **Presentation** tab of the **Documentation Layout** dialog box is marked, then the field **Additional Absolute Operand** is used to define the additional column position.

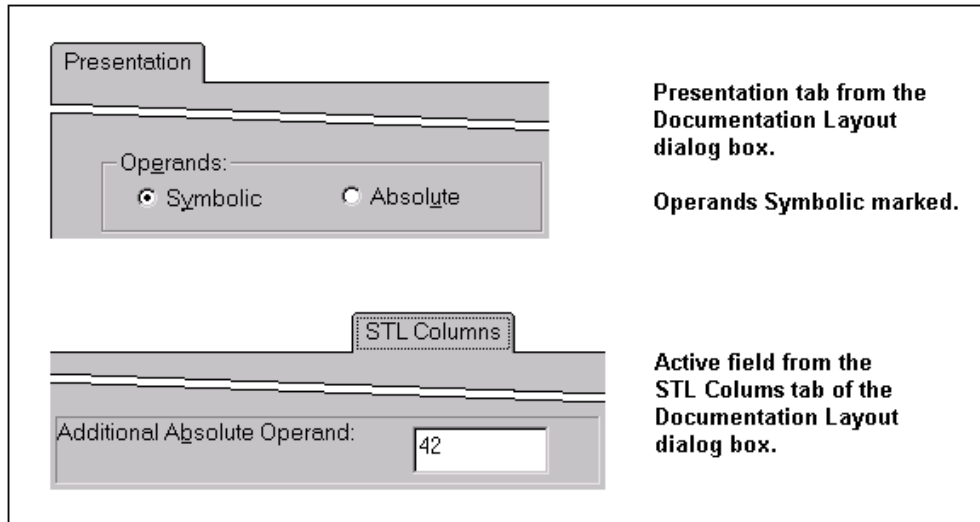


Figure 3-74 Additional absolute Operand

If the **Absolute** button in the **Presentation** tab of the **Documentation Layout** dialog box is marked, then the field **Additional Symbolic Operand** is used to define the additional column position.

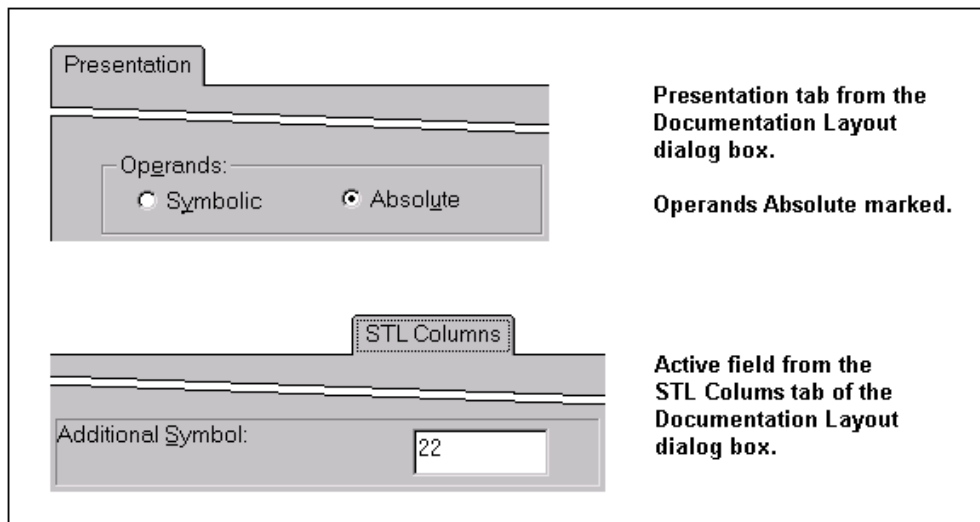


Figure 3-75 Additional symbolic Operand

The following two (2) examples show the column assignment in accordance with the buttons marked from the **Presentation** tab of the **Documentation Layout** dialog box.

Example 1:

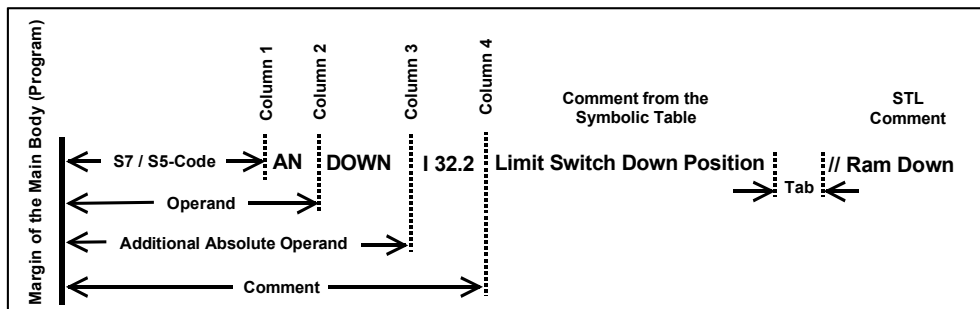


Figure 3-76 Symbolic operands and print symbol comments buttons marked

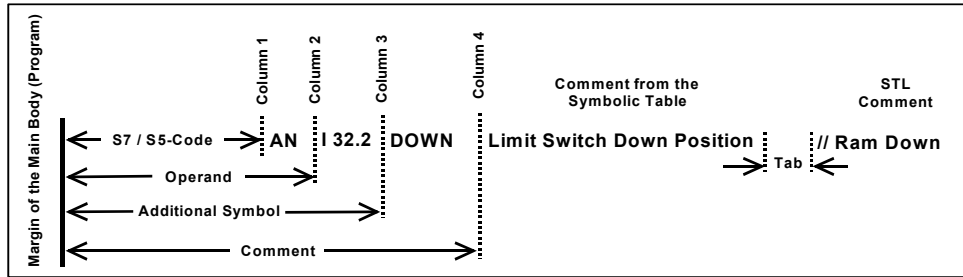
Example 2:

Figure 3-77 Absolute operands and print symbol comments buttons marked

Column Definition

Column	Definition
1	S7 / S5 code
2	Operand
3	Additional absolute operand or additional symbolic operand
4	Comment (Symbolic table and / or STL comment)

The comment, printed in an STL line can be made out of the following parts:

- S7- STL - comment, defined with two slash characters (//) in front of the comment, entered in the STL line.
- S5- STL - comment, defined with a semicolon (;) in front of the comment, entered in the STL line.
- The comment from the symbolic table (operand comment).

The STL comment will be printed at the next Tab position following the comment from the symbolic table. If no symbolic table comment is printed, the STL comment is printed in column 4.

3.2.13.6 Step Sequence (Documentation Layout Dialog Box)

The page layout for printing step sequence documentation is setup with the **Step Sequences** tab from the documentation layout dialog box. The settings from the **STL Columns** tab are saved in the project file **[project name].s5p**.

Column Width:

In the text field you can enter the number of characters that will define the width of the comment field (steps and transitions) for the printout. An automatic line wrap is provided to move the text that exceeds the column width, onto the next line. Up to 35 characters (space characters) are possible.

Note:

The number entered in the column width text field defines the size of the comment field for the printout. The number represents the number of space characters. The actual size (inches) depends on the font selected.

The width of the characters in a proportional font (e.g. Arial, Times New Roman etc.), will vary with the type of letter. Spaces do not necessarily have the same width as the same number of other characters.

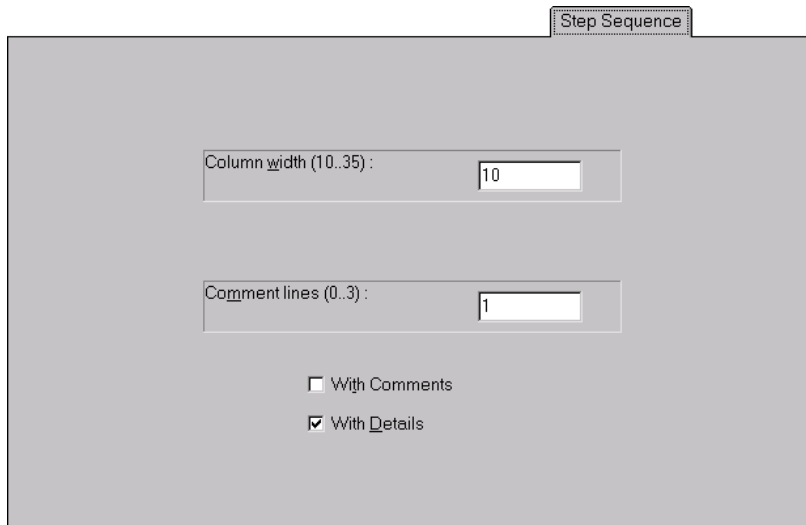


Figure 3-78 Step Sequence tab from the Documentation Layout dialog box

Comment lines:

You can enter the number of lines in the text field that the comment field can hold. The additional lines are automatically filled with text if the comment exceeds the column width. Up to three (3) lines are possible.

With Comments

If this button is marked the step and transition comments are printed.

With Details

If this button is marked the PLC logic, displayed in the step sequence detail display window, is printed out.

The appearance of the PLC logic in the printed documentation is controlled with settings from the **Presentation** tab of the **Documentation Layout** dialog box. The PLC logic may be printed as control system flowchart (CSF), ladder diagram (LAD), or statement list (STL). See chapter 3.2.13.1 for details.

3.2.14 Print

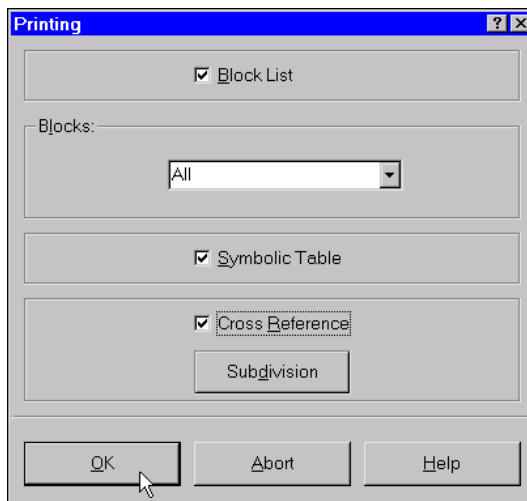



Figure 3-79 Printing dialog box

The **Print** command opens a dialog box where you can select the portions of the PLC program to be printed. The appearance of the PLC logic is controlled via the documentation layout dialog box (see chapter 3.2.13).

 ◆ Click **Print** in the File menu.

 ◆ Press **ALT + F, P**.

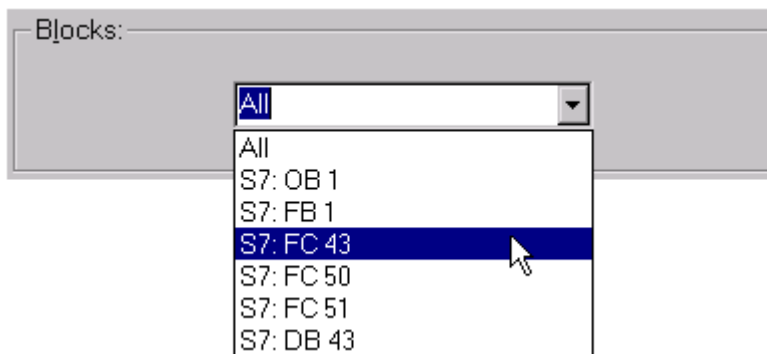
Printing dialog box opens (figure 3-79). The dialog box gives you the ability to select the items to be printed.

● Block List



If the block list button is marked, a list is printed with the information displayed in the **PC Block List** window with the names of the blocks, their length, date and time of the last modification, and the comments that will be printed out.

● Blocks:



A drop down list is provided to select a single block or all blocks.

● Symbolic Table



If the symbolic table button is marked, the symbolic table will be printed out.

● Cross Reference



If the cross-reference button is marked, the whole cross-reference list or portions of the cross-reference list are printed.



Reference.

The portions of the cross-reference list to be printed can be selected with the **Print Cross Reference** dialog box. Activate the *Subdivision* button to open the dialog box Print Cross

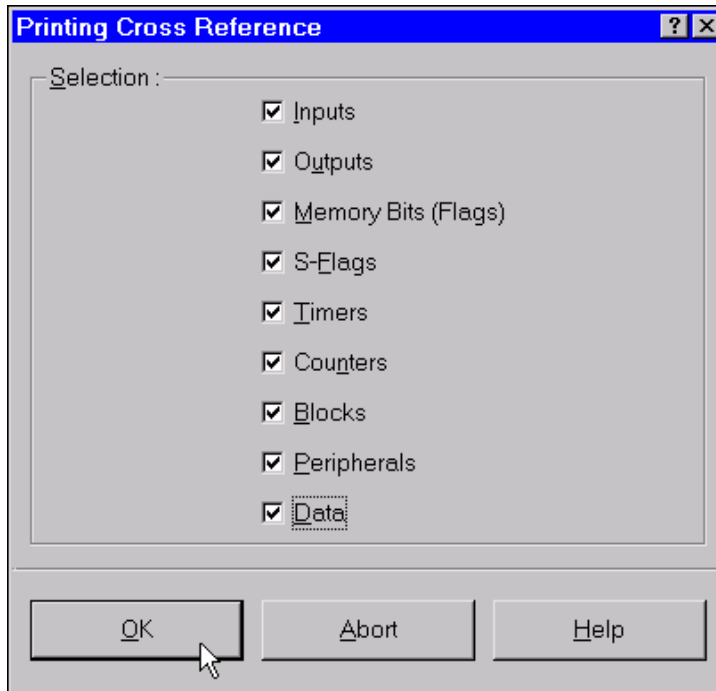


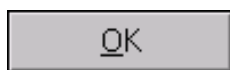
Figure 3-80 Print Cross Reference dialog box

- **Selection**

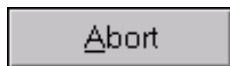
You may mark one, several, or all operand groups to be printed the cross-reference list. The cross-reference list is printed showing the selected operands and where they are used (block and segment number) within the PLC program.



Figure 3-81 Print Cross Reference dialog box general buttons



When clicking the **OK** button the current settings of the **Print Cross Reference** dialog box are saved. The settings are saved in the project file (*.s5p) and the dialog box is closed.



When clicking the **Abort** button all of the settings not previously saved are canceled and the dialog box is closed.

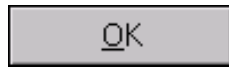


The integrated Help with topics concerning the Cross Reference list is opened.

- **Printing dialog box general buttons**



Figure 3-82 Printing dialog box general buttons



When clicking the **OK** button the current settings of the **Printing** dialog box are saved. The settings are saved in the project file (*.s5p), the dialog box is closed and the Windows Print dialog box (figure 3-83) is opened.



When clicking the **Abort** button all of the settings not previously saved are canceled and the dialog box is closed.



The integrated Help with topics concerning the printing dialog box settings is opened.

● Print dialog box

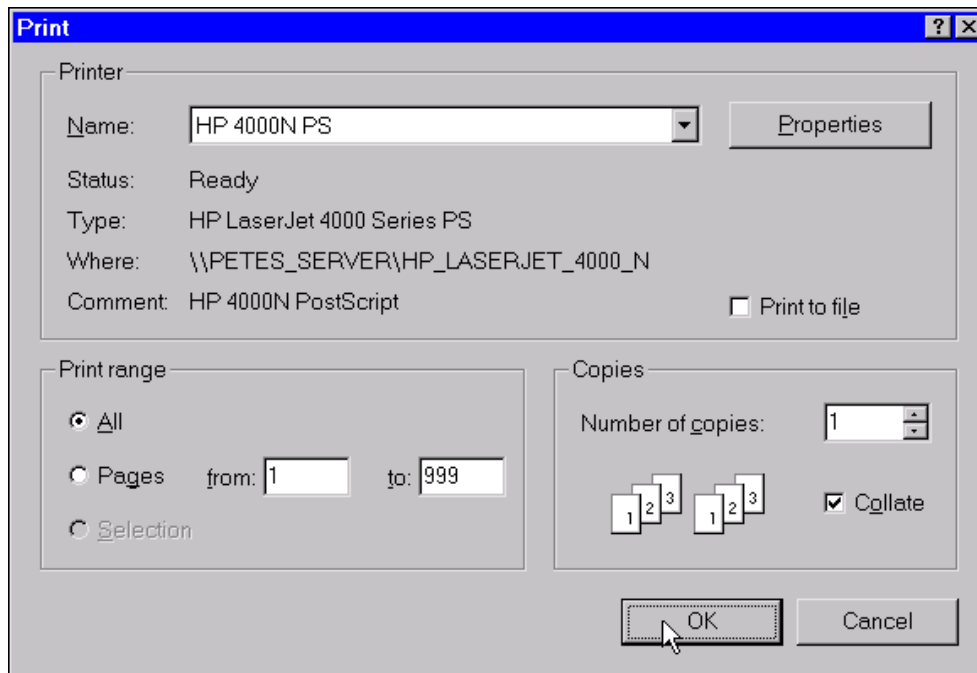


Figure 3-83 Printing dialog box general buttons

This dialog box provides buttons for printing a single page, selected pages or all pages. The number of copies may also be selected or the documentation may be printed to a file.

The button **Properties** opens another dialog box to setup the currently active printer. From the drop down list **Name** you may select another printer.

The appearance of the dialog box **Print**, and the other dialog boxes that can be opened from the **Print** dialog box, depend on the printers installed under Windows.

Activating the **OK** button starts the actual printing process.

3.3 Block (Block Menu – PC Block List)

The commands from the **Block** menu, in the PC block list window, are used to manage a single block, several blocks, a new block or existing blocks. Blocks can be converted from the S5 format to the S7 format or vice versa and the properties of these Blocks may be set or displayed.

The transfer of blocks to the PLC, or to an EPROM programming device (optional), is controlled with the commands from this menu. Cut, copy, and paste functions are provided and can be used to manipulate complete blocks.

Also, data blocks may be created with data masks, and blocks may be imported and exported as ASCII files. A graphical step sequence block may be generated and Blocks may be compared, with the appropriate optional software.

◆ Click **Block** in the menu bar.

◆ Press **ALT + B**.

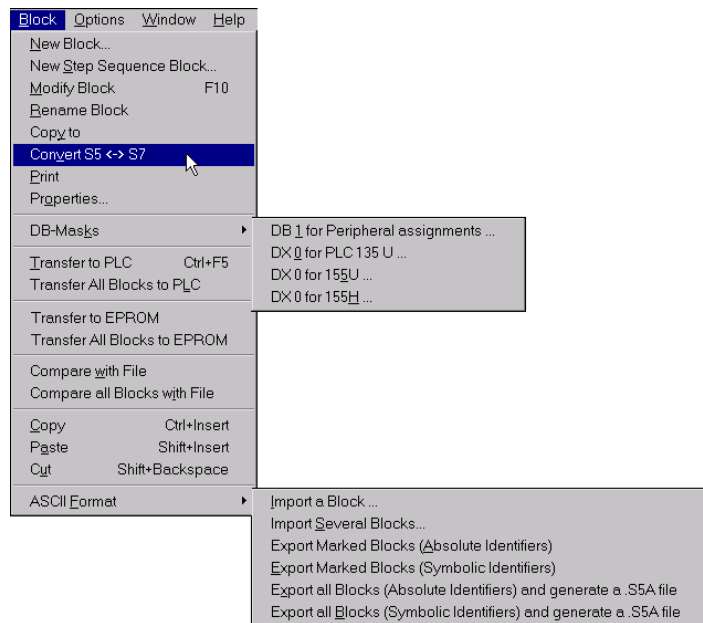


Figure 3-84 Block menu, PC Block List

Note:

Commands and icons that are displayed in light gray are not available. These functions may be part to an additional software option or another mode must be selected to execute these commands.

3.3.1 New Block (Block Menu)

The **New Block** command opens a dialog box to establish the name of the new block. The drop down list shows you the existing blocks. Modifying the segment number is not necessary as a new block always starts with the network (segment) number one (1).

- ◆ Click **New Block** in the block menu.
- ◆ Press **ALT + B, N**.

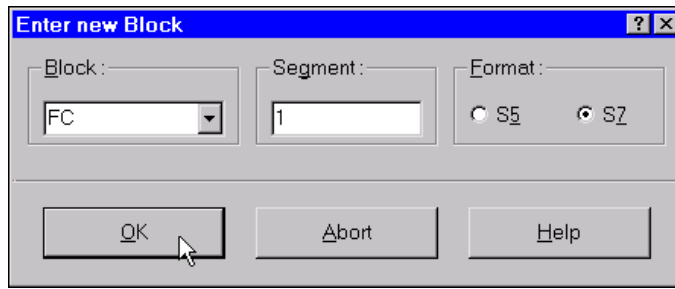
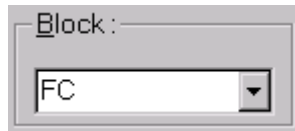


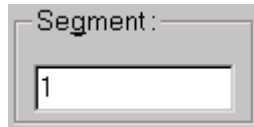
Figure 3-85 Enter new Block dialog box

- **Block**



Enter the block name in the text field. A block name is made up of a two (2) character identifier and a counting number. A drop down list is provided to display the existing blocks. S5 and S7 use different Block types and different Block names (see tables below).

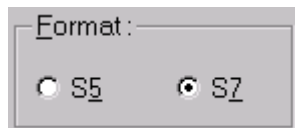
- **Segment (Network)**



In S5 terminology a PLC Block is divided into **Segments**. The S7 literature uses the term **Network** for the same portion of a Block. Because this manual describes S5 and S7 subjects, you will find both terms and they have the same meaning.

A new block always starts with the segment (network) number one (1). Entering the segment number is not required.

- **Format**



A new Block can be created in the Step® 5 (S5) or the Step® 7 (S7) syntax. The default Block format is set in the **Miscellaneous** tab (Preferred Syntax) of the Preference dialog box (see chapter 3.2.11.5).

After entering the new Block name and selecting the Block format confirm with **OK**. The Block Editor window is opened and ready for creating a new Block.

Blocks available with S5

Abbreviation	Block	
	Name	Parameter Limits Counting Numbers
OB	Organization Block	1 - 39
PB	Program Block	0 - 255
SB	Step Sequence Block (without graphical display)	0 - 255
FB	Function Block	0 - 255
FX	Extended Function Block	0 - 255
DB	Data Block	0 - 255
DX	Extended Data Block	0 - 255
BB	Picture Block	0 - 255

Table 3-2 Step® 5 Block names

Organization Block (OB)

OB's are made up of STEP® 5 instructions, special block calls, and maybe, comments. The instructions may be edited and displayed in STL, CSF, and LAD (optional). Comments may be added. Jump instructions may be disabled by activating the button, **Jumps within FB's only** (see chapter 3.2.11.5).

Graphical step sequence may be programmed using the *G5 for Windows* (optional) mode. These step sequences can only be executed if jump instructions are enabled within OB's.

Program Blocks (PB)

PB's are made up of STEP® 5 instructions. The PLC program or parts of the program are stored in PB's. Comments may be added. The instructions may be edited and displayed in STL, CSF, and LAD (optional). Jump instructions may be disabled by activating the button, **Jumps within FB's only** (see chapter 3.2.11.5).

Graphical step sequence may be programmed using the *G5 for Windows* (optional) mode. These step sequences can only be executed if jump instructions are enabled within PB's.

Function Blocks (FB, FX)

FB's are made up of STEP® 5 instructions. The PLC program or parts of the program are stored in FB's. Especially complex or recurring program sequences, are accomplished within FB's. Comments may be added. The instructions may be edited and displayed in STL, CSF, and LAD (optional). The first segment, with the name and the identifiers, must be programmed using STL presentation.

Graphical step sequence may be programmed using the *G5 for Windows* (optional) mode.

Picture Blocks (BB)

Operands (process variables) and data words are defined in a BB to display their status. Comments may be edited in a separate line (a semicolon (;) in front of the comment line). No comment lines are permitted between data words or between a data block identifier and a data word.

Example: Picture Block (BB) Editor

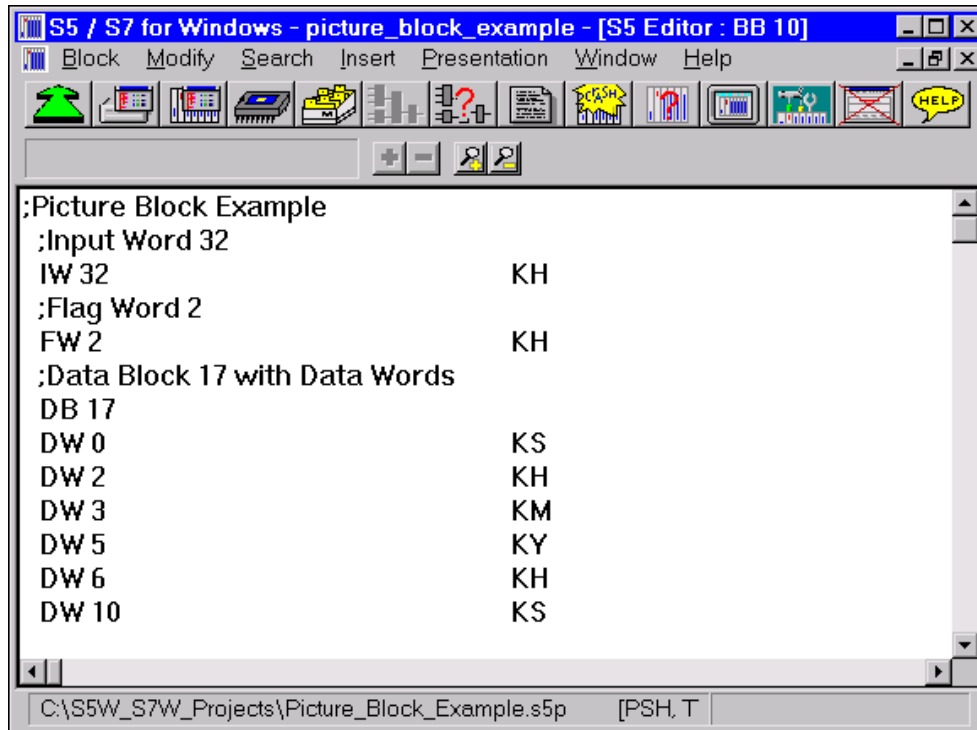


Figure 3-86 Picture Block example

In a Picture Block (**BB**), defined operands (process variables) and data words may be modified directly from the status display.

Data Blocks (DB, DX)

DB's are used to store data (e.g. constants for timers, bit maps, numbers, etc.) for the use within the PLC program

● Sequence Block (SB)

SB's may be programmed using two different tools.

Generating SB's using S5 for Windows

SB's are handled exactly the same way as PB's. They are made up of STEP® 5 instructions. The PLC program or parts of the program are stored in PB's. Comments may be added. The instructions may be edited and displayed in STL, CSF, and LAD (optional). Jump instructions may be disabled by activating the button, **Jumps within FB's only** (preference dialog box called from the project menu).

Generating SB's using G5 for Windows

A Step Sequence Block is programmed using the graphical tools provided by G5 for Windows (optional). A step sequence is made up of steps and transitions to control a sequential process. A detailed description on how to use G5 for Windows can be found in the S5 for Windows User's Guide.

Note:

Programs generated with **G5 for Windows** can be converted into S7 code and may be executed on an **S7-300/400 PLC**.

Blocks available with S7

Abbreviation	Block Name	Parameter Limits Counting Numbers
OB	Organization Block	The number of Blocks possible depends on the S7-300/400 CPU used
FC	Function	
FB	Function Block	
SFC	System Function	
SFB	System Function Block	
DB	Data Block	
SDB	System Data Block	

Table 3-3 Step® 7 Block names

Organization Block (OB)

OB's are made up of STEP® 7 instructions, special block calls, and maybe comments. The instructions may be edited and displayed in STL, CSF, and LAD (optional).

Organization Blocks provide the interface between the users PLC program and the Operating System being executed on the CPU. OB1 is called automatically after it finishes providing the cyclical processing of the users PLC Program. Other Organization Blocks are called by special hardware and software events or interrupts.

Organization Blocks can only be called by the CPU operating system and not by any other PLC Blocks.

Function (FC)

FC's are made up of STEP® 7 instructions. The PLC program, or part of the program, is stored in PB's. Comments may be added. The instructions may be edited and displayed in STL, CSF, and LAD (optional).

FC's have no memory area associated with it. These Blocks may be called anytime from any other PLC Block. Different variables may be passed to the FC whenever the Block is called. The local temporary data used by the FC is relocated after the FC is processed.

Function Block (FB)

FB's are made up of STEP® 7 instructions. The PLC program, or part of the program, is stored in PB's. Comments may be added. The instructions may be edited and displayed in STL, CSF, and LAD (optional).

FB's have memory area associated with it. When calling an FB, a Data Block (Instance DB) must be provided. The Blocks may be called anytime from any other PLC Block. Different variables may be passed to the FB whenever the Block is called. Static

variables for the FB are stored in the Instance DB. The local temporary data used by the FB is relocated after the FB is processed.

FB's can be called with different Instance DB that are assigned to it.

System Function (SFC)

SFC's are PLC Blocks integrated in the S7-300/400 operating system. The SFC's can be called from any other PLC Block. SFC's do not use Instance DB's.

System Function Block (SFB)

SFB's are PLC Blocks integrated in the S7-300/400 operating system. They are very similar in use as the FB's. Different variables may be passed to the SFB whenever the Block is called. Static variables for the SFB are stored in the Instance DB.

SFB's can be called with different Instance DB that are assigned to it.

Data Block (DB)

The PLC's S7-300/400 understand two types of Data Blocks. The Instance Data Block is used to store the data to be used with the its assigned FB. The *shared* DB address is located in the DB address register when the DB is opened. The data from this DB can be used by FC's, FB's or OB's. The DB also provides a storage area for these blocks.

System Data Block (SDB)

SDB's are generated by the CPU operating system to store data required for the PLC operation. The S7-300/400 hardware configuration is stored in SDB's.

3.3.2 New Step Sequence Block (Block Menu)

◆ Click **New Block** in the block menu.

◆ Press **ALT + B, S**.

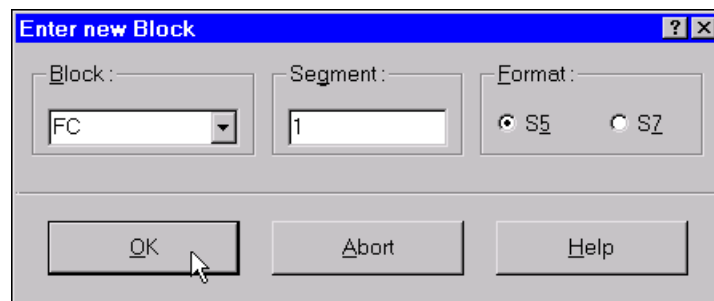


Figure 3-87 Enter new Block dialog box

The **New Step Sequence Block** command opens a dialog box to name the new block. The drop down list shows you the existing blocks. Modifying the segment number is not necessary as a new block always starts with the network (segment) number one (1). This command is only available with the *G5 for Windows* option. Detailed information on how to use the graphical step sequence programming can be found in the *S5 for Windows User's Guide*.

Currently you can only select Block in the S5 format.

- **Block**

Enter the block name in the text field. A block name is made up of a two (2) character identifier and a counting number. A drop down list is provided to display the existing blocks. Only S5 Block names may be used.

Note:

G5 for Windows not only provides a mode to program step sequences in **Sequence Blocks (SB)**, but also in OB's, PB's, and FB's.

These step sequences can only be executed if jump instructions are permitted in the selected block (CPU dependent). To do so, the **Jumps in FB's only** button in the **Miscellaneous** tab of the **Preference** dialog box (see chapter 3.2.11.5) must be marked.

If graphical step sequences are programmed outside of Step Blocks (SB), errors may occur when these Blocks are edited with a Siemens PU.

- **Segment (Network)**

A new block always starts with the segment number one (1). Entering the segment number is not required.

- **Format**

The new Block can only be created in the Step@ 5 (S5) syntax. The default Block format is set in the **Miscellaneous** tab (Preferred Syntax) of the Preference dialog box (see chapter 3.2.11.5).

After entering the new Block name and selecting the Block format confirm with **OK**.

3.3.3 Modify Block (Block Menu)

The **Modify** command opens the **Block Editor** window. The selected block from the PC block list window for is ready for modifications.

◆ Click **Modify** in the block menu.

◆ Press **F10 (ALT + B, M)**.

If a block was selected (marked) in the PC block list window, the **Block Editor** window is opened and the first segment of the marked block is ready for modifications.

If no block was selected (marked) in the PC block list window, the **Modify Block** dialog box opens.

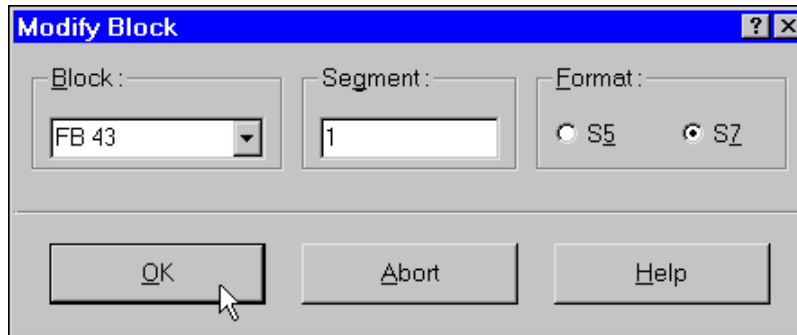
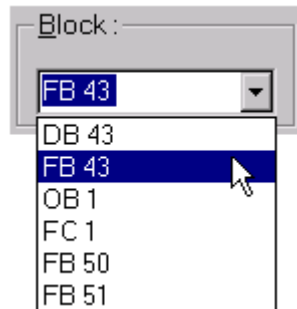


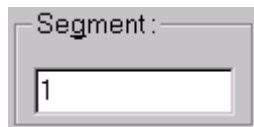
Figure 3-88 Modify Block dialog box

- **Block**



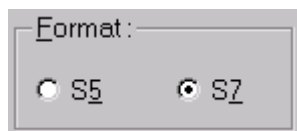
Select the block name to be modified from the drop down list. S5 and S7 use different Block types and different Block names (see tables 3-2, 3-3).

- **Segment (Network)**



Enter the segment (network) number of the block to be modified.

- **Format**



Select the format of the block to be modified. The default block format is set in the **Miscellaneous** tab (Preferred Syntax) of the Preference dialog box (see chapter 3.2.11.5).

Confirm the selection with the **OK** button. The Block Editor window is opened and the block is ready for modifications.

3.3.4 Rename Block (Block Menu)

With the **Rename** command you can give an existing block another number and/or convert the block into another format. The old block is deleted.

- **The existing block and the renamed block have the same format:**

The name identifier (OB, DB, FB, FC; PB, SB etc.) must stay the same. The format selection (From:, To:) is the same.

- **The existing block and the renamed block have different formats:**

If the format of the renamed block is different from the original block, a rename and a conversion take place. It is only possible to convert and rename a block into a corresponding block type.

S5 Block Type ↔ S7 Block Type	
OB	OB
PB, SB	FB
FB, FX	FC, SFC, SFB
DB, DX	DB

Table 3-4 Corresponding block types

◆ Click **Rename** in the block menu.

◆ Press **ALT + B, R**.

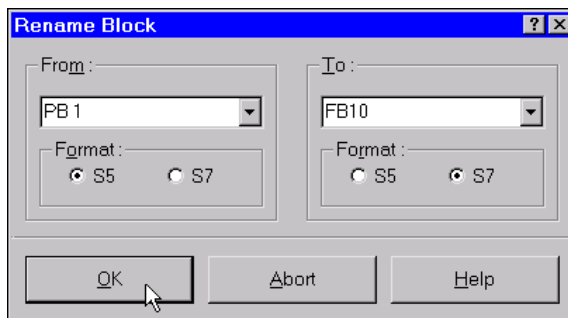


Figure 3-89 Rename dialog box

- **From :**

Format:

Format :
 S5 S7

Select the format of the block to be renamed and/or converted.

From :
 PB 1
 DB 43
 FB 43
 OB 1
 PB 1
 FB 50
 FB 51

Select the block to be renamed from the drop down list. S5 and S7 are using different Block types and different Block names (see tables 3-2, 3-3).

- **To :**

Format:

Format
 S5 S7

Select the format of the block to be renamed and/or converted.

To
 FB10
 DB 43
 FB 43
 OB 1
 PB 1
 FB 50
 FB 51

Enter the new block name. The drop down list gives you an overview of the blocks already used. Confirm the rename with the **OK** button.

3.3.5 Copy to (Block Menu)

With the **Copy to** command you may make a copy of an existing block and/or convert the block into another format. The original block remains untouched.

- **The existing block and the copied block have the same format:**

The name identifier (OB, DB, FB, FC; PB, SB etc.) must stay the same. The copied block will have a new counting number. The format selection (**From:**, **To:**) are the same.


- **The existing block and the copied block have different formats:**

If the format of the copied block is different from the original block, the copying and the conversion take place. It is only possible to convert and copy a block into a corresponding block type.

S5 Block Type ↔ S7 Block Type	
OB	OB
PB, SB	FB
FB, FX	FC, SFC, SFB
DB, DX	DB

Table 3-5 Corresponding block types

 ◆ Click **Copy to** in the block menu.

 ◆ Press **ALT + B, Y**.

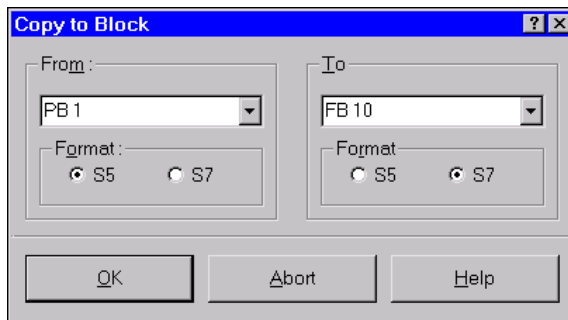
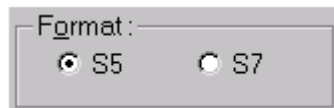


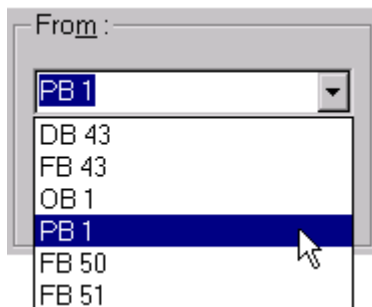
Figure 3-90 Copy to Block dialog box

- **From :**

Format:



Select the format of the block to be copied and/or converted.



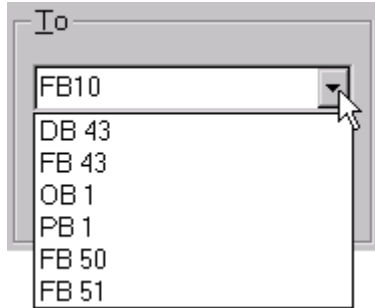
Select the block to be copied and/or converted from the drop down list. S5 and S7 use different Block types and different Block names (see tables 3-2, 3-3).

- To :

Format:



Select the format of the block to be copied and/or converted.




Enter the new block name. The drop down list gives you an overview of the blocks already used. Confirm the copying and/or conversion with the **OK** button.

3.3.6 Convert S5 ⇔ S7 (Block Menu)

The **Convert S5 ⇔ S7** is used to convert a block from the S5 format into a block with the S7 format. The command may also be used to convert an S7 block back into its S5 format.

The block being converted must be selected (marked) in the PC block list window prior executing the **Convert S5 ⇔ S7** command.

 ◆ Click **Convert S5 ⇔ S7** in the block menu.

 ◆ Press **ALT + B, V**.

Note:

Not all S5 instructions can be converted into S7 code (see chapter 3.3.6.1)

The Step® 7 syntax understands more instructions than the Step® 5 syntax. It is almost impossible to convert a block programmed in the S7 format into the S5 format, but a PLC Block, original written in the S5 syntax and converted into the S7 format, can be converted back, as long as no instructions not understood by the S5 syntax, have been added to the PLC block.

3.3.6.1 S5 Instructions not Converted into S7 for Windows

Not all of the S5 instructions can be converted into the S7-300/400 format. These are mainly the instructions to access the system memory areas (e.g. LIR, TIR, etc.) of a S5 CPU. These instructions cannot be used with a S7 CPU.

Blocks using one or more of the following instructions cannot be transferred to the S7-300 / 400 PLC series.

Bit – Test Operations					
TB T x.y	TBN T x.y	SU T x.y	RU T x.y		
TB C x.y	TBN C x.y	SU C x.y	RU C x.y		
TB RI x.y	TBN RI x.y	SU RI x.y	RU RI x.y		
TB RJ x.y	TBN RJ x.y	SU RJ x.y	RU RJ x.y		
TB RS x,y	TBN RS x,y	SU RS x,y	RU RS x,y		
TB RT x.y	TBN RT x.y	SU RT x.y	RU RT x.y		
Load - and Transfer Operations with System Data					
L RI x	L RJ x	L RS x	L RT x		
T RI x	T RJ x	T RS x	T RT x		
Register Functions					
LDI A1	LDI A2	LDI SA	LDI BA	LDI BR	LIR
TDI A1	TDI A2	TDI SA	TDI BA	TDI BR	TIR
MAS	MAB	MSA	MSB	MBA	MBS
MBR	ABR				
Load - and Transfer Operations to or from Absolute Addresses					
LYCBx	LYCWx	LYCDx	LYGBx	LYGWx	LYGDx
LRWx	LRDx	LWCWx	LWCDx	LWGWx	LWGDx
TYCBx	TYCWx	TYCDx	TYGBx	TYGWx	TYGDx
TRWx	TRDx	TWCWx	TWCDx	TWGWx	TWGDx
TYCx	TNBx	TNWx			
Block Transfer Operations					
TXB	TXW				
Jump Operations					
JU OBx	JC OBx				
Other Organizational Operations					
SEDx (SESx)	SEEx (SEFx)	TSCx	TSGx	LIM	SIM
DO RS	RAS	RAF	IAE	RAE	IA
RA	UBE	STP	STS	STW	
Other Operations					
ACR	ENT				
DI					
ASM KHx					

Table 3-6 S5 instruction not possible to be converted into S7 format

3.3.6.2 S7 Block Names

The S7-300 / 400 series PLC's does not recognize Program Blocks (PBxx), Step Sequence Blocks (SBxx), Extended Function Blocks (FXxx), or Extended Data Blocks (DXxx).

To organize a S7 PLC program the following block types are available for the program code:

- Organization Blocks (OB)
- Function Blocks (FB)
- Functions (FC)
- System Functions (SFC)
- System Function Blocks (SFB)
- Data Blocks (DB)
- System Data Blocks (SDB)

The number of code blocks available depends on the type of CPU used.

CPU	OB	FC	FB	DB	SFC	SFB
312	3	32	32	63	25	2
315-2 DP	14	128	128	127	39	See CPU Manual
3xx	13	128	128	127	34	
412/413	See CPU Manual	256	256	511	See CPU Manual	
414		512	1024	1023		
416		2048	2048	4095		

Table 3-7 Number of blocks per block type

3.3.6.3 Block Name Assignment

If a PLC code block is converted by *S7 for Windows*, the following standard assignment is performed.

S5 for Windows ↔ S7 for Windows	
OB 0 ... 255	OB 0 ... 255
OB 6	OB 20
OB 10 .. 18	OB 30 .. 38
OB 19	OB 121
OB 20	OB 100
OB 21	OB 101
OB 23	OB 122
OB 26	OB 80
OB 34	OB 81
OB 35	OB 84
PB 0 ... 255	FB 0 ... 255
FB 0 ... 255	FC 0 ... 255

DB 0 ... 255	DB 0 ... 255
DX 0 ... 255	DB 256 ... 511
SB 0 ... 255	FB 256 ... 511
FX 0 ... 127	SFC 0 ... 127
FX 128 ... 255	SFB 0 ... 127

Table 3-8 Block name assignment

The standard assignment for the code block names can be modified. To do so the entries in the S5CONVS7.INI file must be altered. The file must be located in the *S5 for Windows* folder (directory). The syntax to assign code block names is as follows:

[BLOCKNAMES]

<S5-Name>=<S7-Name>

<S5-Name>=<S7-Name>

Example:

You want to convert code block SFB 12 into FB 12. You want to convert code block FX 10, FX 11, and FX 12 into functions FC 300, FC 301, and FC 302:

[BLOCKNAMES]

FB12=SFB12

FX10=FC300

FX11=FC301

FX12=FC302

Only code blocks of the same type may be converted:


S5 Code Block Type	S7 Code Block Type
OB	OB
PB, SB	FB
FB, FX	FC, SFC, SFB
DB, DX	DB

Table 3-9 Corresponding block types

3.3.7 Print Block (Block Menu)

The **Print** command is used to print out the documentation of existing blocks. The documentation layout will be in accordance to the settings selected with the dialog boxes **Documentation Layout** (see chapter 3.2.13). The **Print** command only works if one or more blocks are marked.

 ◆ Click **Print** in the block menu.

 ◆ Press **ALT + B, P**.

If one block or several blocks have been selected (marked) in the PC block list window, the **Print** dialog box is opened (see chapter 3.2.12, figure 3-57).

To begin the printing process you can also click the **Print** icon from the tool bar



3.3.8 Properties (Block Menu)

The **Properties** command opens up a dialog box that displays information about the block marked in the PLC Block List. Fields are provided to enter additional information about the block.

◆ Click **Properties** in the block menu.

◆ Press **ALT + B, O**.

Figure 3-91 Block Properties (FB 12) dialog box

- **Comment:**

<u>C</u> omment :	Punch Press Sequence Control
-------------------	------------------------------

- **S7 for Windows**

The text entered in the **Comment** field can be displayed in the PC Block List. The information that is displayed in the PC Block List depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The text is stored in the Block Header under the **key word "Title"**. The comment can have up to 60 characters.

```

FUNCTION_BLOCK FB 12
TITLE=Punch Press Sequence Control
AUTHOR : PSH
FAMILY : S7W
NAME : PSC_99
VERSION : 2.1

```

Figure 3-92 Block Header

S5 for Windows The text entered in the Comment field has the highest priority of all the comments to be displayed in the PC Block List. The other comments to be displayed in the PC Block List are selected in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The text is saved in the project file (*.s5p). The comment can have up to 60 characters. If the PLC program is exported the comment will be lost.

- **Library Number:**

Library Number : 12345

You may assign a library number to a block. The library number is a five (5) digit identification number. If you are using original SIEMENS block this number has been assigned. If you programmed the block yourself you can assign a library number to that block. The library number is saved in the PLC when you transfer the block to the PLC. Only *S5 for Windows* understands Library Numbers.

- **Name:**

Name : PSC_99

S7 for Windows The text entered in the **Name** field can be displayed in the PC Block List and the PLC Block List. The information that is displayed in the PC Block List (PLC Block List) depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The text is stored in the Block Header under the **key word "Name"** (see figure 3-92). The comment can have up to 8 characters.

S5 for Windows The text entered in the **Name** field can be displayed in the PC Block List. The information that is displayed in the PC Block List depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The name can have up to 8 characters. The text is saved in the project file (*.s5p). If the PLC program is exported the comment will be lost.

- **Family:**

Family : S7W

S7 for Windows The text entered in the **Family** field can be displayed in the PC Block List and the PLC Block List. The information that is displayed in the PC Block List (PLC Block List) depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The text is stored in the Block Header under the **key word "Family"** (see figure 3-92). The comment can have up to 8 characters.

S5 for Windows The text entered in the **Family** field can be displayed in the PC Block List. The information that is displayed in the PC Block List depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The name can have up to 8 characters. The text is saved in the project file (*.s5p). If the PLC program is exported the comment will be lost.

- **Author:**

Author : PSH

S7 for Windows The text entered in the **Author** field can be displayed in the PC Block List and the PLC Block List. The information that is displayed in the PC Block List (PLC Block List) depends on the settings in the **Listings** tab of the **Preference**

dialog box (see chapter 3.2.11.3). The text is stored in the Block Header under the **key word "Author"** (see figure 3-92). The comment can have up to 8 characters.

S5 for Windows The text entered in the **Author** field can be displayed in the PC Block List. The information that is displayed in the PC Block List depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The name can have up to 8 characters. The text is saved in the project file (*.s5p). If the PLC program is exported the comment will be lost.

- **Version:**

Author :

S7 for Windows The number entered in the **Version** field can be displayed in the PC Block List and the PLC Block List. The information that is displayed in the PC Block List (PLC Block List) depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3). The number is stored in the Block Header under the **key word "Version"** (see figure 3-92).

A version number can be used. If you elect to use a version number it must have at least one number before and one number after the period (1.0) and can have a maximum of two numbers before and two numbers after the period (15.15).

S5 for Windows The number entered in the **Version** field can be displayed in the PC Block List. The information that is displayed in the PC Block List depends on the settings in the **Listings** tab of the **Preference** dialog box (see chapter 3.2.11.3).

A version number can be used. If you elect to use a version number it must have at least one number before and one number after the period (1.0) and can have a maximum of two numbers before and two numbers after the period (15.15). The number is saved in the project file (*.s5p). If the PLC program is exported the comment will be lost.

Format:

Format :

Format displays the current code format of the block. This can be S7 or S5. The information displayed is generated from the actual code of the block and is the same information displayed in the PC Block List (if selected see chapter 3.2.11.3).

Created in presentation:

Created in presentation :

Created in presentation displays the presentation used (STL, LAD, CSF, etc.) to create the block. This information is used by the S7 CPU in case the program was programmed using another programming language (e.g. SCL etc.).

The information is saved in the S7 block and remains valid if the block is exported. (reserved for *S7 for Windows* versions above 4.05).

Created:

Created :

Created displays the date and time the block was created.

S7 for Windows The information is saved in the S7 block and remains valid if the block is exported.

S5 for Windows The information is saved in the project file (*.s5p). If the PLC program is exported the date will be lost.

Last modified:

Last modified : 07.11.1999 14:12:33

Last modified displays the date and time the block was modified the last time.

S7 for Windows The information is saved in the S7 block and remains valid if the block is exported.

S5 for Windows The information is saved in the project file (*.s5p). If the PLC program is exported the date will be lost.

Interface last modified:

Interface last modified : 05.11.1999 10:01:29

Interface last modified displays the last date and time the local variables (interface to the program) have been modified.

The information is saved in the S7 block and remains valid if the block is exported (reserved for *S7 for Windows* versions above 4.05). S5 does not understand this information.

Total length:

Total length : 376

Total length displays the memory area the block would use if transferred into the PLC (S7 load memory). The length is displayed in bytes. The information displayed is generated from the actual code of the block and is the same information displayed in the PC Block List (if selected see chapter 3.2.11.3).

This information is not saved but recalculated whenever a S7 or S5 block is created, modified or opened.

Code length:

Code length : 248

A PLC block is made up of the actual code and the block header. When transferring a block into an S7-300/400 CPU, the total block (with its block header) is loaded into the **Load Memory**. The actual code (the block without its header) is then passed into the CPU RAM. Therefore, an S7 block will need more space in the load memory than in the CPU RAM. **Code length** displays the length of the code of a block (total block length minus header).

S5 does not use this technique; the total block is always saved in the CPU RAM.

The information is not saved but recalculated whenever a S7 or S5 block is created, modified or opened.

Number of Segments:

Number of Segments : 12

Number of Segments (Networks) displays the current number of Networks (Segments) within the block.

The information is not saved but recalculated whenever a S7 or S5 block is created, modified or opened.

Number of Jumps:

Number of Jumps : 2

Number of Jumps displays the current number of jumps within the block.

The information is not saved but recalculated whenever a S7 or S5 block is created, modified or opened.

Number of Jump Tags:

Number of Jump Tags : 2

Number of Jump Tags displays the current number of Jump Tags (destination of a jump) within the block. The number of Jumps and the number of Jump Tags must be equal because jumps are only allowed within the block.

The information is not saved but recalculated whenever a S7 or S5 block is created, modified or opened.

Local Data length:

Local Data length : 30

An S7 block may have local data (Local Variables) assigned to. The memory area occupied by the local data in the S7-300/400 CPU memory is displayed in bytes. Local Data needs the same amount of space in the **Load Memory** and the **CPU RAM**.

S5 blocks do not understand local data.

The information is not saved but recalculated whenever a S7 block is created, modified or opened.

Attributes:

Attributes :

Block Attributes are currently not supported by *S7 for Windows*. S5 does not understand local data.

Statement Comments:

Statement Comments :
 Number : 10
 Length : 243

A Statement Comment is a text entered in a line (STL presentation) to describe the function. This comment could be placed in a separate line or in the line with the code. In the Statement Comments field, the number of Statement Comments about the block and their length (in byte) are displayed. S5 and S7 understand Statement Comments.

Segment Comments:

Segment Comments :	
Number :	0
Length :	0

A Segment Comment is a text assigned to a network (segment). In the Segment Comments field, the number of Segment Comments about the block and their length (in byte) are displayed. S5 and S7 understand Segment Comment.

3.3.9 DB - Masks (Block Menu)

S5 for Windows provides special masks as dialog boxes to generate the data blocks DB1 and DX for the PLC 135U, 155U and 155H.

◆ Click **DB - Masks** in the block menu.

◆ Press **ALT + B, K**.

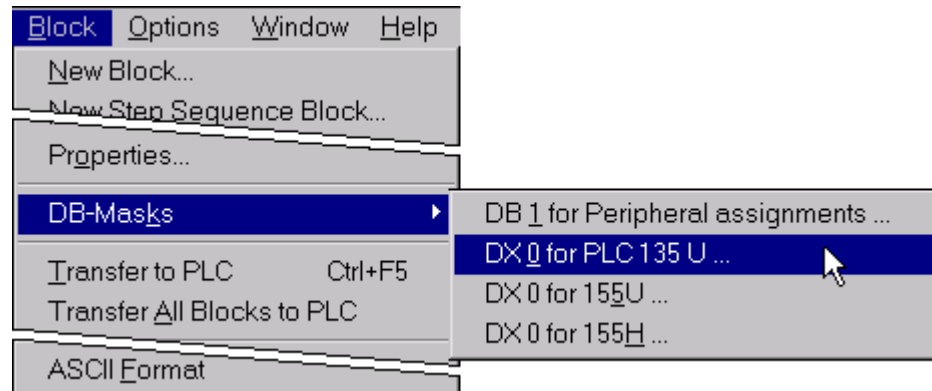


Figure 3-93 **DB - Masks** menu

3.3.9.1 DB 1 for Peripheral assignments

The PLC 135 U may be used as a multi-processor PLC system. Since all CPU's use the same I/O bus, each digital input and output module must be allocated to a specific CPU. Also, the inter-processor communication (IPC), input and output flags, and the length of the timer field (area) must be assigned to specific CPU.

◆ Click **DB - Masks** in the block menu and **DB 1 for Peripheral assignments** in the DB - Masks menu.

◆ Press **ALT + B, K, 1**.

The definition of the values to be entered can be found in the manual for the particular CPU.

The data block DB1 is generated and will be displayed in the PC block list window.

Confirm the entered values by activating the **OK** button.

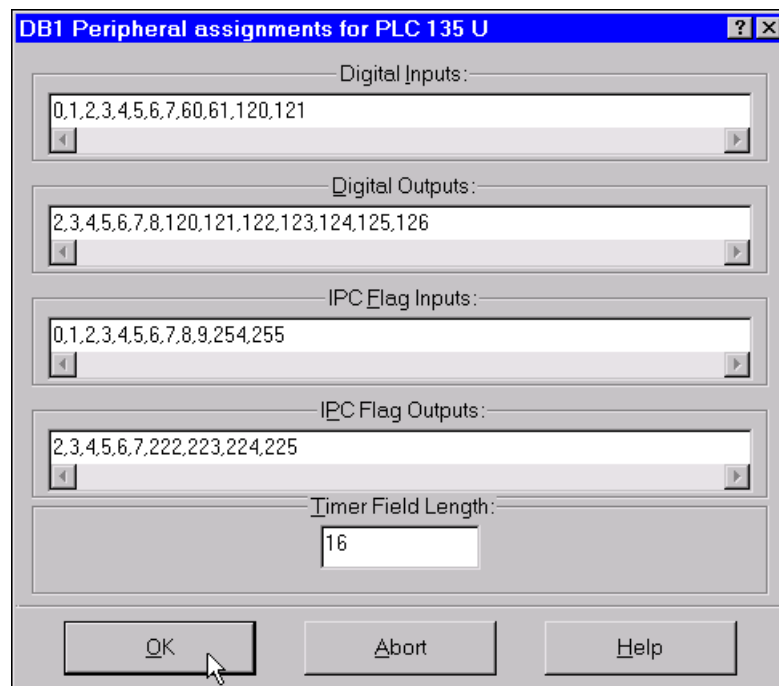


Figure 3-94 DB 1 for Peripheral assignments for PLC 135 U dialog box

3.3.9.2 DX 0 for PLC 135 U

S5 for Windows provides a dialog box **DX0 Parameter (PLC 135 U: CPU 928B, CPU 928, CPU 922)** that allows you to easily enter system data and presets.

- ◆ Click **DB - Masks** in the block menu and **DX 0 for PLC 135 U** in the DB - Masks menu.
- ◆ Press **ALT + B, K, 0**.

Which buttons you mark and the values you have to enter will depend on the project and the CPU you are using. The definition of the buttons and the values to be entered can be found in the manual for the particular CPU.

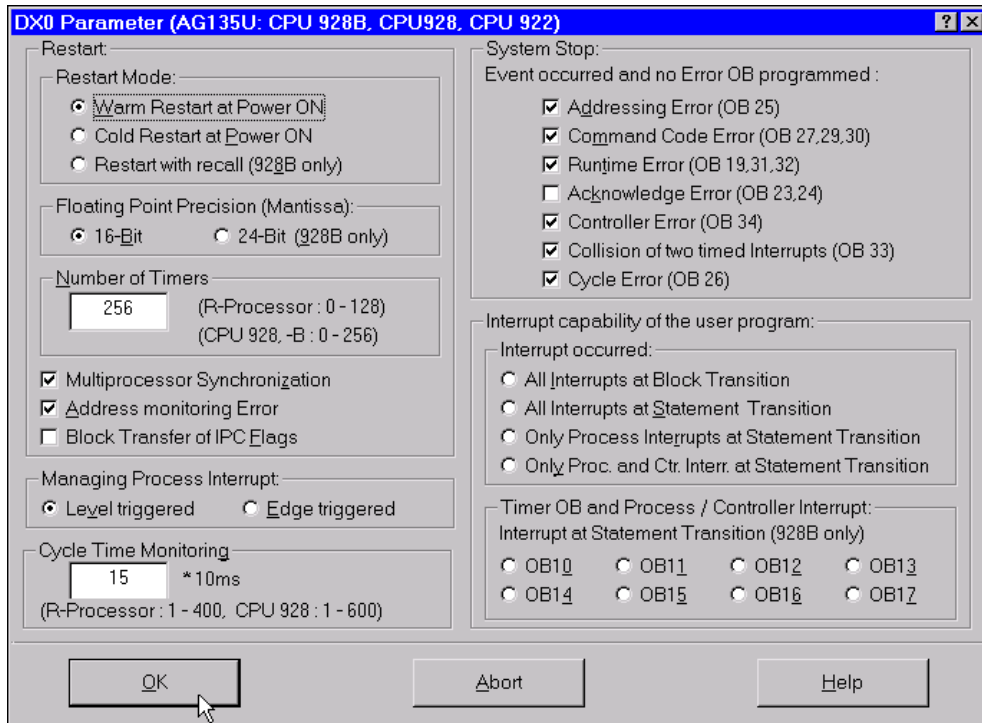


Figure 3-95 **DX0 Parameter (PLC 135 U: CPU 928B, CPU 928, CPU 922)** dialog box

Confirm the entered values and the marked buttons by activating the **OK** button.

The data block DX0 is generated and will be displayed in the PC block list window.

3.3.9.3 DX 0 for 155 U

S5 for Windows provides a dialog box **DX0 Parameter (PLC 155 U: CPU 946/947/948)** that allows you to easily enter system data and presets

◆ Click **DB - Masks** in the block menu and **DX 0 for 155 U** in the DB - Masks menu.

◆ Press **ALT + B, K, 5**.

Which buttons you mark and the values you have to enter will depend on the project and the CPU you are using. The definition of the buttons and the values to be entered can be found in the manual for the particular CPU.

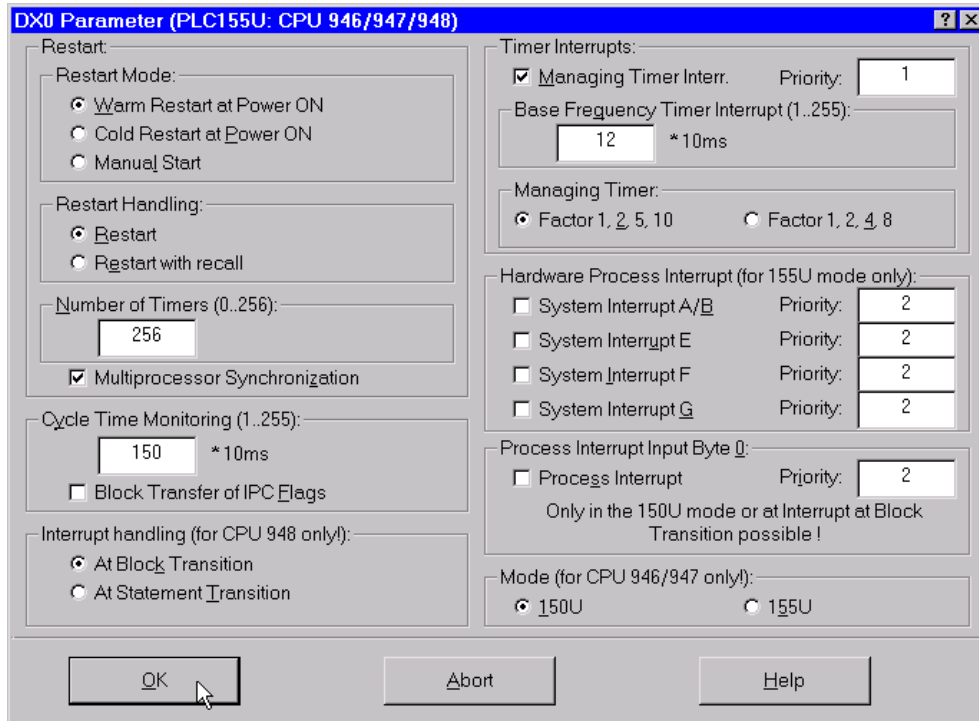


Figure 3-96 **DX0 Parameter (PLC 155 U: CPU 946/947/948)** dialog box

Confirm the entered values and the marked buttons by activating the **OK** button.

The data block DX0 is generated and will be displayed in the PC block list window.

3.3.9.4 DX 0 for 155 H

S5 for Windows provides a dialog box **DX0 Parameter (PLC 155 H: CPU 948R)** that allows you to easily enter system data and presets.

- ◆ Click **DB - Masks** in the block menu and **DX 0 for 155 H** in the DB - Masks menu.
- ◆ Press **ALT + B, K, H**.

Which buttons you mark and the values you have to enter will depend on the project and the CPU you are using. The definition of the buttons and the values to be entered can be found in the manual for the particular CPU.

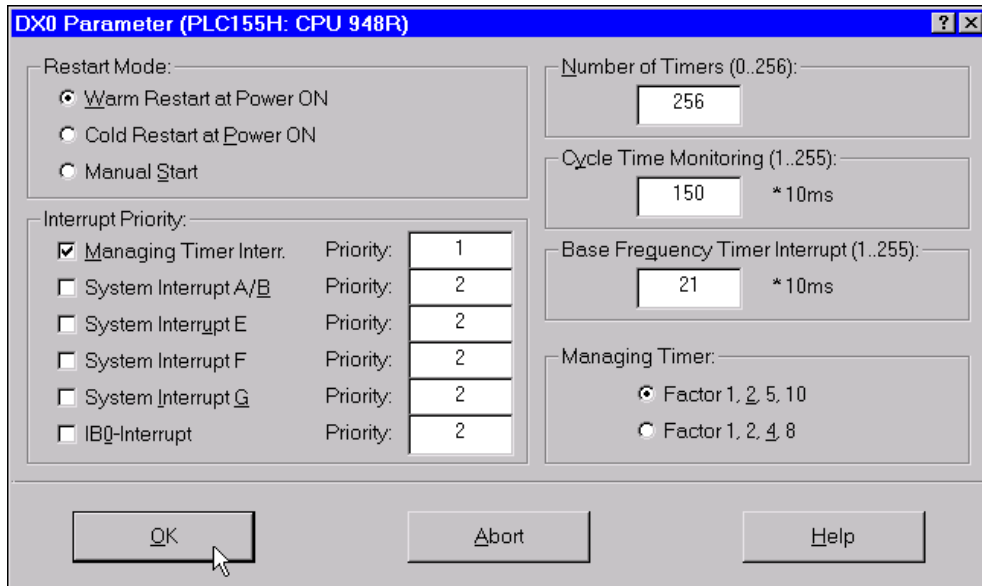


Figure 3-97 **DX0 Parameter (PLC 155 H: CPU 948R)** dialog box

Confirm the entered values and the marked buttons by activating the **OK** button.

The data block DX0 is generated and will be displayed in the PC block list window.

3.3.10 Transfer Blocks to PLC (Block Menu)

The **Transfer to PLC** command is used to transfer blocks to the PLC via the serial link. The selected (marked) blocks from the PC block list window are transferred to the S7-300/400 or the S5 PLC. This can be a single block or multiple blocks.

The transfer is done via the serial link defined with the settings in the interface tab in the Preferences dialog box (see chapter 3.2.11.1). If the block to be transferred already exists in the PLC, a dialog box will open to allow you to override the block or to cancel the transfer (see chapter 3.3.11, figure 3-98).

- ◆ Click **Transfer to PLC** in the block menu.
- ◆ Press **CTRL + F5 (ALT + B, T)**.

If one block or several blocks have been selected (marked) in the PC block list window, the block transfer to the PLC starts immediately. If no block was selected (marked) in the PC block list window the command shows no reaction.

Note:

If you want to transfer several blocks to the PLC, mark these blocks in the PC block list. For details on how to mark several blocks see chapter 3.1.1. The transfer command starts the block transfer to the PLC.

To start the transfer to the PLC you may also click the **Block Transfer** icon from the tool bar



3.3.11 Transfer all Blocks to PLC (Block Menu)

The command **Transfer all Blocks to PLC** from the block menu is used to transfer all blocks listed in the PC block list window to the PLC (transferring a complete PLC program).

◆ Click **Transfer All Blocks to PLC** in the Block menu.

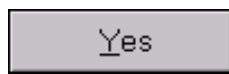
◆ Press **ALT + B, A**.

If a block is already stored in the PLC, a dialog box will open to allow you to overwrite the block or to abort the transfer.

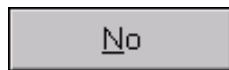


Figure 3-98 PLC Block already in PLC dialog box

● The buttons have the following functions:



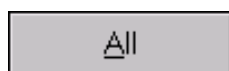
Activating the **Yes** button will only overwrite the PLC block mentioned in the dialog box. If another block is stored in the PLC, the dialog box will be opened again.



If the **No** button is activated, the block mentioned in the dialog box will not be transferred to the PLC. The original block stored in the PLC remains in the PLC. If another block is stored in the PLC, the dialog box will be opened again.



Activating the **Abort** button will cancel the block transfer to the PLC. No further blocks are transferred.



Activating the **All** button will restart the block transfer. The PLC block mentioned in the dialog box will be overwritten. Any other block stored in the PLC will also be overwritten. The dialog box will not be opened again.

3.3.12 Transfer Block to EPROM (Block Menu)

The **Transfer to EPROM** command is used to program EPROM / EEPROM / FLASH modules with the **EPROMMER** (programming device). The selected (marked) blocks from the PC block list window are transferred into the EPROM / EEPROM / FLASH module. This can be a single block or multiple blocks.

Note:

The **EPROMMER** must be initialized and the module must be selected prior starting the programming process.

◆ Click **Transfer to EPROM** in the block menu.

◆ Press **ALT + B, E**.

If one block or several blocks have been selected (marked) in the PC block list window, the programming of the EPROM / EEPROM / FLASH module will start immediately. If no block has been selected (marked) in the PC block list window the command shows no reaction.

If a block already exists in the EPROM / EEPROM / FLASH module the programming procedure is aborted and the following error message will be displayed.

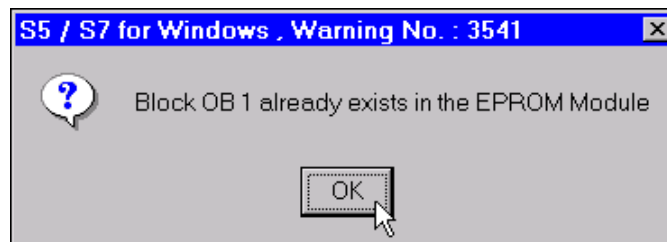


Figure 3-99 Error message Block already exists in the EPROM / EEPROM / FLASH module

Note:

If you want to program an EPROM / EEPROM / FLASH module with several blocks, mark these blocks in the PC block list. For details on how to mark several blocks see chapter 3.1.1. The **Transfer to EPROM** command starts the EPROM / EEPROM / FLASH module programming.

The successful EPROM / EEPROM / FLASH module programming is indicated with a message.

3.3.13 Transfer all Blocks to EPROM (Block Menu)

The **Transfer all Blocks to EPROM** command from the block menu is used to program an EPROM / EEPROM / FLASH module with the **EPROMMER** (programming device). All blocks from the PC block list window are programmed into the EPROM / EEPROM / FLASH module (programming a complete PLC program).

The **EPROMMER** must be initialized and the module must be selected prior starting the programming process.

◆ Click **Transfer All Blocks to EPROM** in the block menu.

◆ Press **ALT + B, B**.

The programming of the EPROM / EEPROM / FLASH module starts immediately. The progress of the programming process is displayed. After the erase check the blocks are prepared for transfer.

If a block currently exists in the EPROM / EEPROM / FLASH module, the programming procedure is aborted and an error message (see figure 3-99) will be displayed.

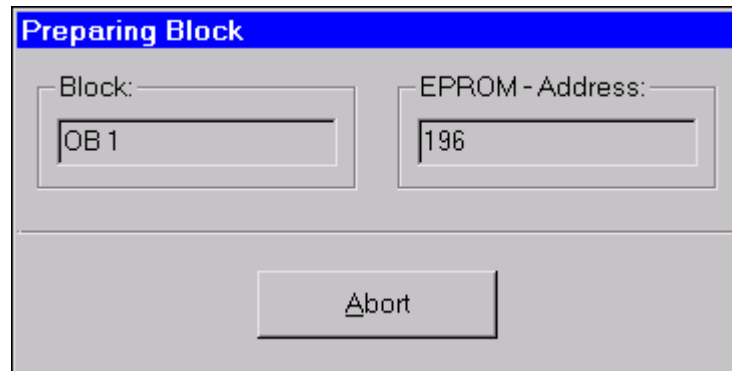


Figure 3-100 EPROM programming progress message Preparing Block

During the burning process, the EPROM address being programmed is displayed.

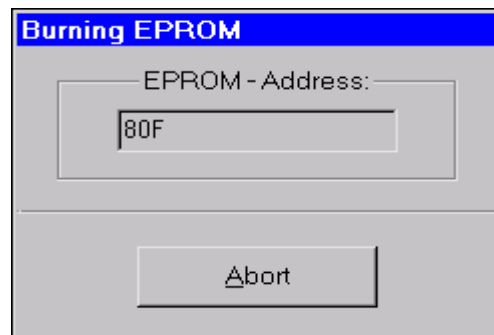


Figure 3-101 EPROM programming progress. EPROM address to be programmed

After burning the EPROM, the contents of the EPROM is compared with the contents of the blocks transferred to the EPROM (verify).

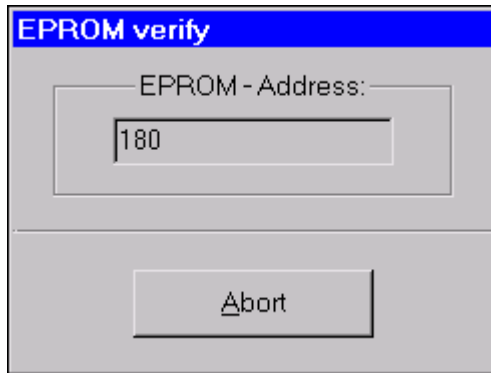


Figure 3-102 EPROM programming progress. Verify EPROM

The successful EPROM / EEPROM / FLASH module programming is indicated with a message.

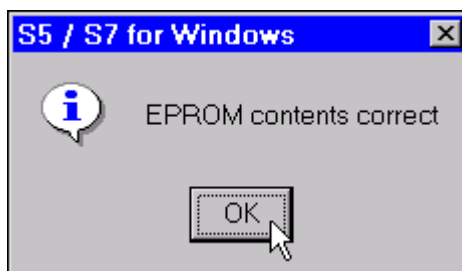


Figure 3-103 EPROM programmed successfully

3.3.14 Compare with File (Block Menu)

The **Compare with File** command from the block menu is used to compare the marked block (one block or several blocks) with the corresponding blocks of a PLC program file located at one of the PC drives. This command requires the additional **BlockDiff** option. *S5 / S7 for Windows* offers **BlockDiff**, a powerful software package used to compare PLC Blocks and PLC Programs. You will find detailed information on how to use the **BlockDiff** software option in the **BlockDiff** user's guide.

3.3.15 Compare all Blocks with File (Block Menu)

The **Compare all Blocks with File** command from the block menu is used to compare all block listed in the PC Block List with the corresponding blocks of a PLC program file located at one of the PC drives. This command requires the additional **BlockDiff** option. *S5 / S7 for Windows* offers **BlockDiff**, a powerful software package used to compare PLC Blocks and PLC Programs. You will find detailed information on how to use the **BlockDiff** software option in the **BlockDiff** user's guide.

3.3.16 Copy Block (Block Menu)

The command **Copy** from the block menu copies the selected blocks (one or several blocks may be marked) into a temporary file on the hard disk. The copied blocks may be inserted into another PLC program (PC block list window) at a later time.

The temporary file is not deleted if *S5 / S7 for Windows* is closed or the PC is switched off. Another copy command will overwrite the blocks in the temporary file. The *S5 for Windows* copy command is similar to the windows **Copy to Clipboard** command.

The marked blocks in the PC block list window remain untouched by the copy command.

- ◆ Click **Copy** in the block menu or click the **Copy Block** icon in the tool bar.



- ◆ Press **CTRL + INSERT** or **CTRL + C (ALT + B, C)**

The selected blocks are copied into the *S5 / S7 for Windows* temporary file (clipboard function).

Note:

If you would like to paste those blocks back into the same PC block list, you must rename the original blocks prior to using the paste command.

3.3.17 Paste Block (Block Menu)

The **Paste** command from the block menu, pastes the previously copied or cut blocks into the PC block list. The blocks in the temporary file remain untouched. To paste blocks into a PC block list it you must insure that blocks to are going to paste have different names than the existing blocks in the PC block list.

The *S5 / S7 for Windows* paste command is similar to the windows **Paste from Clipboard** command.

- ◆ Click **Paste** in the block menu or click the **Paste Block** icon in the tool bar.



- ◆ Press **Shift + INSERT** or **CTRL + V, (ALT + B, A)**


The selected blocks are pasted into the PC block list (clipboard function).

3.3.18 Cut Block (Block Menu)

The command **Cut** from the block menu copies the selected blocks (one or several blocks may be marked) into a temporary file on the hard disk. The cut blocks may be inserted into another PLC program (PC block list window) at a later date.

The temporary file is not deleted if *S5 / S7 for Windows* is closed or the PC is switched off. Another cut command will overwrite the blocks in the temporary file. The *S5 / S7 for Windows* cut command is similar to the windows **Cut to Clipboard** command.

The marked blocks are deleted from the PC block list window by the cut command.

 ◆ Click **Cut** in the block menu or click the **Cut Block** icon in the tool bar.



 ◆ Press **↑ Shift** + **BACKSPACE** or **CTRL + X**, (**ALT + B, U**)

If one block or several blocks have been selected (marked) in the PC block list window, the selected blocks are copied into the *S5 / S7 for Windows* temporary file (clipboard function) and the marked blocks are deleted from the PC block list window.

If no block was selected (marked) in the PC block list window the command shows no reaction.

3.3.19 ASCII Format (Block Menu)

S5 / S7 for Windows provides the tools to export and import one or more blocks in a statement list (STL) presentation. The files are in an ASCII (text) format.

Due to the export and import functions it is possible to manipulate blocks in a Statement List format (Block STL, Source Text) outside of *S5 / S7 for Windows* with a text editor.

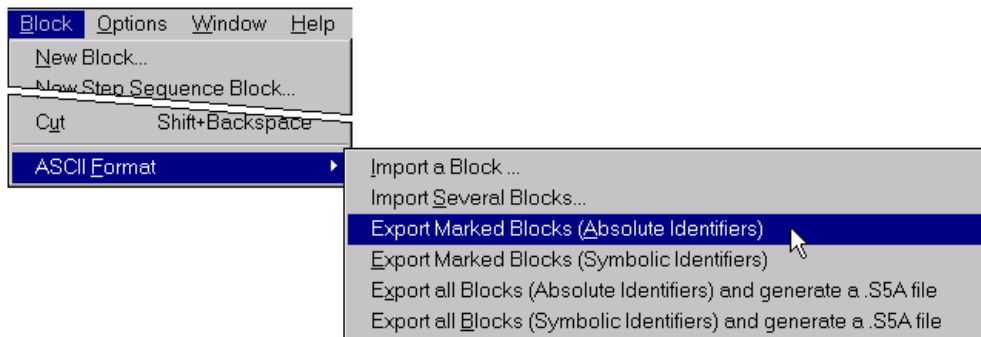


Figure 3-104 ASCII Format menu

Note:

The name of a **Block File** to be imported by the *S5 / S7 for Windows* ASCII format import function must have the following syntax:

S7 for Windows	[Block identifier][number].aw7
[Block identifier]	OB, FB, FC, etc.
[number].	0 up to 4095 (depending on the CPU and block type)
Example:	FC33.aw7
S5 for Windows	[Block identifier][number].awl
[Block identifier]	OB, PB, FB, SB, etc.
[number].	0 up to 255 (depending on the CPU and block type)
Example:	PB12.awl

When exporting a block the file name (Block name) and the correct file name extension (*.aw7, *.awl) is generated automatically. No input is required.

- **Block manipulations saved in an ASCII format (external Editor)**

The following manipulations may be performed on S7 or S5 blocks in ASCII format outside of the *S5 / S7 for Windows* editor .

Converting a Block File

It is possible to convert a block into another block type.

S5 for Windows converting a program block (PB) into a function block (FB).

S7 for Windows converting a function (FC) into a function block (FB).

To do so you must export the block and change the file name. With a text editor (e.g. Notepad) you must then insert the correct header. Now you may import the converted file. You can edit the converted file with the *S5 / S7 for Windows* block editor.

Example:

format	old block name	old file name	new file name	new block name
S7	FB12	FB12.aw7	FC14.aw7	FC14
S5	PB10	PB10.awl	OB12.awl	OB12

Generating a Block File

You may use a text editor (e.g. Notepad) to program a block as an ASCII file. The syntax must conform with Step@ 7 Source text or Step@ 5 Block STL presentation and the block type (e.g. a function block) must start with **Name:xxx** etc.).

You may use absolute or symbolic operands. If you use symbolic operands a symbolic table, used with the symbolic operands, must be present in *S5 for Windows* when importing the file.

PC Block File Library

You may build a library by exporting blocks in an ASCII file format for later use.

Generating a new Project

From an existing library of **Block Files** you may build a new project using a simple text file.

You may use a text editor (e.g. Notepad) to write a text file in an ASCII format. In the block list file all the blocks to be used in the project are listed.

The **Block List** file you have created is read by *S5 / S7 for Windows* using the command **Import several Blocks**. The blocks listed are transferred to *S5 / S7 for Windows* and listed in the PC block list.

Note:

The name of the text file (**Block List**) to be read by *S5 / S7 for Windows*, using the **Import Several Blocks** command, must have the following syntax:

[Project name].s5a

[Project name] up to eight (60) characters

Example: Machine Project 5.s5a

Example (S7 for Windows):

Write the following text file (**S7Example.s5a**) using Notepad.

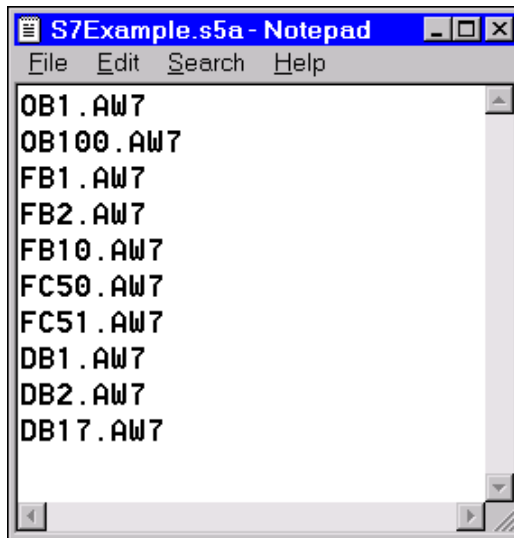


Figure 3-105 Text file to import several S7 blocks

Save the block list file **S7Example.s5a** in the library folder (directory). If you save the text file in another folder you must include the path in the text file.

e.g. `c:\s7w\library\OB1.aw7`

The command **Import Several Blocks** opens the **Open file** dialog box (see chapter 3.3.19.2).

Select the file **S7Example.s5a**.

You may have to open a different folder to have the file **S7Example.s5a** listed in the file name field. The default file type is **Block List (*.s5a)**.

Example (S5 for Windows):

Write the following text file (**S5Example.s5a**) using Notepad.

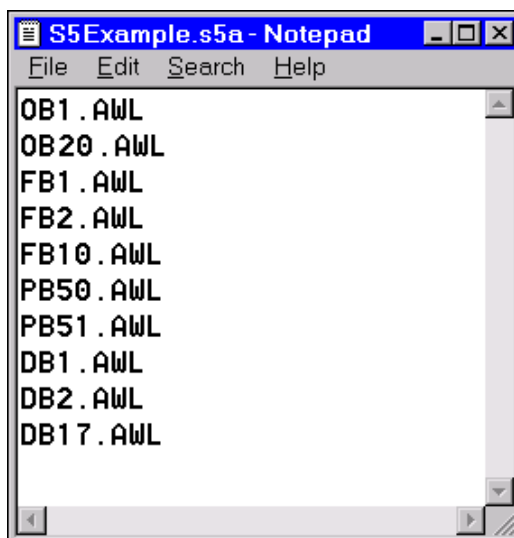


Figure 3-106 Text file to import several S5 blocks

Save the block list file **S5Example.s5a** in the library folder (directory). If you save the text file in another folder you must include the path in the text file.

e.g. **c:\s5w\library\OB1.aw7**

The command **Import Several Blocks** opens the **Open file** dialog box (see chapter 3.3.19.2).

Select the file **S5Example.s5a**.

You may have to open a different folder to have the file **S5Example.s5a** listed in the file name field. The default file type is **Block List (*.s5a)**.

3.3.19.1 Import a Block (ASCII Format)

With the command **Import a Block** you may import a single **Block File**. The block must be saved as a text file in an ASCII format. The text must represent the PLC logic using the Statement List (Source Text, Block-STL) syntax.

S7 for Windows **[Block identifier][number].aw7**
 [Block identifier] OB, FB, FC, etc.
 [number]. 0 up to 4095 (depending on the CPU and block type)
 Example: **FC33.aw7**

S5 for Windows **[Block identifier][number].awl**
 [Block identifier] OB, PB, FB, SB, etc.
 [number]. 0 up to 255 (depending on the CPU and block type)
 Example: **PB12.awl**

◆ Click **ASCII Format** in the block menu and **Import a Block** in the ASCII format menu.

◆ Press **ALT + B, F, I**.

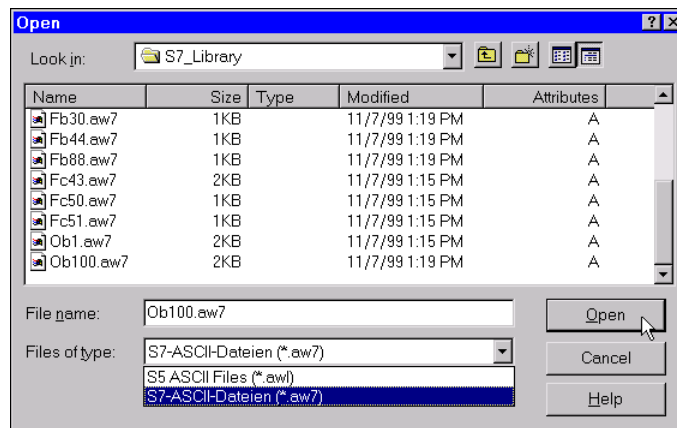


Figure 3-107 Import an ASCII format block. Open dialog box

With the **Files of type** drop down list you can select whether you want to import an **S7 ASCII file (*.aw7)** or an **S5 ASCII file (*.awl)**. The available files of the type you selected are listed.

Note:

If symbolic operands are used in the ASCII text file, a symbolic table defining the symbols must be present within *S5 / S7 for Windows*, prior to importing the file.

Text files that do not follow the **Step® 7 Source Text** or the **Step® 5 Block Statement List** syntax, can not be imported. An error message will be displayed and the import process is aborted.

3.3.19.2 Import Several Blocks (ASCII Format)

With the command **Import Several Blocks** you may import block files listed in a text file (block list *.s5a).

The format of the **Block List** file must be as follows:

[drive:][directory][name].s5a

[drive:]	drive where the block list is located	e.g.	d:\
[directory]	directory where the block list is located	e.g.	s7w\S7_library\
[name]	up to eight (80) characters	e.g.	S7w_example1

Each block file to be imported is listed in a separate line of the block list. For more details on how to write a text file, listing the ASCII blocks to be imported, see chapter 3.3.19.

◆ Click **ASCII Format** in the block menu and **Import Several Blocks** in the ASCII format menu.

◆ Press **ALT + B, F, S**.

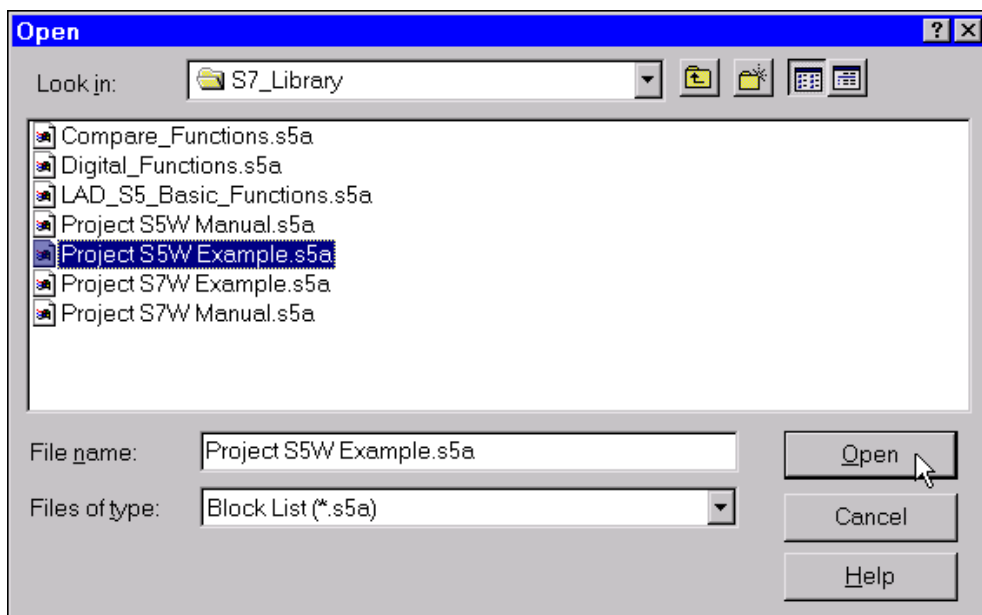


Figure 3-108 **Import Several Blocks** in the ASCII, **Open File** dialog box

Note:

If symbolic operands are used in the ASCII text file, a symbolic table defining the symbols must be present within *S5 / S7 for Windows* prior to importing the file.

Text files that do not follow the **Step® 7 Source Text** or the **Step® 5 Block Statement List** syntax, can not be imported. An error message will be displayed and the import process is aborted.

3.3.19.3 Export Marked Blocks (Absolute Identifiers) (ASCII Format)

With the command **Export Marked Blocks (Absolute Identifiers)** you may export one or more blocks selected (marked) from the PC block list. Each block marked will be exported as a separate file (Block File). The operands and any other variables are exported in their absolute form regardless of the setting in the preference dialog box.

The block must be saved as a text file in an ASCII format. The text represents the PLC logic using the Statement List (Source Text, Block-STL) syntax. The block name is used for the file name. The file name extension depends on the block format (S7, S5).

S7 for Windows	[Block identifier][number].aw7
[Block identifier]	OB, FB, FC, etc.
[number]	0 up to 4095 (depending on the CPU and block type)
Example:	FC33.aw7

S5 for Windows	[Block identifier][number].awl
[Block identifier]	OB, PB, FB, SB, etc.
[number].	0 up to 255 (depending on the CPU and block type)
Example:	PB12.awl

These files may be used to build a block file library with absolute identifiers. No symbolic table is needed to import these block files

◆ Click **ASCII Format** in the block menu and **Export Marked Blocks (Absolute Identifiers)** in the ASCII format menu.

◆ Press **ALT + B, F, A**.

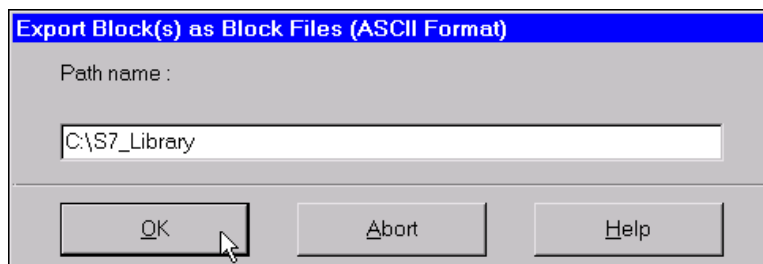


Figure 3-109 **Export Block(s) as Block Files (ASCII Format)** dialog box

Path name

As a default, *S5 / S7 for Windows* offers the path of the open project to save the **Block Files**. The file names are assigned by *S5 / S7 for Windows*.

The blocks selected (marked) from the PC block list may be saved in any other path you enter in the path name text field. The path must include the drive and the folder where you want to save the block files.

```

Pb1.awl - Notepad
File Edit Search Help
[1      Punch Press Sequence Control
      A      -BOTTOM
      L      KT 003.2
      SD     -T-PRSS
      ***
]
[2      Step Sequence Control
      A      -S-NEXT
      AN     -S-RESET
      JC     -FB 50
NAME:   NEXT_ST
      ***
]
[3      Punch Press Down
      A(
      O      -S-DOWN
      O      -S-DOWN-1
      )
      AN     -BOTTOM
      =      -DOWN-1
      =      -DOWN
      BE
]

```

Figure 3-110 Exported S5 Block (Absolute Identifiers) in the ASCII format

3.3.19.4 Export Marked Blocks (Symbolic Identifiers) (ASCII Format)

With the command **Export Marked Blocks (Symbolic Identifiers)** you may export one or more blocks selected (marked) from the PC block list. Each block marked will be exported as a separate file (Block File). The operands and any other variables are exported in their symbolic form regardless of the setting in the preference dialog box.

The block must be saved as a text file in ASCII format. The text represents the PLC logic using the Statement List (Source Text, Block-STL) syntax. The block name is used for the file name. The file name extension depends on the block format (S7, S5).

S7 for Windows	[Block identifier][number].aw7
[Block identifier]	OB, FB, FC, etc.
[number].	0 up to 4095 (depending on the CPU and block type)
Example:	FC33.aw7
S5 for Windows	[Block identifier][number].awl
[Block identifier]	OB, PB, FB, SB, etc.
[number].	0 up to 255 (depending on the CPU and block type)
Example:	PB12.awl

These files may be used to build a block file library with symbolic identifiers.

A symbolic table must be present in *S5 / S7 for Windows* prior to the importation of these block files. An error message will be displayed if an undefined symbolic operand is found and the import process is aborted.

- ◆ Click **ASCII Format** in the block menu and **Export Marked Blocks (Symbolic Identifiers)** in the ASCII format menu.
- ◆ Press **ALT + B, F, E**.

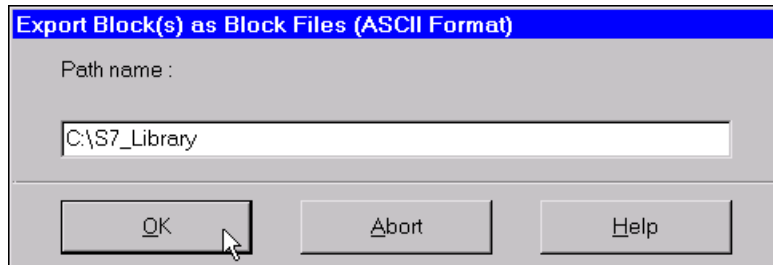


Figure 3-111 Export Block(s) as Block Files (ASCII Format) dialog box

Path name

As a default, *S5 / S7 for Windows* offers the path of the open project to save the **Block Files**. The file names are assigned by *S5 / S7 for Windows*.

```

FUNCTION_BLOCK FB 12
TITLE=Punch Press Sequence Control
AUTHOR : PSH
FAMILY : S7W
NAME : PSC_99
VERSION : 2.1
UAR_TEMP
  CONU_AKKU1 : DWORD;
  CONU_AKKU2 : DWORD;
  CONU_STW : WORD;
  CONU_INDEX : WORD;
  CONU_DT : DATE_AND_TIME;
  CONU_HDR : STRUCT
    TEMP17 : WORD;
    TEMP18 : WORD;
  END_STRUCT;
END_UAR
BEGIN
NETWORK
TITLE=Punch Press Sequence Control
  A "Limit_01_In";
  L S5T#3S;
  SD "T-PRS";
NETWORK
  TITLE=Step Sequence Control
  A "DUMMY";
  AN "S-RESET";
  JCN X000;
  CALL "FC 50";
X000: NOP 0;
END_FUNCTION_BLOCK

```

Figure 3-112 Exported S7 Block (Symbolic Identifiers) in the ASCII format

The blocks selected (marked) from the PC block list may be saved in any other path you enter in the path name text field. The path must include the drive and the folder you want to save the block files in.

3.3.19.5 Export all Blocks (Absolute Identifiers) and generate an .S5A File

With the command **Export all Blocks (Absolute Identifiers) and generate an .S5A File** you may export all the blocks from the PC block list. Each block will be exported as a separate file (Block File).

In addition, a **Block List** file (*.S5A) will be generated and saved. The **Block List** file is an ASCII text file listing all the files from the PC block list. *S5 / S7 for Windows* automatically assigns a project name to the **Block List** file.

You may import all block files listed in the Block List file using the **Import Several Blocks** command.

The blocks are saved as a text file in ASCII format. The text represents the PLC logic using the Statement List (Source Text, Block-STL) syntax. The block name is used for the file name. The file name extension depends on the block format (S7, S5).


S7 for Windows	[Block identifier][number].aw7
[Block identifier]	OB, FB, FC, etc.
[number].	0 up to 4095 (depending on the CPU and block type)
Example:	FC33.aw7

S5 for Windows	[Block identifier][number].awl
[Block identifier]	OB, PB, FB, SB, etc.
[number].	0 up to 255 (depending on the CPU and block type)
Example:	PB12.awl

These files may be used to build a block file library with absolute identifiers.

Note:

No symbolic table is needed to import these block files.

 ◆ Click **ASCII Format** in the block menu and **Export all Blocks (Absolute Identifiers) and generate a .S5A File** in the ASCII format menu.

 ◆ Press **ALT + B, F, X**.

The **Export Block(s) as Block Files (ASCII Format)** dialog box is opened (see figure 3-109).

Path name

As a default, *S5 / S7 for Windows* offers the path of the open project to save the **Block Files**. The file names are assigned by *S5 / S7 for Windows*.

The blocks selected (marked) from the PC block list may be saved in any other path you enter in the path name text field. The path must include the drive and the folder you want to save the block files in.

3.3.19.6 Export all Blocks (Symbolic Identifiers) and generate an .S5A File

With the command **Export all Blocks (Symbolic Identifiers) and generate a .S5A File** you may export all the blocks from the PC block list. Each block will be exported as a separate file (Block File).

In addition, a **Block List** file (*.S5A) will be generated and saved. The **Block List** file is an ASCII text file listing all the files from the PC block list. *S5 / S7 for Windows* automatically assigns the project name to the **Block List** file.

You may import all block files listed in the Block List file using the **Import Several Blocks** command.

The blocks are saved as a text file in ASCII format. The text represents the PLC logic using the Statement List (Source Text, Block-STL) syntax. The block name is used for the file name. The file name extension depends on the block format (S7, S5).

S7 for Windows	[Block identifier][number].aw7
[Block identifier]	OB, FB, FC, etc.
[number].	0 up to 4095 (depending on the CPU and block type)
Example:	FC33.aw7


S5 for Windows	[Block identifier][number].awl
[Block identifier]	OB, PB, FB, SB, etc.
[number].	0 up to 255 (depending on the CPU and block type)
Example:	PB12.awl


These files may be used to build a block file library with symbolic identifiers.

Note:

A symbolic table must be present in *S5 / S7 for Windows* prior to importing these block files.

An error message will be displayed if an undefined symbolic operand is found and the import process is aborted.

 ◆ Click **ASCII Format** in the block menu and **Export all Blocks (Symbolic Identifiers) and generate an .S5A File** in the ASCII format menu.

 ◆ Press **ALT + B, F, X**.

The **Export Block(s) as Block Files (ASCII Format)** dialog box is opened (see figure 3-109).

Path name

As a default, *S5 / S7 for Windows* offers the path of the open project to save the **Block Files**. The file names are assigned by *S5 / S7 for Windows*.

The blocks selected (marked) from the PC block list may be saved in any other path you enter in the path name text field. The path must include the drive and the folder you want to save the block files in.

3.4 Options (Options Menu - PC Block List)

The **Option** menu commands are used to rewire operands, configure the H1 and TCP/IP connections, generate a step sequence diagnostics block, manage the writing of PLC password protection, and to handle special S7 commands.

◆ Click **Options** in the Menu bar.

◆ Press **ALT + O**.

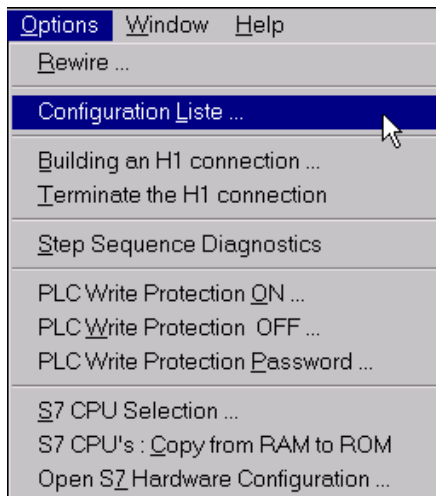


Figure 3-113 The **Option** menu (H1 connection)

By marking the button **INAT TCP/IP selected** on the interface tab of the preferences dialog box, the option menu exchanges the H1 commands with commands to configure the TCP/IP connection.

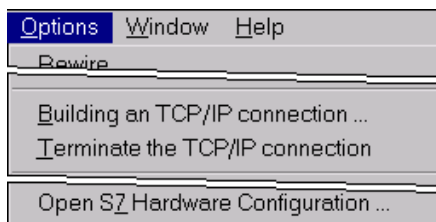


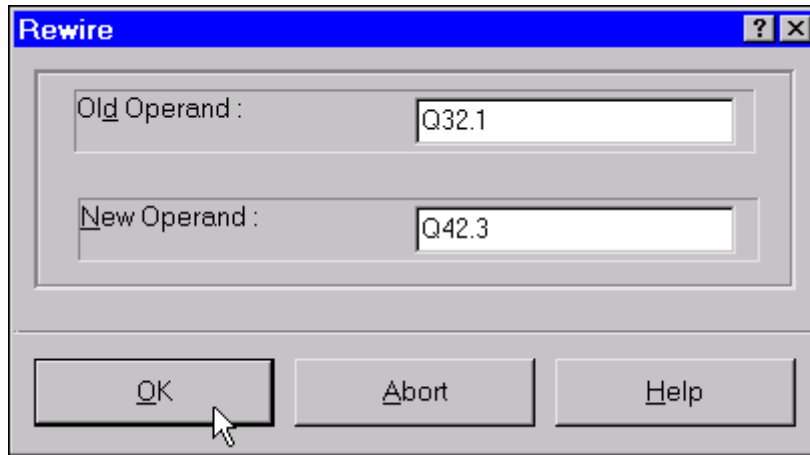
Figure 3-114 The **Option** menu (TCP/IP connection)

3.4.1 Rewire (Options Menu)

The Rewire dialog box allows you to rewire operands. With this command you can give an existing operand a new name. The rewired operands must be of the same type. The rewire function is currently only available with S5 Blocks and S5 operands. An extended rewire function for S5 and S7 blocks is under development.

◆ Click **Rewire** in the option menu.

◆ Press **ALT + O, R**.

Figure 3-115 **Rewire** dialog box

The **Rewire** dialog box provides the ability to rename absolute operands. The rewire function searches the complete PLC for the operand name that is entered in the text field **Old Operand**. The name of the old operand is replaced with the name you have entered in the **New Operand** text field.

If a symbol has been assigned to the operand (old operand), in the symbolic table, the new operand will be assigned to the symbol.

Example 1:

The symbolic table has the following entries:

I 32.1	BOTTOM	Punch Press at Bottom
I 32.2	TOP	Punch Press at Top
I 42.1	not used	

I32.1	BOTTOM	Punch Press at Bottom
OB 1,	Segment : 5*	
PB 1,	Segment : 1	
	: 4	
PB 17,	Segment : 5*	
I32.2	TOP	Punch Press at Top
OB 1,	Segment : 6*	
PB 1,	Segment : 3	
PB 17,	Segment : 2*	

Figure 3-116 **Cross reference** list prior rewiring (Example 1)

The following Operands are entered into the **Rewire** dialog box:

Old Operand: I 32.1 **New Operand:** I 42.1

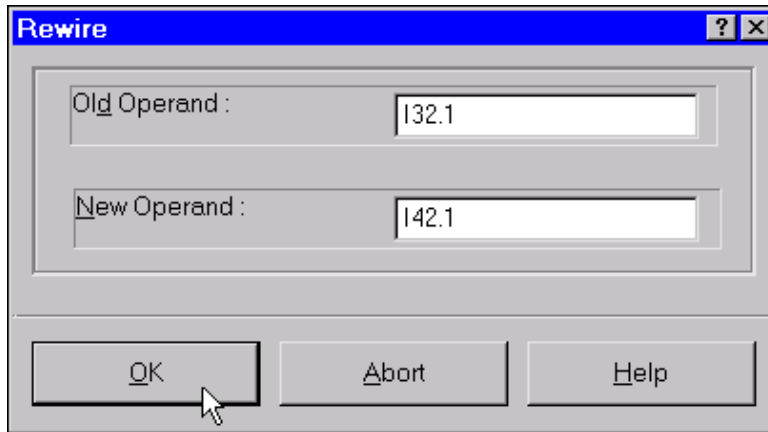


Figure 3-117 Rewire dialog box (Example 1)

S5 for Windows indicates the amount of operands modified.



Figure 3-118 Rewire information, modified instructions

After rewiring the symbolic table has the following entries:

I 32.2	TOP	Punch Press at Top
I 42.1	BOTTOM	Punch Press at Bottom
I 32.1	not used	

The new **Cross reference** lists after the rewiring is shown in figure 3-119.

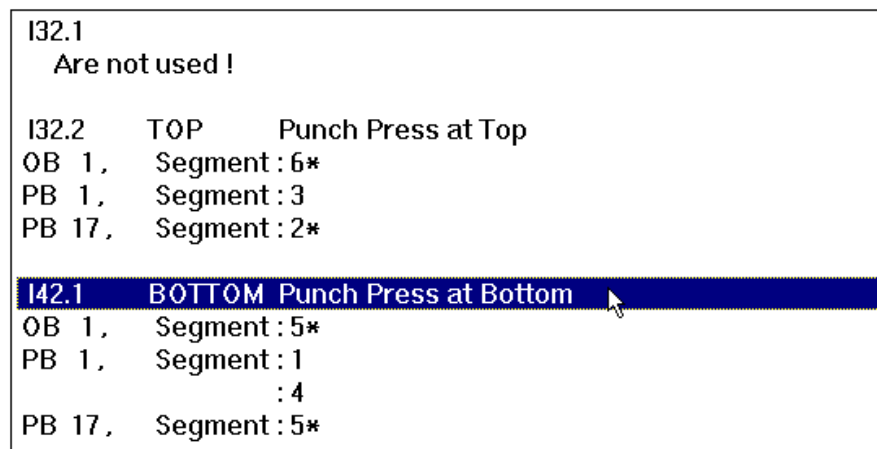


Figure 3-119 Cross reference lists after the rewiring (Example 1)

Example 2:

The symbolic table has the following entries:

I 32.1	BOTTOM	Punch Press at Bottom
I 32.2	TOP	Punch Press at Top

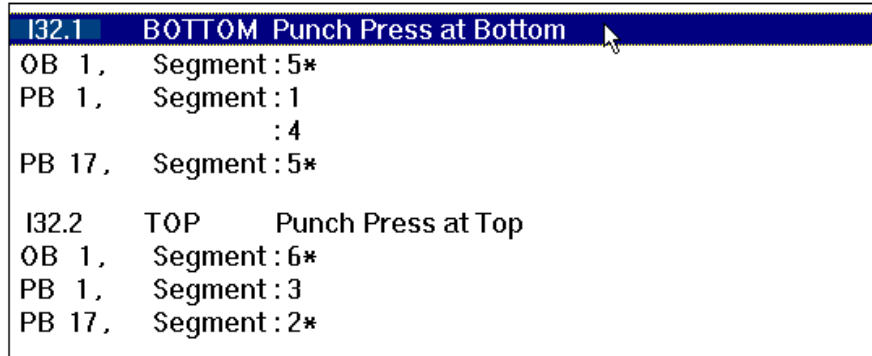


Figure 3-120 **Cross reference** list prior to rewiring (Example 2)

The following Operands are entered into the **Rewire** dialog box:

Old Operand: I 32.1 **New Operand:** I 32.2

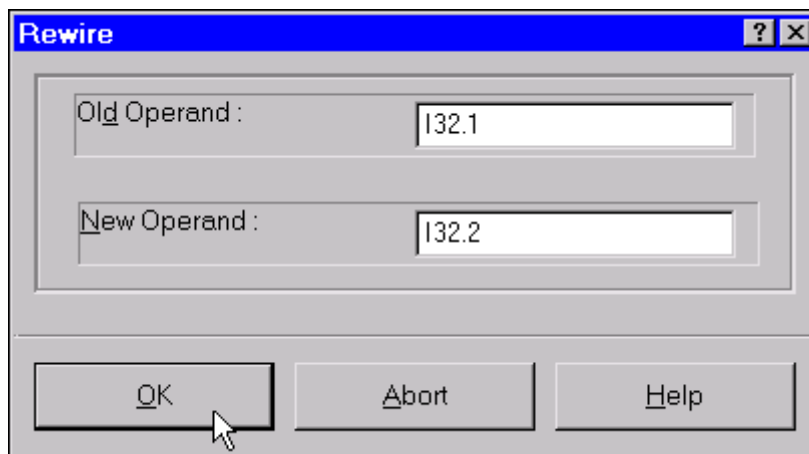


Figure 3-121 **Rewire** dialog box (Example 2)

If you enter an operand, that currently exist in the **New Operand** text field, *S5 for Windows* will display the following warning (figure 3-122).

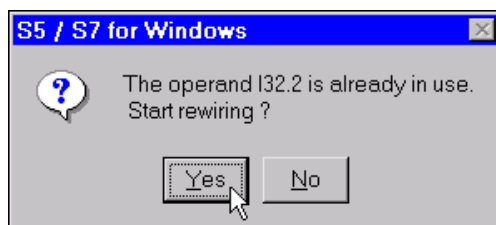


Figure 3-122 Rewire information, is operand already in use

If you do not abort the rewiring process (activating the Yes button), the operand you defined in the **New Operand** text field will have a symbol assigned to it and an additional warning will be displayed.

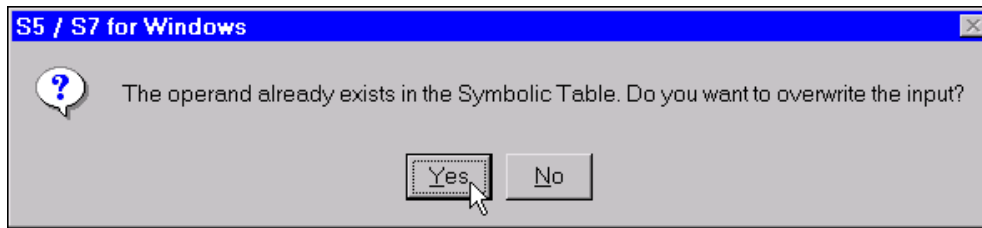


Figure 3-123 Rewire information, operand defined in the Symbolic Table

If you activate the **Yes** button the symbol assigned to the operand from the **Old Operand** text field will be assigned to the operand entered in the **New Operand** text field.

The symbolic table will have the following entries after the rewire process.

```
I 32.2    BOTTOM          Punch Press at Bottom
I 32.1    not used
```

I32.1	Are not used !	
I32.2	BOTTOM	Punch Press at Bottom
OB 1,	Segment : 5*	
		: 6*
PB 1,	Segment : 1	
		: 3
		: 4
PB 17,	Segment : 2*	
		: 5*

Figure 3-124 **Cross reference** lists after the rewiring (Example 2, override symbolic table)

If you activate the **No** button the symbol assigned to the operand in the **New Operand** text field remains untouched.

The symbolic table will have the following entries after the rewire process.

```
I 32.2    TOP           Punch Press at Top
I 32.1    not used
```

I32.1	Are not used !	
I32.2	TOP	Punch Press at Top
OB 1,	Segment : 5*	
		: 6*
PB 1,	Segment : 1	
		: 3
		: 4
PB 17,	Segment : 2*	
		: 5*

Figure 3-125 **Cross reference** lists after the rewiring (Example 2, symbolic table remains the same)

● Rewire a Complete Byte

A complete byte (or a word) may be rewired using the following procedure.

- ◆ Enter byte (word) names in the text field old operand and new operand.

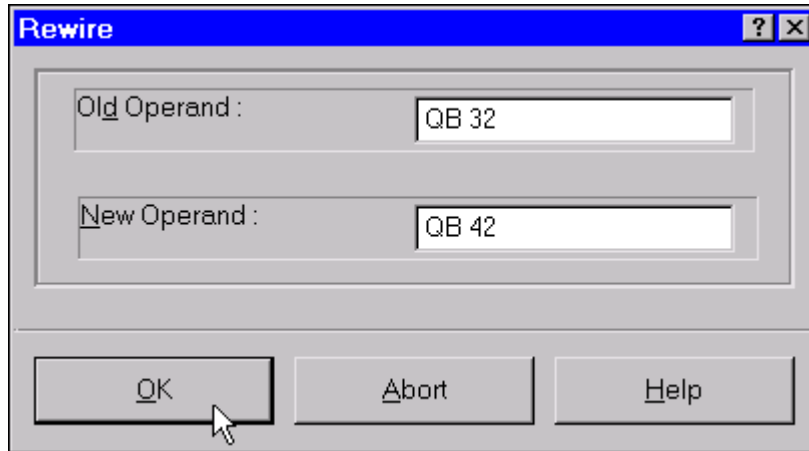


Figure 3-126 Rewire a Complete Byte

The rewiring has the following effect:

Operands prior to the rewiring	Operands after the rewiring	Notes
Q 32.0	Q 42.0	The symbolic table entries of the single bits are not affected by the rewiring process
Q 32.1	Q 42.1	
Q 32.2	Q 42.2	
Q 32.3	Q 42.3	
Q 32.4	Q 42.4	
Q 32.5	Q 42.5	
Q 32.6	Q 42.6	
Q 32.7	Q 42.7	
QB 32	QB 42	Symbolic table will be modified

Table 3-10 Symbolic Table, Rewire a Complete Byte

You may also use the **Search / Replace** function to rename operands.

3.4.2 Configuration List (Option Menu)

With the **Configuration List** command a window is opened to display the operands used in the PLC program.

- ◆ Click **Configuration List** in the option menu.

- ◆ Press **ALT + O, L**

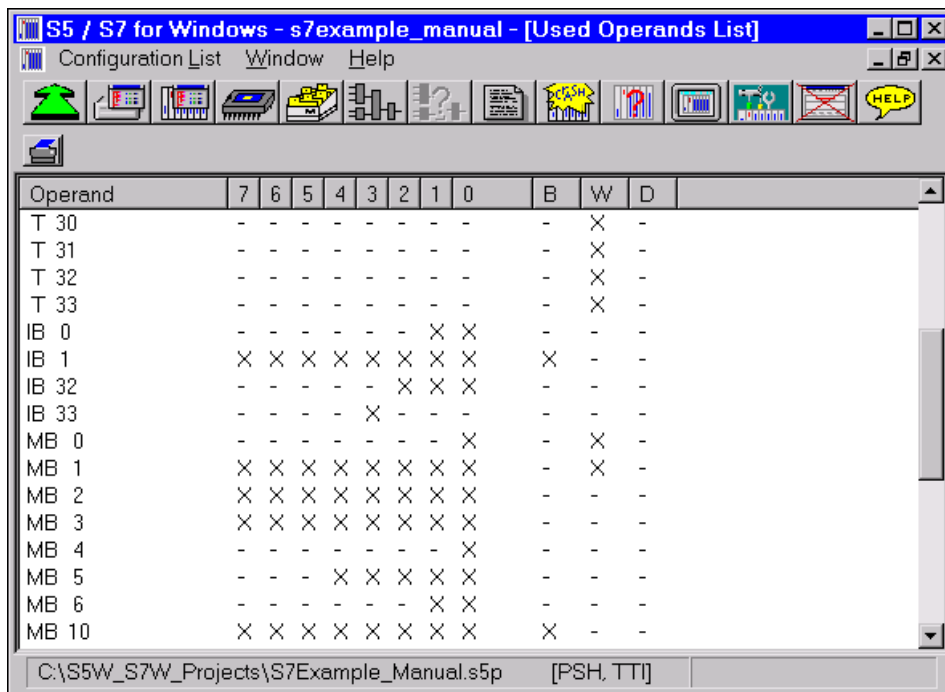


Figure 3-127 Configuration List window

The following operands are displayed:

<i>S7 for Windows</i>			<i>S5 for Windows</i>		
Operand		Example	Operand		Example
I	Inputs	IB 32	I	Inputs	IB 32
Q	Outputs	QB 17	Q	Outputs	QB 17
M	Memory	MB 42	F	Flags	FB 42
T	Timers	T 12	T	Timers	T 12
C	Counters	C14	C	Counters	C14

Table 3-11 Configuration List Operands

If the operand is used as a bit it will be indicated (the bit number is marked), byte (B), word (W), or double word (D).

● Configuration List Commands

The Configuration List window provides commands to print the Configuration List. The menus **Window** and **Help** are identical to the window and help menu from the PC block list window. For more details see chapter 3.5 and 3.6.

Configuration List Menu

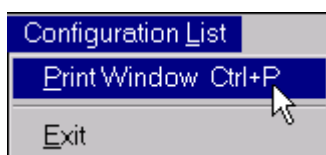


Figure 3-128 Configuration List menu

- ◆ Click **Configuration List** in the configuration list menu or click the icon.
- ◆ Press **CTRL+P**.



The windows print dialog box opens to setup the printer and to start the printing process.

Operand	7	6	5	4	3	2	1	0	B	W	D
Operand Name	Used Bits								Operand defined as a Byte	Operand defined as a Word	Operand defined as a Double Word

Figure 3-129 Displayed operands

3.4.3 Building an H1 Connection (Option Menu)

The **Building an H1 Connection** command from the option menu gives you the ability to go online with any of the PLC's connected to the H1 bus. The H1 connection is only available with S5 CPU's.

- ◆ Click **Building an H1 Connection** in the option menu.
- ◆ Press **ALT + O, B**.

There are two possibilities available to connect *S5 for Windows* via the H1 bus to an external S5 PLC.

Standard H1 connection

Your PC must have a serial link to a **Master PLC**. The master PLC is one of the PLC's connected with the H1 bus. Via the master PLC you have access to any other PLC on the H1 bus. To do so, a serial link between the PLC CPU and its CP (H1 communication processor) must be established at all **Host PLC's**. The host PLC's are all the PLC's you want to go online with via the H1 bus.

A special telegram is sent from *S5 for Windows* to the host PLC's. As a result a certain host PLC will have an online connection with *S5 for Windows* (via the master PLC).

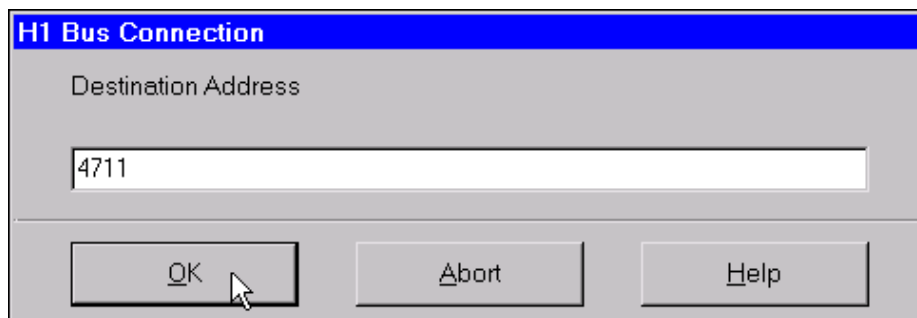


Figure 3-130 Standard H1 Bus connection dialog box

Destination Address

Each PLC connected to the H1 bus has its own destination address. The destination address (hex number) must be unique for every PLC connected to the H1 bus. To connect a PLC online via the H1 bus, enter its unique destination in the text field. All the online functions provided by *S5 for Windows* are available with the PLC connected to the H1 bus

- ◆ Activating the OK button will connect the PLC online with *S5 for Windows*.

Advanced H1 connection

S5 for Windows also provides the ability to use a standard Ethernet network board to connect to the H1 bus directly. In conjunction with the INAT Company, an additional software driver is provided to allow the use of a standard Ethernet network board to connect to the H1 bus. In addition, the **INAT H1** button in the interface tab of the preference dialog box must be marked.



3.4.4 Building an TCP/IP Connection (Option Menu)

The ***Building an TCP/IP Connection*** command from the option menu gives you the ability to go online with any of the PLC's connected to the bus. In conjunction with the INAT Company's special hardware you can connect S5 CPU's to a network using the TCP/IP protocol. A standard Ethernet network board can be used in the PC to connect to the bus. The driver is built into the *S5 for Windows* software. In addition the button **INAT TCP/IP** in the interface tab of the preference dialog box must be marked. The PLC's TCP/IP connection is currently only available with S5 CPU's.

-  ◆ Click ***Building an TCP/IP Connection*** in the option menu.
-  ◆ Press **ALT + O, B**.

3.4.5 Terminate the H1 connection (Option Menu)

An established communication link with a PLC, connected via the H1 bus, can be disconnected with the ***Terminate the H1 connection*** command from the option menu. How to establish a connection to a PLC connected to the H1 bus is described in chapter 3.4.3.

-  ◆ Click ***Terminate the H1 connection*** in the option menu.
-  ◆ Press **ALT + O, T**.

3.4.6 Terminate the TCP/IP connection (Option Menu)

An established communication link with a PLC connected via the H1 bus can be disconnected with the ***Terminate the TCP/IP connection*** command from the option menu. How to establish a connection to a PLC connected to a bus using the TCP/IP is described in chapter 3.4.4.

-  ◆ Click ***Terminate the TCP/IP connection*** in the option menu.
-  ◆ Press **ALT + O, T**.

3.4.7 Step Sequence Diagnostics (Option Menu)

With the **Step Sequence Diagnostics** command from the option menu, you can open the step sequence diagnostic window. This window provides you with information concerning the execution of step sequence within the PLC (*S5 for Windows* must be online with the PLC). The command is only available in conjunction with the optional *G5 for Windows* software (*S5 for Windows*) and the Graph® 5 modes.

- ◆ Click **Step Sequence Diagnostics** in the option menu.
- ◆ Press **ALT + O, D**.

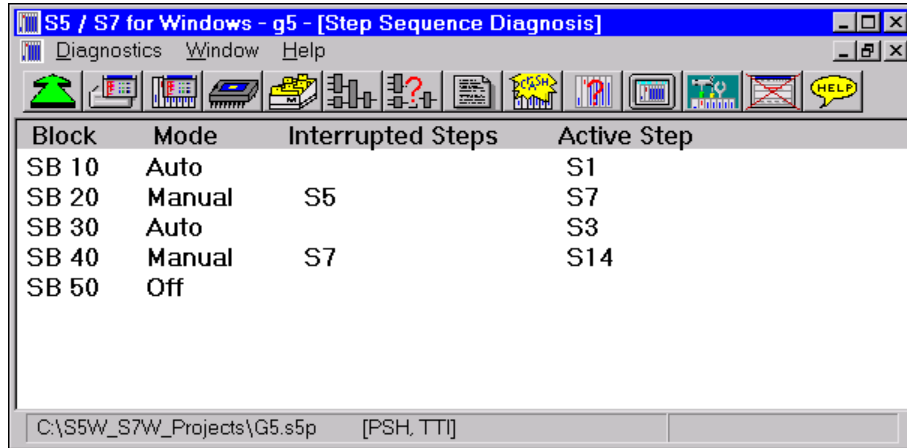


Figure 3-131 Step sequence diagnosis window

To display step sequence diagnostic information, the PLC must be connected online with your PC. The required standard function blocks must be stored in the PLC and their parameters must be set to enable the diagnostic function. The required diagnostic blocks (data blocks) must have been generated with the optional *G5 for Windows* programming system.

3.4.7.1 Diagnostics - Step Sequence Diagnosis Window

With the command **Diagnostics** from the step sequence diagnostic window you can close the window.

- **Diagnostics - Step Sequence Diagnostic Window**

With the command **Diagnostics** from the step sequence diagnostic window you can close the window. The menus **Window** and **Help** are identical with the window and help menus from the PC block list window. For more details see chapter 3.5 and 3.6.

Diagnostic Menu



Figure 3-132 Diagnostics menu

3.4.8 PLC Write Protection ON (Option Menu)

S5 / S7 for Windows provides the ability to insert write protection into the PLC. With active write protection you may go online with a PLC and display the status. Data transfer to the PLC is prohibited. Accidental alteration of a PLC program is not possible as long as the write protection is active.

The write protection may only be canceled with a predefined password.

- ◆ Click **PLC Write Protection ON** in the option menu.
- ◆ Press **ALT + O, O**.

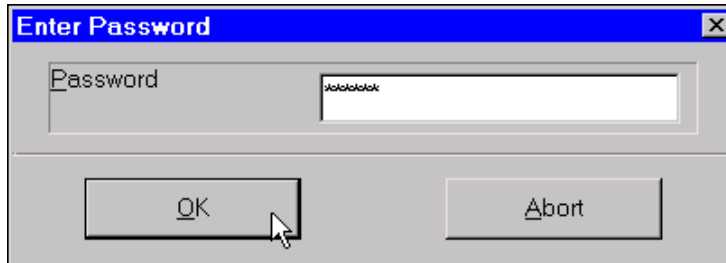


Figure 3-133 Enter Password dialog box

Enter the password in the text field you defined in the **PLC Write Protection Password** (see chapter 3.4.10). The password is not displayed in the text field. Each star represents one (1) character.

- ◆ To confirm the password entry, activate the **OK** button. The write protection is active.

If you enter an incorrect password, a warning will be displayed and the write protection stays inactive.



Figure 3-134 Wrong Password

- ◆ Confirm the warning and enter the correct password to activate the PLC write protection.

3.4.9 PLC Write Protection OFF (Option Menu)

With the command **PLC Write Protection OFF** from the option menu you may cancel the PLC write protection. The default setting for PLC write protection is off.

◆ Click **PLC Write Protection OFF** in the option menu.

◆ Press **ALT + O, W**.

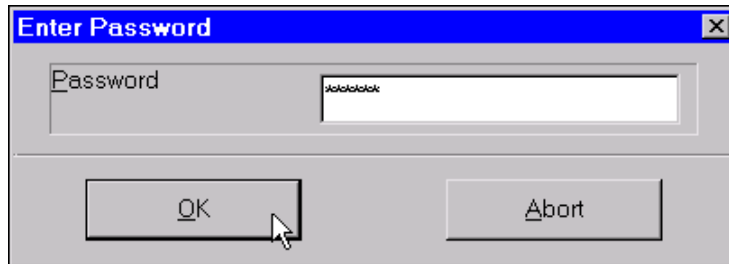


Figure 3-135 Enter Password dialog box

Enter the password in the text field you defined in the **PLC Write Protection Password** (see chapter 3.4.10). The password is not displayed in the text field. Each star represents one (1) character.

◆ To confirm the password entry, activate the **OK** button. The write protection is turned off. Now you may transfer data to the online PLC.

If you entered an incorrect password a warning will be displayed and the write protection stays active.



Figure 3-136 Incorrect Password

◆ Confirm the warning and enter the correct password to turn the PLC write protection off.

3.4.10 PLC Write Protection Password (Option Menu)

Prior to activating the PLC write protection you have to define a password to turn the protection on and off. The password may have up to 27 characters. The password may be changed at any time as long as you know the old password. As a default no password is assigned.

◆ Click **PLC Write Protection Password** in the option menu.

◆ Press **ALT + O, P**.

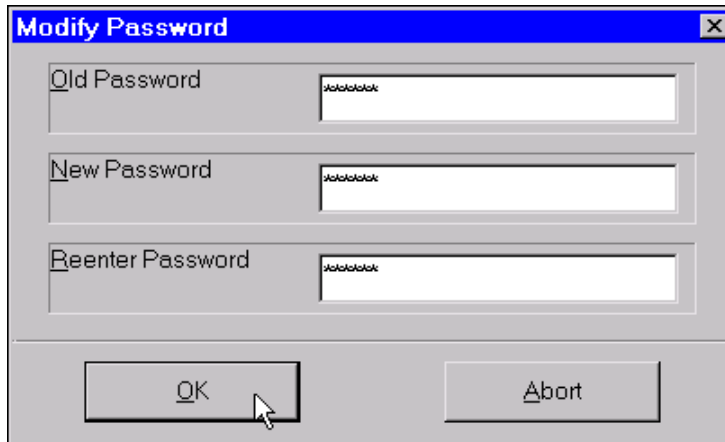


Figure 3-137 Modify Password dialog box

In the text field **Old Password** enter the password you defined the last time. If no password was yet assigned (default setting) it is not possible to enter a password.

In the text field **New Password** enter the password you want to use to turn the PLC write protection on. The same password is needed to turn the PLC write protection off.

To avoid entering an incorrect password due to a typing error, you have to type the new password again in the text field **Reenter Password**.

- ◆ To confirm the password entry, activate the **OK** button.

If the re-entered password and the new password do not match a warning will be displayed and the new password is ignored.



Figure 3-138 Wrong Password warning

The modify password dialog box is still open.

We recommend that you reenter the old password, the new password and then type the new password in the reenter password text field.

The write protection may now be turned on and off with the defined password

In case you lose the password you will have to reinstall *S5 / S7 for Windows*. If you do reinstall *S5 / S7 for Windows* make sure you have the PIN codes available to activate *S5 / S7 for Windows* and the options.

3.4.11 S7 CPU Selection (Option Menu)

Via the MPI (multi point interface) several S7-300/400 CPU's and/or programmable modules may be connected to a PC running *S7 for Windows*. The CPU's and the modules that are connected together must each have unique MPI addresses.

The command S7 CPU Selection allows you to select the CPU (module) you want to communicate with.

Note:

If additional CPU communication processors (CP's) or other programmable modules (FM's) are located in the S7 300/400 PLC, these modules (CP, FM) will have an MPI address automatically assigned.

The firmware assigns the MPI address of the CPU +1 to the first module. The second module will get the CPU MPI address +2 etc.

The communication rate is dependent on the setting of the PC-MPI cable and can be between 19.2 to 115,2 kBaud (187.5 kBaud between the modules). The maximum cable length of the complete network (without additional amplifiers) is limited to 50 meters (160 ft.).

MPI addresses between 0 and 126 may be assigned to the devices connected to the MPI network.

Table 3-1 shows the default MPI address settings. Unique MPI addresses must be assigned to the devices prior to connecting the devices to the MPI network.

Device (Node)	Default MPI Address	Highest Default MPI Address
Programming Device (PG)	0	15
Operators Panel (OP)	1	Depending on the OP type
CPU	2	15

Table 3-12 Default MPI address settings

◆ Click **Options, S7 CPU Selection**.

◆ Press **ALT+ O, S**.

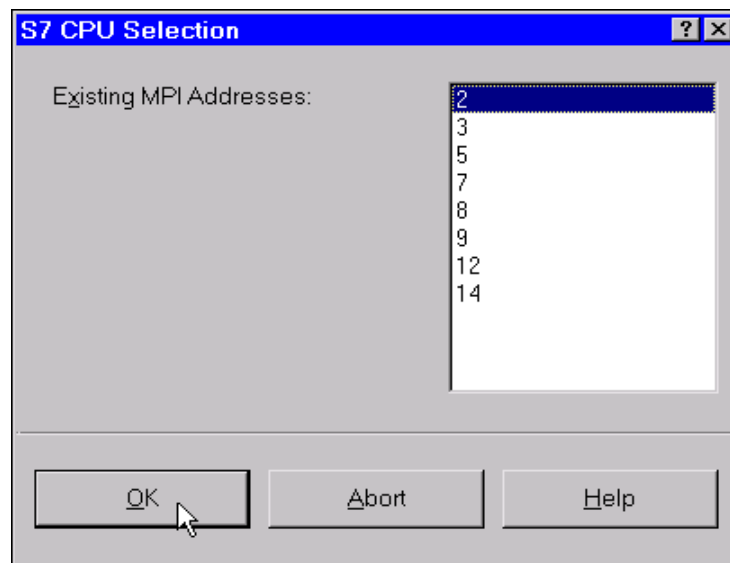


Figure 3-139 S7 CPU Selection

Note:

Make sure that all the devices connected to one MPI Bus have the same **Max. MPI Address** setting. If devices with different **Max. MPI Address** settings are connected on one bus, the devices will not be recognized and communication cannot take place.

For more details see chapter 3.2.11.1 (interface tab, preference dialog box)

3.4.12 S7 CPU's: Copy from RAM to ROM (Option Menu)

Some of the CPU's of the S7-300/400 series (e.g. CPU 312) do not provide a memory card slot. To save the CPU RAM contents in the integrated ROM (EEPROM) area and prevent the loss of the data in case of a power failure or shut down, *S7 for Windows* provides a **Copy from RAM to ROM** command. To execute the command the S7-300/400 CPU must be connected online (via the PC-MPI cable) with the PC.

To copy the contents of the RAM into the integrated ROM area follow the steps outlined below:

- ◆ Click **Options, S7 CPU's: Copy from RAM to ROM**.
- ◆ Press **ALT+ O, C**.

To transfer the contents of the RAM into the EEPROM (ROM), the key switch of the CPU must be in its **Stop** position. If the key switch is not in the **Stop** position, an error message is displayed and the transfer process is aborted.

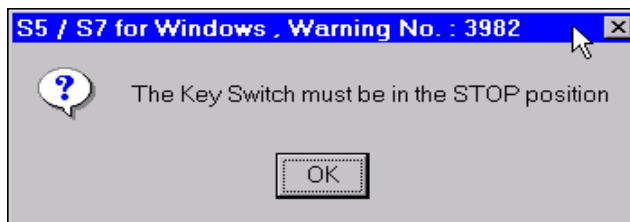


Figure 3-140 Transfer warning

The successful transfer from RAM into the EEPROM (ROM) is indicated with the following message:



Figure 3-141 Successful transfer from the RAM into the EEPROM (ROM) message

Note:


To delete the data in the integrated EEPROM module, the module must be programmed with "null" data.

If there is no PLC Program located in the RAM area and the **Copy from RAM to ROM** command is executed all the data in the EEPROM module is erased.

3.4.13 Open S7 Hardware Configuration (Option Menu)

S7 for Windows provides a separate window to configure the hardware and set the parameters.

 ◆ Click **Options, Open S7 Hardware Configuration**.

 ◆ Press **ALT + O, 7**.

The S7 Hardware Configuration program has all the tools integrated, for an easy hardware configuration. The built in Hardware Catalog lets you select the hardware used in specific applications.

The functions of the Hardware configuration window are explained in detail in chapter 13.

Note:

If a project has a hardware configuration file assigned to it, the command **S7 Hardware Configuration** opens this file and is ready for modifications (see chapter 3.2.5.2).



If there is no hardware configuration file assigned to the project, a new S7 hardware configuration file may be generated and assigned to the project.

The hardware configuration file is saved using the project name with the file name extension ***.CF7**.

3.5 Windows Menu (PC Block List)

The **Windows** menu is divided into three (3) sections. The first section provides you with the commands to manage the windows, opened under *S5 / S7 for Windows*. The second section lists all the windows available under *V*. The third section lists all the open windows. The active window is marked. The PC block list window is always open. Depending on the arrangement of the open windows you may only see one window. All the other windows are in the background.

It is a good habit to check the window menu frequently and to close all open windows not being used. An excess of open windows will decrease the performance of Windows

-  ◆ Click **Window** in the menu bar.
-  ◆ Press **ALT + W**.

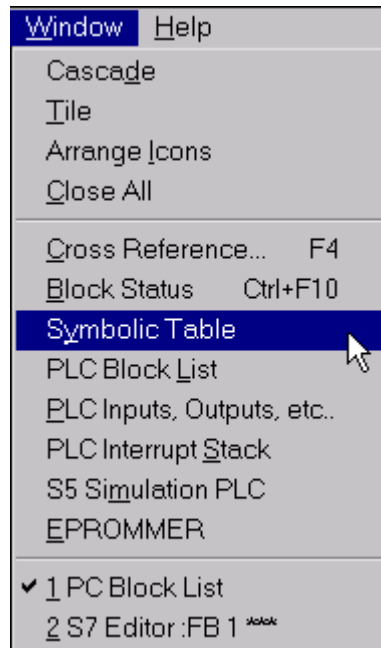




Figure 3-142 **Windows** menu (PC Block List)

3.5.1 Cascade (Windows Menu)

The **Cascade** command causes the open windows in *S5 / S7 for Windows* to overlap so that each title bar is visible.

-  ◆ Click **Cascade** in the Window menu.
-  ◆ Press **ALT + W, D**.

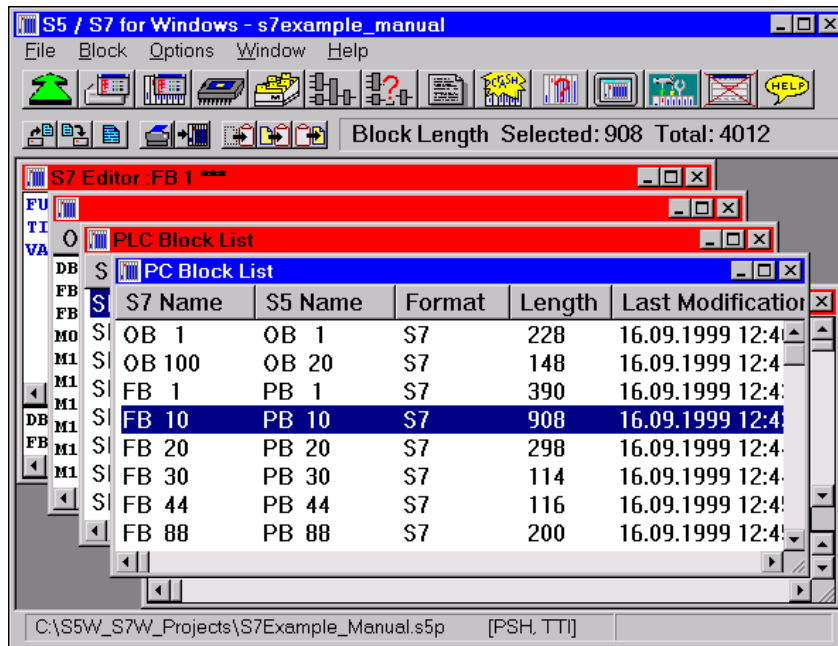


Figure 3-143 Windows arranged in a cascade

3.5.2 Tile (Windows Menu)

The **Tile** command arranges the open windows in *S5 / S7 for Windows* in smaller sizes to fit next to each other on the basic window workplace.

- ◆ Click **Tile** in the window menu.
- ◆ Press **ALT + W, T**.

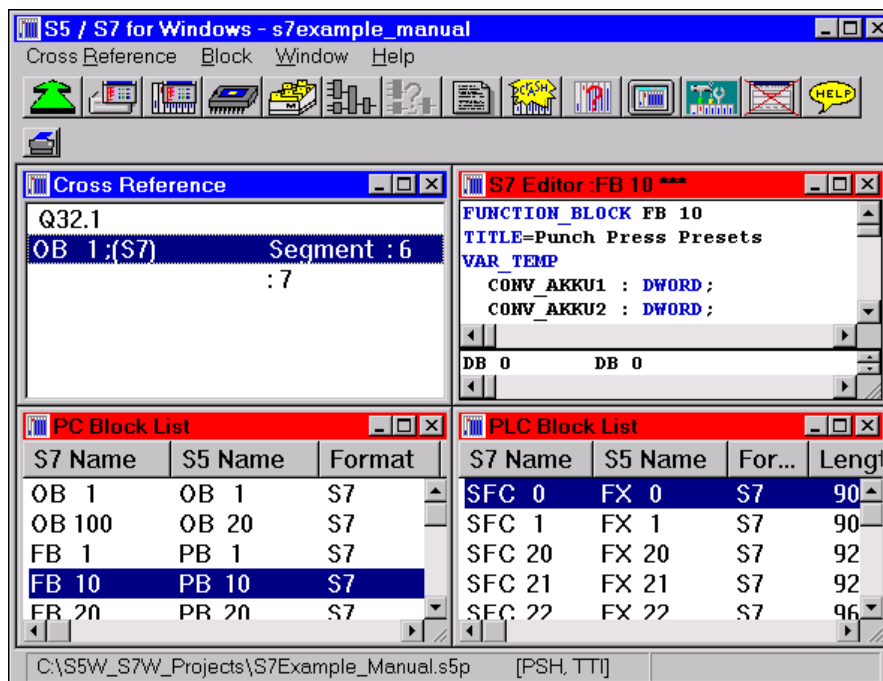




Figure 3-144 Windows arranged in a tile layout



3.5.3 Arrange Icons (Windows Menu)

When you minimize a window in *S5 / S7 for Windows*, it becomes an icon. You can move these icons around in the basic window workplace by dragging them with the mouse. If you have several icons in the basic window you can arrange them so that they are evenly spaced and do not overlap.

-  ◆ Click **Arrange Icons** in the window menu.
-  ◆ Press **ALT + W, I**.

3.5.4 Close All (Windows Menu)



After working for some time with *S5 / S7 for Windows* you may have opened many windows. It is a good habit to close all the unnecessary windows. An excess of open windows could reduce the performance of Windows drastically.

-  ◆ Click **Close All** in the window menu.
-  ◆ Press **ALT + W, A**.

This command closes all the windows except the PC block list window.

3.5.5 Cross Reference (Windows Menu)



This command opens the **Cross Reference** window. For more details about the cross-reference window, see chapter 7.

-  ◆ Click **Cross Reference** in the window menu, or click the icon in the tool bar.
-  ◆ Press **F4**.



3.5.6 PLC Status (Windows Menu)



This command opens the **PLC Status** window. For more details about the block status window, see chapter 10.

-  ◆ Click **PLC Status** in the window menu, or click the icon in the tool bar.
-  ◆ Press **CTRL+F10**.



3.5.7 Symbolic Table (Windows Menu)


This command opens the **Symbolic Table** window. For more details about the symbolic table window, see chapter 8.

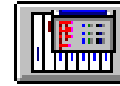
-  ◆ Click **Symbolic Table** in the window menu, or click the icon in the tool bar
-  ◆ Press **ALT + W Y**.




3.5.8 PLC Block List (Windows Menu)

This command opens the **PLC Block List** window. For more details about the PLC block list window, see chapter 9.


-  ◆ Click **PLC Block List** in the window menu, or click the icon in the tool bar.

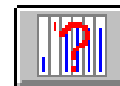



-  ◆ Press **ALT + W, L**.

3.5.9 PLC Inputs, Outputs, etc. (Windows Menu)

This command opens the **PLC Inputs, Outputs, etc.** window (**External PLC Status**). For more details about the PLC inputs, outputs, etc. window, see chapter 11.


-  ◆ Click **PLC Inputs, Outputs, etc.** in the window menu, or click the icon in the tool bar.




-  ◆ Press **ALT + W, X**.

3.5.10 PLC Interrupt Stack (Windows Menu)

This command opens the **PLC Interrupt Stack** window. For more details about the PLC interrupt stack window, see chapter 12.


-  ◆ Click **PLC Interrupt Stack** in the window menu, or click the icon in the tool bar.

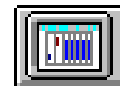



-  ◆ Press **ALT + W, S**.

3.5.11 S5 Simulation PLC (Windows Menu)

This command opens the **S5 Simulation PLC** window. For more details about the simulation PLC window, see chapter 14.

-  ◆ Click **S5 Simulation PLC** in the window menu, or click the icon in the tool bar.



-  ◆ Press **ALT + W, M**.

3.5.12 EPROMMER (Windows Menu)

This command opens the **EPROMMER** window. The **EPROMMER** window provides the commands to burn EPROMS and EEPROMS. For more details about the **EPROMMER** window, see the **EPROMMER User's manual**.

-  ◆ Click **EPROMMER** in the window menu, or click the icon in the tool bar.

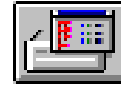


-  ◆ **ALT + W, E**.

3.5.13 PC Block List (Windows Menu)

This command opens the **PC Block List** window. For more details about the PC block list window, see chapter 3.

- ◆ Click **1 PC Block List** in the window menu, or click the icon in the tool bar.



- ◆ Press **ALT + W, 1**.

3.6 Help Menu

S5 / S7 for Windows online **Help** is an easy way to look up information about a task you are performing, a feature you would like to know more about, or a command you want to use.

S5 / S7 for Windows help is available whenever you see a help button, or use help from the menu bar or the help icon in the tool bar.

Activating the help button in a dialog box gives you specific information about the tasks you can perform with that dialog box.

Activating the help icon in the tool bar gives you specific information about the tasks you can perform in the active window. Pressing the key F1 has the same function.

The help command from the menu bar allows you to select general help topics.

- ◆ Click **Help** in the menu bar.

- ◆ Press **ALT + H**.

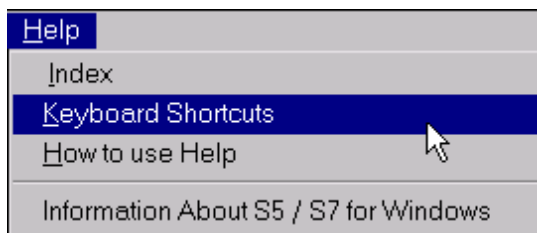


Figure 3-145 Help menu

3.6.1 Index (Help Menu)

The **Index** command from the help menu gives you a list of all help topics from *S5 / S7 for Windows*.

- ◆ Click **Index** in the help menu.

- ◆ Press **ALT + H, I**.

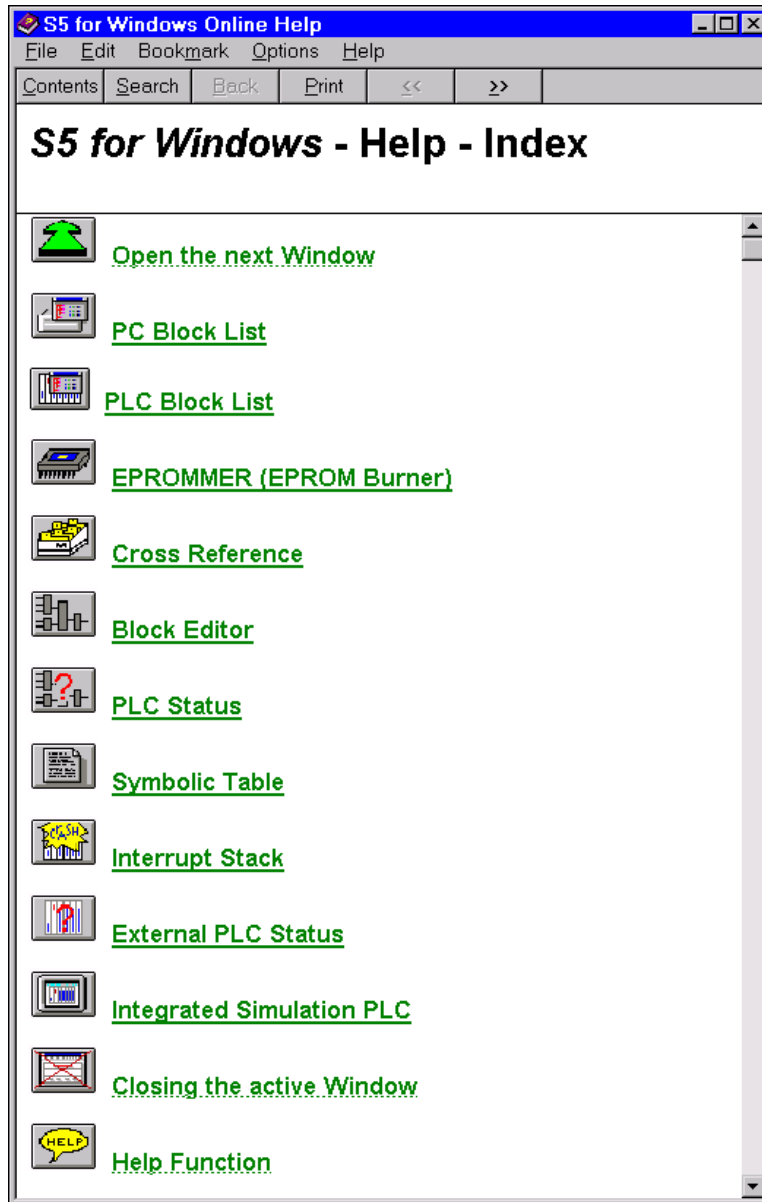


Figure 3-146 The list of the main help topics.

Click the underlined text to open a help topic.

3.6.2 Keyboard Shortcuts

To operate *S5 / S7 for Windows* without a mouse, many keyboard shortcuts are integrated for easy operation. The command **Keyboard Shortcuts** displays a list of the function keys used in *S5 / S7 for Windows*.

- ◆ Click **Keyboard Shortcuts** in the help menu.
- ◆ Press **ALT + H, K**.



Figure 3-147 Keyboard shortcuts list sorted by functions (portion).

3.6.3 How to use Help


This command opens the **How to use Help** file displaying instructions how to use the Windows help files.

- ◆ Click **How to use Help** in the help menu.
- ◆ Press **Alt + H, H**.

3.6.4 Information About S5 / S7 for Windows

The **About S5 / S7 for Windows** opens a display field that provides you information such as serial number, version, copyright, etc.

 ◆ Click **About S5 for Windows** in the help menu.

 ◆ Press **ALT+ H, A**.

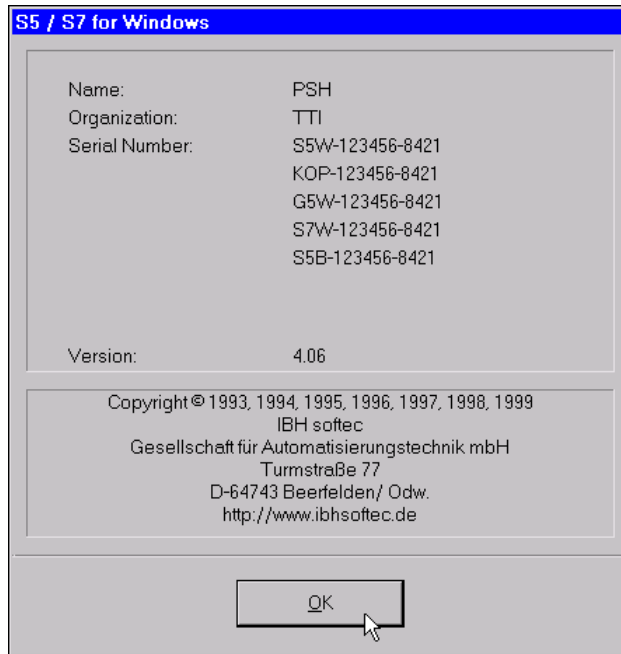


Figure 3-148 The **About S5 S7 for Windows** display box

4 PC Block Editor

S5 / S7 for Windows provides two block editors. With the **PC Block Editor** you can create and/or modify blocks stored in your PC (Personal Computer). The operation and the tools provided in the **PLC Block Editor** are basically the same as the PC editor.

The differences are:

The **PC block editor** allows you to work with blocks stored in the PC.

The **PLC block editor** allows you to work with blocks stored in the PLC.

There are some differences in the way you save modified Blocks in the PLC. Therefore, we recommend that you use the **PC block editor** to create new blocks and to modify existing blocks.

Dependant on the set-up of your programming system, the software options, the two editors "**understand**" the STEP® 5 syntax and/or the STEP® 7 syntax.

The **S5 for Windows** software, allows you to create and modify PLC programs using the **STEP® 5** syntax. The PLC logic may be displayed in Statement List (STL, Source Text), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

The **S7 for Windows** software allows you to create and modify PLC programs using the **STEP® 7** syntax. The PLC logic may be displayed in Statement List (STL, Source Text), Ladder Diagram (LAD) , or Control System Flowchart (CSF) presentation.

If only one of the software packages, *S5 for Windows* or *S7 for Windows*, has been installed, the Block Editors will only understand the syntax that is used with that software package.

Special features required to "**understand**" both the STEP® 5 syntax and the STEP® 7 syntax such as e.g. converting blocks from one syntax format into the other syntax form are not available.

In this chapter we will explain how to use the **Block Editor**. These explanations will be based on the PC block editor. Differences in how to manipulate the **PLC Block Editor** are specifically explained.

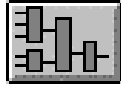
4.1 Editor Window

The Functions of the PC Editor and the PLC Editor may be divided into several groups:

- Common functions
- Editing a Statement Lists (STL)
- Editing a Block-STL (Source Text)
- Editing Ladder Diagrams (LAD)
- Editing a Control System Flowcharts (CSF)
- Editing a Step Sequence (*G5 for Windows*)

The editor may be called from different windows.

From the **PC Block List** window.

- ◆ Double click a block (block name in the block list) or if you marked a block prior clicking the icon, the block editor window opens immediately. 
- ◆ Activate the **New Block** command from the block menu.
- ◆ Press **F10**. If you marked a block prior clicking the icon the block editor window opens immediately.
- ◆ Press **ALT + B, M** to activate the **Modify** command from the block menu

You may also open the PC block editor from the **S5 Simulation PLC Status** window by clicking the block editor icon or pressing the **F10** key

Note:

When calling the editor from the **PLC Block List**, the **Editor** is open and ready to modify the Blocks stored in the PC.

If you are trying to open a block with the **PLC Editor** and the same block is already open in the **PC Editor**, a warning will be displayed. Editing the same Block with two editors may end up with unwanted results.

4.2 Common Functions (Editor)

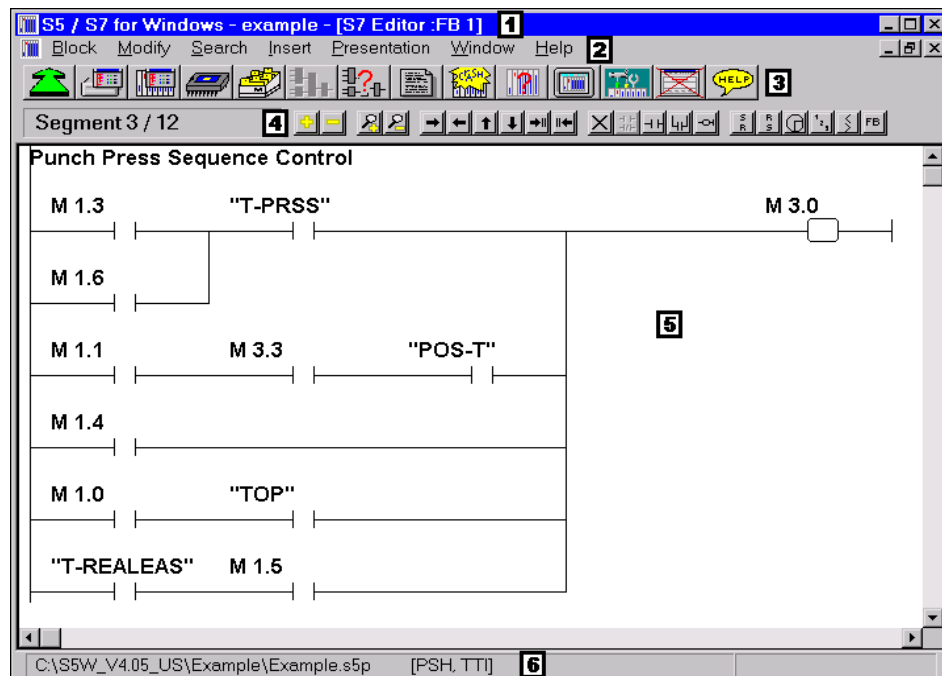
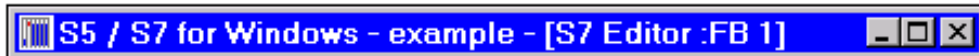


Figure 4-1 Block editor window (PC block editor, S7 ladder diagram presentation)

1 Title Bar

S7 Editor Title Bar (Editor – PC source)



The title bar informs you that the **S7 Editor** has opened the Function Block FB 1 from the project **example**.

S5 Editor Title Bar (Editor – PC source).



The Title Bar of the S5 Editor window displays the project name (example), S5 Editor, and the name of the open block (PB1).

S7 Editor Title Bar (Editor – PLC source)



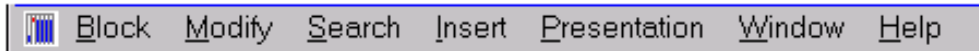
The title bar informs you that the **S7 PLC Editor** has opened the Function Block FB 1.

S5 Editor Title Bar (Editor – PLC source).

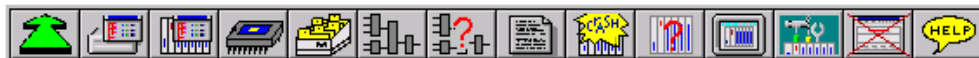


The Title Bar of the S5 Editor window displays **S5 PLC Editor** and the name of the open block (PB1).

The three stars (***) after the block name indicate that the block has been modified and has not yet been saved.

2 Menu Bar

The menu bar displays a list of menus. The Menu Names are identical for the S7 and the S5 Editors. The menu commands vary between the editors. You can open a menu by clicking on the name of the menu or by pressing the keys **ALT** and then the underlined character from the menu name. All the commands from these menus are described in this chapter.

3 Tool Bar

The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. With the keyboard you can reach these functions via the window menu and/or the function keys.

4 Tool Bar II

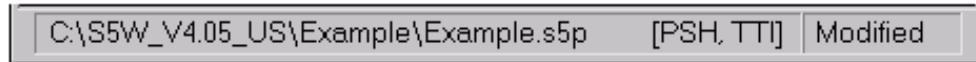
The tool bar II provides instant access to frequently used Editor commands. Click an icon with the mouse and the command is executed. With the keyboard you can reach these functions via the menu commands. Also, the segment (network) number and the

total number of segments (networks) are displayed. If a variable definition table is selected, it is also indicated. The toolbar II changes with the type of editor and the presentation selected.

5 Workplace

This is the area where you may generate PLC logic and define the variables (S7 only).

6 Status Bar



The status bar displays the name and the path of the active PLC project, the progress of a selected action, or information about the command where the mouse pointer is located. Also it is indicated whether or not a block has been modified and not yet been saved.

4.2.1 Block (Block Menu - Editor Window)

With commands from the **Block** menu you can save a block and close the block editor. You can also save the symbolic table or Undo any modifications from the symbolic table. The commands from the block menu are the same for all PLC logic presentations. The block menu for the PC and PLC block editor are the same. Also the commands for the S7 and the S5 editors are the same.

◆ Click **Block** in the menu bar (editor window).

◆ Press **ALT + B**.

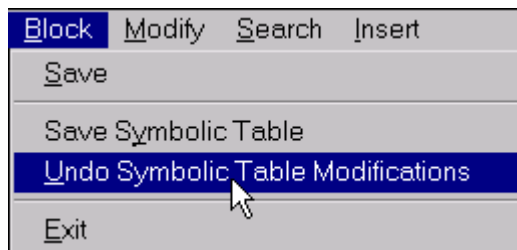


Figure 4-2 Block menu (editor window)

4.2.1.1 Save Block

This command saves the open block. The location where the block is saved depends on the following:

- The editor was opened from the **PC Block List**
- The editor was opened from the **PLC Block List**
- **Immediately on Disk** was marked on the editor tab of the preference dialog box (see chapter 3.2.11.2).
- **On PC and PLC** was marked on the editor tab of the preference dialog box (see chapter 3.2.11.2).

The editor was opened from the PC Block List

If the button **Immediately on Disk** is *not* marked, the **Save** command saves the block, opened with the editor, in a temporary buffer.

If the button **Immediately on Disk** is *not* marked, the blocks (PLC Program) can only be saved on disk with the Save (Save As) command from the File menu (PC block list window)

If the button **Immediately on Disk** is marked, the modified block is saved on disk.

If the button **On PC and PLC** was marked, the block is also transferred to the PLC whenever it is saved on disk. A warning is displayed and you are prompted whenever the system tries to transfer a block to the PLC.

The editor was opened from the PLC Block List

The **Save** command transfers the modified block to the PLC. A warning is displayed and you are prompted whenever the system tries to transfer a block to the PLC.

If the button **On PC and PLC** was marked, the block is also saved on disk whenever the block is transferred to the PLC with the **Save** command.

4.2.1.2 Save Symbolic Table

This command saves the **Symbolic Table**, currently in the PC RAM, under the same file name as the PLC project file, with the file name extension **.seq**.

You should use this command only if you saved the project previously with the command **Save As** (see chapter 3.2.4)


 ◆ Click **Save Symbolic Table** in the block menu.

 ◆ Press **ALT + B, Y**.

4.2.1.3 Undo Symbolic Table Modifications

This command cancels all the modifications to the symbolic table since the last time the symbolic table was saved.


 ◆ Click **Undo Symbolic Table Modifications** in the block menu.

 ◆ Press **ALT + B, O**.

4.2.1.4 Exit

With the **Exit** command from the block menu in the editor window, you close the editor window.

 ◆ Click **Exit** in the block menu.

 ◆ Press **ALT + B, E**.

4.2.2 Modify (Modify Menu - Editor Window)

The commands from the **Modify** menu, in the editor window, are used to work with an existing segment (network) and/or create a new segment (network). The variable table may also be created or modified (S7 only). In this chapter all the commands from the **Modify** menu are explained. Depending on the presentation selected (STL, CSF, LAD, or Block STL [Source Text]) some commands may not be available. These commands are displayed in light gray. Only commands displayed in bold black may be used.

 ◆ Click **Modify** in the menu bar.

 ◆ Press **ALT + M**.

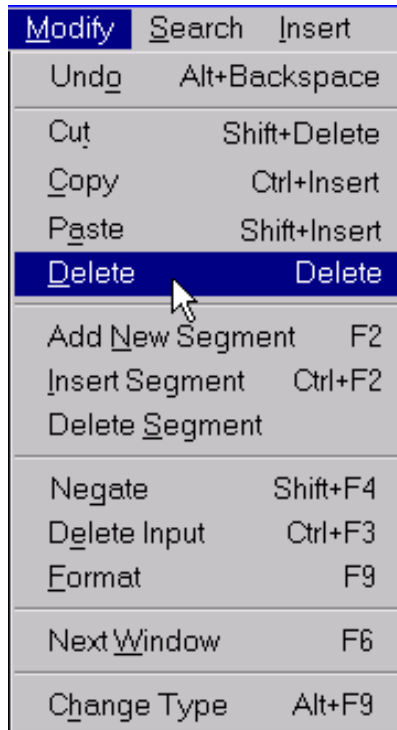


Figure 4-3 Modify Menu - Editor Window

The search menu for the PC and PLC block editor are the same. Also the commands for the S7 and the S5 editors are the same.

4.2.2.1 Undo (Modify Menu)

S5 / S7 for Windows keeps track of the edits you have made. If you change your mind or make a mistake, you can usually reverse the last action you have taken.

 ◆ Click **Undo** in the modify menu.

 ◆ Press **ALT + BACKSPACE (ALT + M, O)**.

The last insert or delete action is reversed.

4.2.2.2 Cut, Copy, Paste (Modify Menu)

S5 / S7 for Windows supports the Windows clipboard to move or copy text (STL and Block STL [Source Text] presentation - segments, steps, transitions, SUL's -, comments, symbolic table) within *S5 / S7 for Windows* or to and from other windows applications.

- **Moving** means to remove (**Cut**) the selected text from one location and insert it in another location. This could be within the same segment, another segment or block, comments, symbolic tables, another PLC program or a windows application (e.g. Word Processor).
 - **Copying** means to make a copy of the selected text and insert it in another location. This could be within the same segment, another segment or block, comments, symbolic tables, another PLC program or a windows application (e.g. Word Processor).



◆ To move or copy text using the mouse

- ◆ Select the text with the mouse.

To **move** text, click **Cut** from the modify menu. The text is transferred into the windows clipboard and is removed from the current location.

To **copy** text, click **Copy** from the modify menu. The text is transferred into the windows clipboard. The text maintains in the current location.

- ◆ Position the insertion point in a new location.

If the new location is another segment, another segment or block, comments, symbolic tables, another PLC program or a *Windows* application (e.g. Word Processor), open the desired location.

If you want to paste the text into a segment click the **Paste** command from the modify menu. All windows application supporting the clipboard, provide the paste command.

The selected text is at the new location.



◆ To move or copy text using the keyboard

- ◆ Select the text by using key combinations.

Do one of the following.

To:	Press:
Copy selected text to the clipboard	CTRL + INSERT , or CTRL + C , or ALT + M, C
Move (Cut) selected text to the clipboard	⇧ Shift + DELETE or CTRL + X , or ALT + M, T
Paste Clipboard contents into a new location	⇧ Shift + INSERT , or CTRL + V , or ALT + M, A

Table 4-1 Move or copy text using the keyboard

4.2.2.3 Delete (Modify Menu)

The **Delete** command from the modify menu is used to delete marked (selected) text. The *Windows* clipboard contents are not modified by this command. Deleted text may only be returned to its original location by executing the **Undo** command directly after the deleting the text.

 ◆ Click **Delete** in the modify menu.

 ◆ Press the **DELETE** key (**ALT + M, D**).

The marked text is deleted.

4.2.2.4 Add New Segment (Modify Menu)

The **Add New Segment** command from the modify menu adds a new segment (network) at the end of the block. The new segment is assigned a segment number - the last segment number in the block plus (1) one.

 ◆ Click **Add New Segment** in the modify menu.

 ◆ Press the **F2** key (**ALT + M, N**).


The new network (segment) is opened and ready for editing.

The **Add New Segment** command is also used to add a segment to a step, transition or SUL.

4.2.2.5 Insert Segment (Modify Menu)

The **Insert Segment** (network) command from the modify menu inserts a new segment directly behind the displayed segment. The new segment is assigned the segment number of the displayed segment plus (1) one. All segments after the inserted segment are assigned a new segment number (the old segment number plus (1) one).

 ◆ Click **Insert Segment** in the modify menu.

 ◆ Press **ALT + M, I**.

The segment is deleted.



The **Insert Segment** command is also used to insert a segment in a step, transition or SUL.

4.2.2.6 Negate (Modify Menu)

The **Negate** command, from the modify menu, changes the selected input from a normal input to an inverted input or vice versa (inverted input to normal input).

The **Negate / Invert** command is also used to invert a normally open contact (NO) into a normally closed contact (NC) or vice versa. To do so the operand must be marked.

 ◆ Click **Negate** in the modify menu.

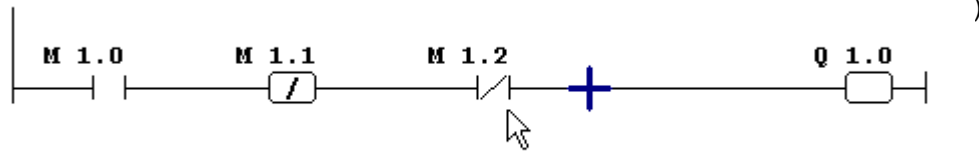
 ◆ Press +**F4** (**ALT + M, G**).

- **S7 Editor**

LAD presentation

Contacts may be negated to use them as normally open (NO) or normally closed (NC) contacts. Intermediate flags may also be negated.

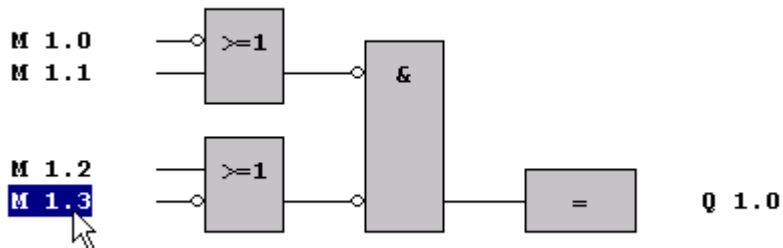
Figure 4-4



CSF presentation

Inputs and outputs from logical connections (AND, OR) with the displayed operand may be negated.

Figure 4-5

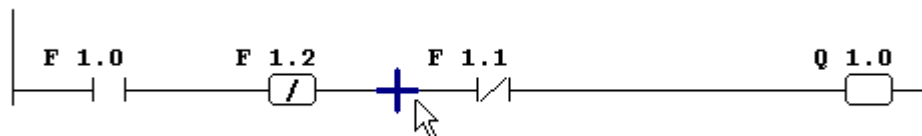


- **S5 Editor**

LAD presentation

Contacts may be negated to use them as normally open (NO) or normally closed (NC) contacts. Intermediate flags may also be negated.

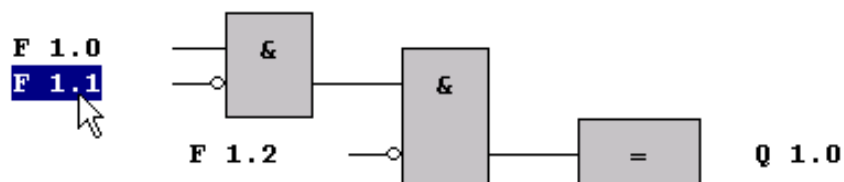
Figure 4-6



CSF presentation

Only inputs from logical connections (AND, OR) with the displayed operand may be negated.

Figure 4-7



4.2.2.7 Delete Input (Contact) (Modify Menu)

The **Delete Input** command is used to delete contacts in the Ladder Diagram presentation and inputs in the Control System Flowchart presentation. Other logical elements cannot be deleted by using this command.

LAD presentation

The **Delete Input** command, from the modify menu, deletes the selected contact to the right of the insertion point (blue cross). Only contacts may be deleted.

CSF presentation

The **Delete Input (Contact)** command, from the modify menu, deletes the selected input or the selected logical connection. A selected input or logical connection is displayed in dark blue. Only inputs from **AND's** and **OR's** may be deleted.

 ◆ Click **Delete Input** in the modify menu.

 ◆ Press **CTRL+F3 (ALT + M, E)**.

The input (logical connection) or contact is deleted.

4.2.2.8 Format (Modify Menu)

The **Format** command, from the modify menu, formats the created PLC logic (LAD, STL, and Block-STL [Source Text]) and performs a syntax check. If *S5 / S7 for Windows* detects an error, an error message is displayed indicating the incorrect syntax.

In STL (Block-STL [Source Text]) presentation prompting the error message will highlight the incorrect syntax.

 ◆ Click **Format** in the modify menu.

 ◆ Press **F9 (ALT + M, F)**.

Note:



STL, Block-STL [Source Text] programming

If the button **Format Automatically** is marked (Editor tab, Preference dialog box chapter 3.2.11.2) the syntax is automatically checked when the **RETURN** key is pressed at the end of an edited line. The line is only formatted if the syntax is correct.

The next line may be edited whether or not the previous line fulfills the syntax.



4.2.2.9 Next Window (Modify Menu)

The **Next Window** command, from the modify menu, allows you to move the insertion point (cursor) between the workplaces displayed. This could be a segment (network) and the displayed symbolic table, a segment and the displayed extended segment comment, the step sequence overview and a displayed step (transition), etc..

- ◆  Position the mouse pointer in the display you want to be active (segment / network, Overview Display, Detail Display, symbolic table or extended segment comment display) and click the left mouse button.
- ◆  Press **F6 (ALT + M, W)**.
The insertion point moves into the next display.

4.2.2.10 Change Type (Modify Menu)

The **Change Type** command, from the modify menu, allows you to modify the type of logical function. This command also changes the type of assignment (coil, output) to an **S** (set) or **R** (reset) type and inverts the intermediate results. You may have to activate the change type command several times to make the desired element out of an existing logical element (e.g. change a pulse timer into a stored on-delay timer).

- ◆  Click **Change Type** in the modify menu.
- ◆  Press **ALT + F9 (ALT + M, H)**.

4.2.3 Search (Search Menu - Editor Window)

The commands from the **Search** menu are used to search and replace text strings and operands in a segment or block. Also, another segment may be opened. In this chapter all the commands from the **Search** menu are explained. Depending on the presentation selected (STL, CSF, LAD, or Block STL [Source Text]) some commands may not be available. These commands are displayed in light gray. Only commands displayed in bold black may be used.



- ◆  Click **Search** in the menu bar.
- ◆  Press **ALT + S**.



Figure 4-8 Search Menu - Editor Window

The search menu for the PC and PLC block editor are the same. Also, the commands for the S7 and the S5 editors are the same.


4.2.3.1 Search for (Search Menu)

The **Search for** command opens a dialog box to enter a text string to be searched for. The search function looks for identical ASCII strings and can only be used in the STL presentations.

In **STL** (Block-STL [Source Text]) presentation, the displayed segment (the entire Block or a marked portion) is searched. If an identical string is found the search is canceled and the identified string is marked (blue background). If no identical string is found the search is canceled and a corresponding message will be displayed.

You may restart the search after a text string is found by pressing the **F3** key, until the segment end (STL) or block end (STL-Block [Source Text]) is reached.

 ◆ Click **Search for** in the search menu.

 ◆ Press **ALT + S, S**.

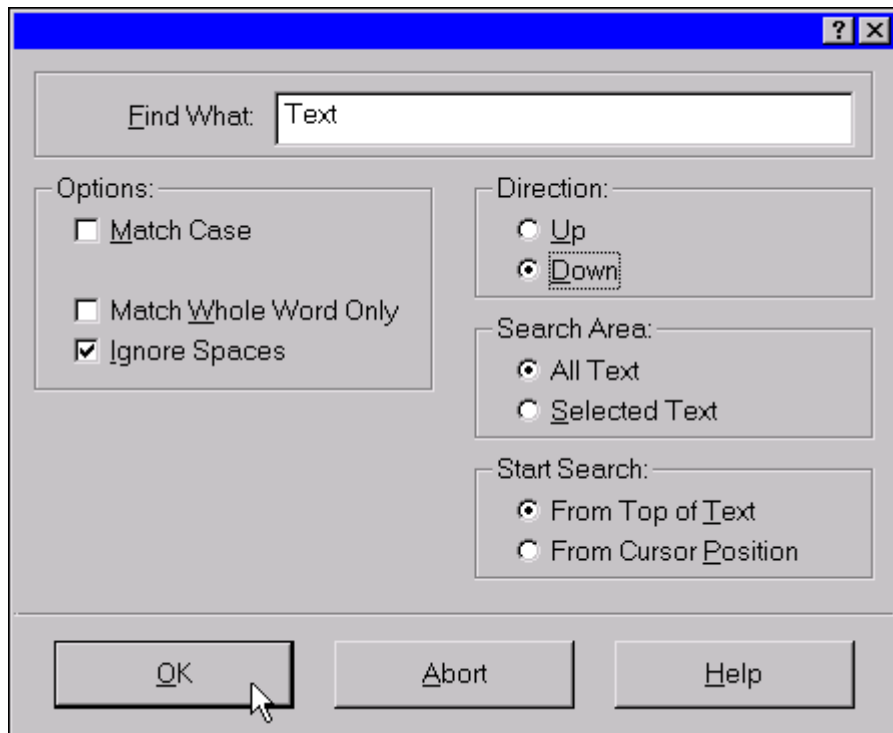


Figure 4-9 Find dialog box

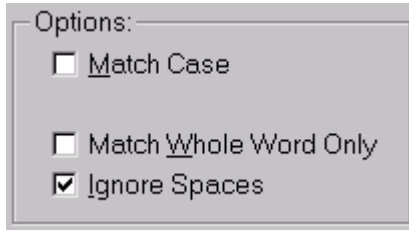
In **STL** presentation the active segment (network) is searched. In **Block-STL (Source Text)** the active block is searched.

- **Find What:**



In the text field **Find What** enter the text string you want to search for. The text field is supported by the Clipboard copy function. It is wise to copy the string to search for into the text field to avoid spelling mistakes.

- **Options**



The search function allows you to select options on how to handle the search string.

Match Case



If the **Match Case** button is marked the search function will only find text strings having the same pattern of uppercase and lowercase letters as the search string.

Match Whole Word Only



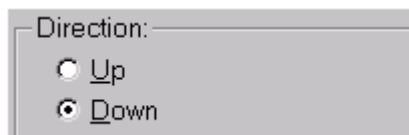
If the **Match Whole Word Only** button is marked the search function will only find text strings having the same length as the search string.

Ignore Spaces



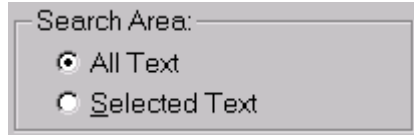
Text strings to search for may have space characters included. To ensure that differences in the number of spaces will not influence the search function you may mark the **Ignore Spaces** button.

- **Direction**



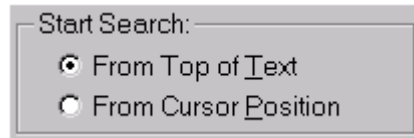
The search may be performed in the upward or downward direction.

- **Search Area**



The search may be performed in the text (Segment/ Network or Block) opened with the editor or only in the marked portion of the text

- **Start Search**



The search may start at the beginning of the Segment/ Network or Block or it may start from the position of the insertion mark (Cursor).

4.2.3.2 Replace (Search Menu)

The **Replace** command opens a dialog box to enter a text string to be searched for and another text string to replace the located text string.

◆ Click **Replace** in the search menu.

◆ Press **ALT + S, R**.

In the **STL** presentation, the active segment (network) is searched. In **Block-STL (Source Text)** the active block is searched.

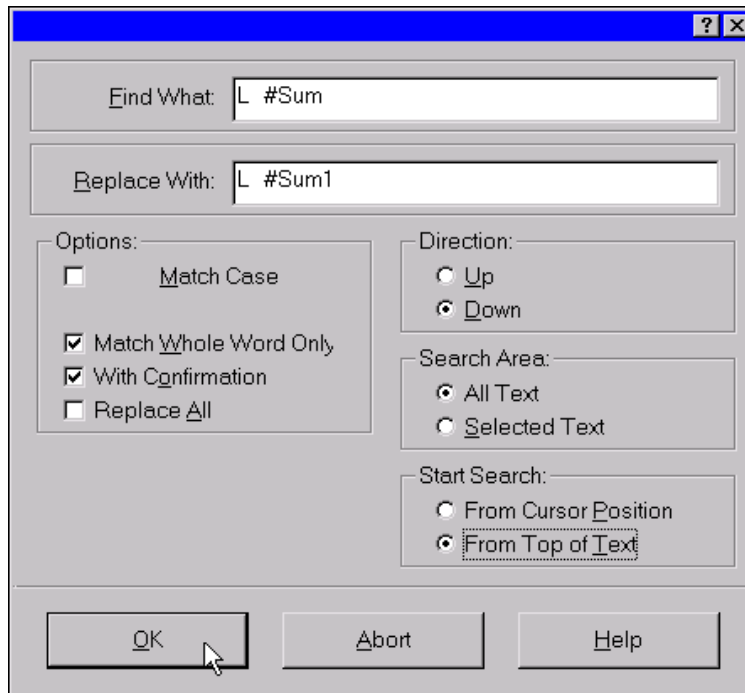



Figure 4-10 Search and Replace dialog box

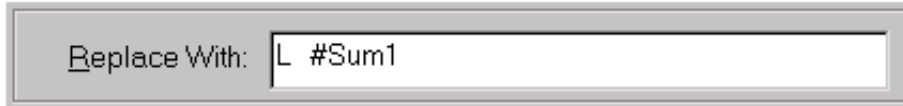
In the **STL** presentation the active segment (network) is searched. In **Block-STL (Source Text)** the active block is searched.

- **Find What:**

A screenshot of a text input field with a light gray border. The text "L #Sum" is entered into the field. The label "Find What:" is positioned to the left of the input area.

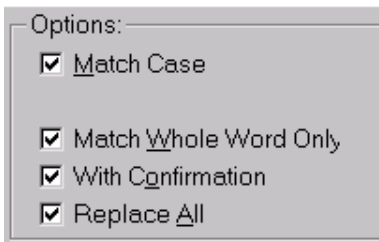
In the text field **Find What** enter the text string you want to search for. The text field is supported by the Clipboard copy function. Make sure that all the required spaces are included in the search string. Spaces are handled as characters during the search operation. It is wise to copy the string to search for into the text field to avoid spelling mistakes.

- **Replace With:**

A screenshot of a text input field with a light gray border. The text "L #Sum1" is entered into the field. The label "Replace With:" is positioned to the left of the input area.

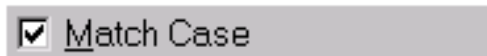
In the text field **Replace With** enter the replacement text string. The text field is supported by the Clipboard copy function.

- **Options**

A screenshot of a dialog box titled "Options:". It contains four checked checkboxes: "Match Case", "Match Whole Word Only", "With Confirmation", and "Replace All".

The search and replace function allows you to select options on how to handle the search string.

Match Case

A screenshot of a single checkbox labeled "Match Case" which is checked.

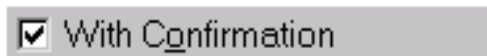
If the **Match Case** button is marked the search function will only find text strings having the same pattern of uppercase and lowercase letters as the search string.

Match Whole Word Only

A screenshot of a single checkbox labeled "Match Whole Word Only" which is checked.

If the **Match Whole Word Only** button is marked the search function will only find text strings having the same length as the search string.

With Confirmation

A screenshot of a single checkbox labeled "With Confirmation" which is checked.

If you mark **With Confirmation**, and *S5 / S7 for Windows* finds a match of the text string, a dialog box will open.

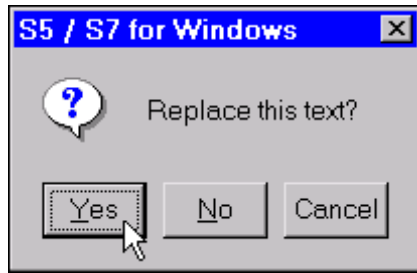
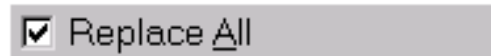


Figure 4-11 Replace Text prompting

The identified string is marked (blue background).

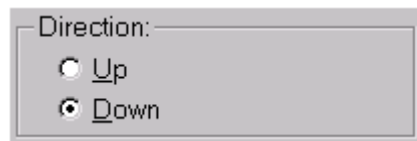
- ◆ Activate the **Yes** button to replace the string.
- ◆ Activate the **No** button to search for the next matching string.
- ◆ Activate the **Cancel** button to abort the replace action.
- ◆ Press **F3** to repeat the search after you activated the **Yes** or **No** button.
S5 / S7 for Windows tries to find the next match.

Replace All



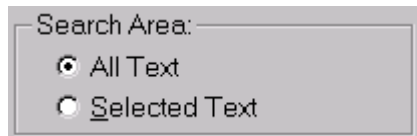
Mark the **Replace All** button if you want to automatically replace all the matching text strings.

● Direction



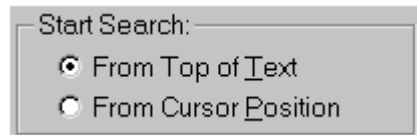
The search and replace function may be performed in the upward or downward direction.

● Search Area



The search and replace function may be performed in the text (Segment/ Network or Block) opened with the editor or only in the marked portion of the text

● Start Search



The search and replace function may start at the beginning of the Segment/ Network or Block or it may start from the position of the insertion mark (Cursor).

4.2.3.3 Search Again (Search Menu)

Use the **Search Again** command to restart a search after a matching text string was found (see chapter 4.2.3.1, 4.2.3.2). *S5 / S7 for Windows* starts the searches for the next matching text string.

◆ Click **Search Again** in the search menu.

◆ Press **F3**.

4.2.3.4 Search Operand (Search Menu)

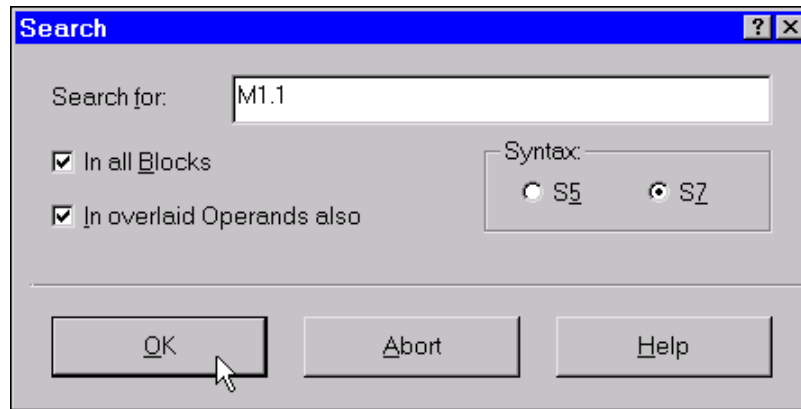


Figure 4-12 Search Operand dialog box

With the command **Search Operand** from the search menu, a dialog box is opened to enter the operand you want to search for.

◆ Click **Search Operand** in the search menu.

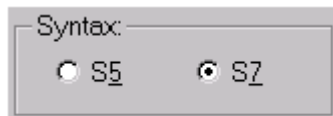
◆ Press **ALT + S, O**.

- **Search for:**



In the text field **Search for**, enter the operand you want to search for. The operand must be entered in its absolute form. The operand identifier may be entered in lower case. Spaces are ignored.

- **Syntax:**



S5 / S7 for Windows allows you to have Blocks in the S5 and the S7 syntax, to be present in one program. You have to select the syntax of the blocks you want to search. Mark the corresponding button.

- **In all Blocks:**

In all Blocks

If the button **In all Blocks** is marked, all the blocks in the selected syntax of the open project will be searched for the next matching operand.

If the button **In all Blocks** is **not** marked only the open block is searched.

- **In Overlaid Operands also**

In overlaid Operands also

If the button **In overlaid Operands also** is marked, the specified bit is not only found as a bit but also in a byte or word (etc.). A specified byte is also found in a word.

The block or the total PLC program is searched from its beginning to its end. If an operand is found, the operand is marked (blue background) and the search is aborted.

By pressing the **F5** key you may restart the search after an operand is found, until the complete block or the complete PLC program has been searched.

If no matching operand is found, a message box is opened.



Figure 4-13 Operand not found message

4.2.3.5 Search Operand Again (Search Menu)

Use the **Search Operand Again** command to restart a search after a matching operand is found (see chapter 4.2.3.4). The same parameters as the last search are used and *S5 / S7 for Windows* searches for the specified operand in the forward direction.

 ◆ Click **Search Operand Again** in the search menu.

 ◆ Press **F5 (ALT + S, E)**.

4.2.3.6 Next Segment (Search Menu)

With the command **Next Segment** you may open the next segment (network) of the same block. If you have reached the last segment, the command is deactivated and the command (icon) changes to a light gray color.

In a step sequence block you may use the command **Next Segment** to open the next step, transition or SUL.

In an S7 block you may use the command to go from the **Variable Table** to the first **Network**.

- ◆ Click **Next Segment** in the search menu or the **Next Segment** icon in the tool bar.



- ◆ Press **F8**.

The next segment (network), step, transition or SUL is opened.

The command **Next Segment** is also used to open the next segment within a step, transition, or SUL.

4.2.3.7 Previous Segment (Search Menu)

With the command **Previous Segment** you may open the previous segments (network) of the same block until the first segment of that block is displayed. When you have reached the first segment (S7 – Variable Table) the command is deactivated and the command (icon) changes to a light gray color.

In an S7 block you may use the command to go from the first **Network** to the **Variable Table**.

In a step sequence block you may use the command **Previous Segment** to open the previous step, transition or SUL.

- ◆ Click **Previous Segment** in the search menu or the **Previous Segment** icon in the tool bar.



- ◆ Press **F7**.

The previous segment (network), step, transition, SUL, or the S7 – Variable Table, is opened.

The command **Previous Segment** is also used to open the previous segment within a step, transition, or SUL.

4.2.3.8 Go to (Go to Segment) (Search Menu)

With the command **Go to** you may open any existing segment (network) of the same Block. If you choose a segment number higher than the last segment number in this block, the last segment is opened. This command opens a dialog box to enter the segment number. In a step sequence block you may use the command **Go to Segment** to open specific step, transition or SUL.

◆ Click **Go to Segment** in the search menu.

◆ Press **ALT + S,G**.

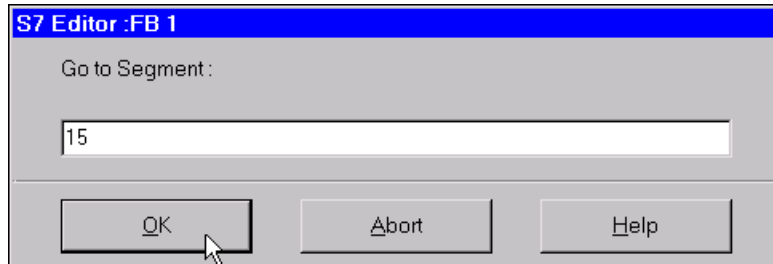


Figure 4-14 Go to segment (network) dialog box

Enter the segment (network) number in the **Go to Segment** text field.

If the block editor displays a step sequence block and the insertion point (cursor) is in the detail display, the command **Go to Segment** opens the following dialog box.

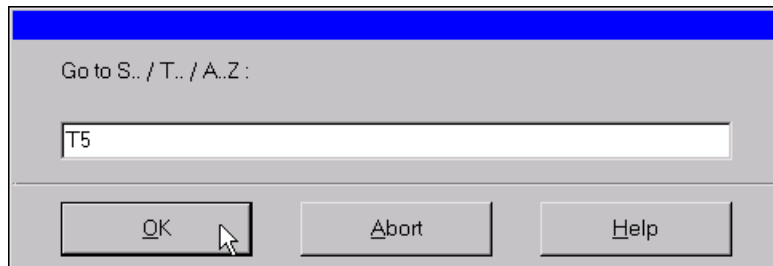


Figure 4-15 Go to step, transition, SUL dialog box

In the text field enter the step, transition or SUL you want to open.

Abbreviation	Description	Example
Snn	the step you want to open	S12 (step 12)
Tnn	the transition you want to open	T3 (transition 3)
[N]	the SUL you want to open [N] the letter to identify the SUL	A (SUL A)

Table 4-2 Go to step, transition, SUL Abbreviations

4.2.4 Insert (Insert Menu - Editor Window)

The commands from the **Insert** menu are used to insert logical functions in the workplace. Depending on the presentation selected (STL, CSF, LAD, Block-STL [Source Text] or step sequence display) not all commands may be available in the editor. These commands are displayed in light gray. Also some of the commands are only available with S7 blocks and others only in S5 blocks.

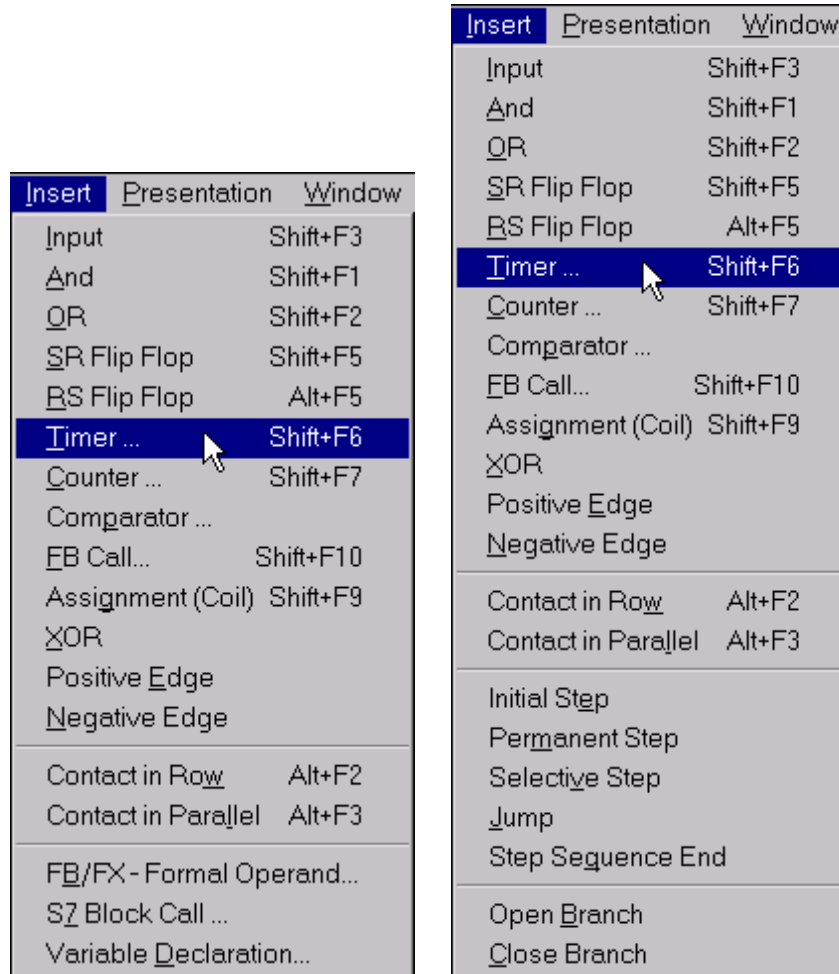


Figure 4-16 Insert menus with the maximum number of possible commands (without / with graphical Step Sequence programming)

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

Only commands displayed in bold black may be used.

The commands from the **Insert** menu are described in the chapter describing the special editor functions concerning the different logic presentations (STL, LAD, CSF, Block-STL [Source Text] or step sequence display).

The search menu for the PC and PLC block editor is the same.

4.2.5 Presentation (Presentation Menu - Editor Window)

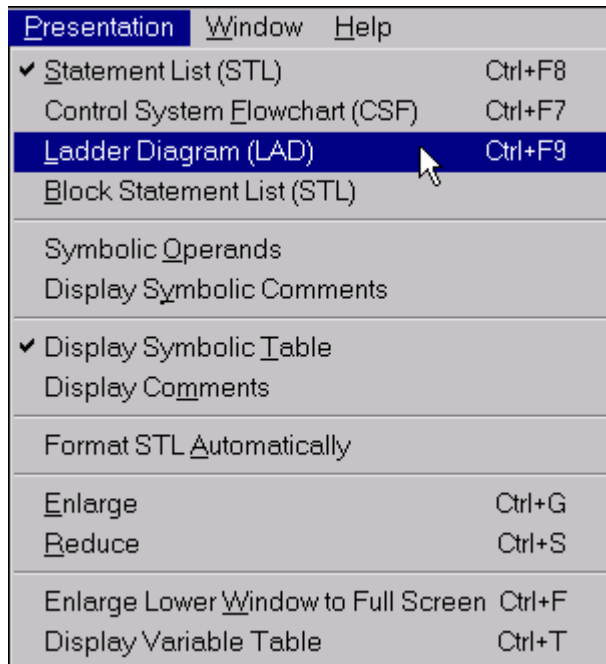


Figure 4-17 Presentation menu with the maximum number of possible commands (without graphical Step Sequence programming)

The selected functions are marked with a

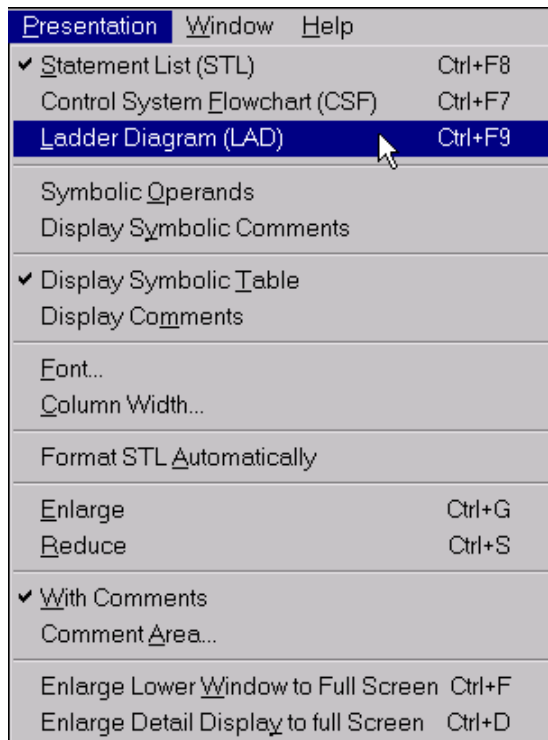


Figure 4-18 Presentation menu with the maximum number of possible commands (with graphical Step Sequence programming)

The commands from the **Presentation** menu are used to select the logic presentation (STL, CSF, LAD, etc.) additional commands are available to configure the appearance of the presentations. Not all commands may always be available.

Only commands displayed in bold black may be used.

The commands from the **Presentation** menu are described in this chapter. Two different **Presentation** menus are available, one for the STL, LAD, CSF, Block-STL [Source Text] presentation, and the other for the step sequence editor.

The presentation menu for the PC and PLC block editor are the same.

 ◆ Click **Presentation** in the menu bar.

 ◆ Press **ALT + P**.

Note:

All these adjustments are only for the active Editor window. As soon as this window is closed the default presets are valid (see chapter 3.2.11.2).

4.2.5.1 Statement List (STL) (Presentation Menu)


In a **Statement List**, the control task is described with mnemonic abbreviations in the form of a list. For more details see chapter 3.2.11.2.

- **S7 for Windows**

In a **Statement List (STL)**, the control task is described with mnemonic abbreviations in the form of a list. The programming language is based on IEC 1131. When selected, the editor window displays the network (segment) as a statement list.

- **S5 for Windows**

In a **Statement List (STL)**, the control task is described with mnemonic abbreviations in the form of a list. The programming language is based on DIN 19239. When selected, the editor window displays the segment (step, transition, or SUL in the Detail Display) as a statement list.

 ◆ Click **Statement List (STL)** in the presentation menu.

 ◆ Press **CTRL + F8 (ALT + P, S)**.

4.2.5.2 Control System Flowchart (CSF) (Presentation Menu)

In a **Control System Flowchart**, the control task is described with symbols. For more details see chapter 3.2.11.2.

- **S7 for Windows**

In a **Control System Flowchart (CSF)**, the control task is described with symbols identical to the symbols used with *S5 for Windows*. This ensures a smooth transition from *S5 for Windows* to *S7 for Windows*. When selected, the editor window displays the network (segment) as a control system flowchart.

- **S5 for Windows**

In a **Control System Flowchart (CSF)**, the control task is described with symbols based on DIN 40700. When selected, the editor window displays the segment (step, transition, or SUL in the Detail Display) as a control system flowchart.



◆ Click **Control System Flowchart (CSF)** in the presentation menu.



◆ Press **CTRL + F7 (ALT + P, F)**.

4.2.5.3 Ladder Diagram (LAD) (Presentation Menu)

In a **Ladder Diagram**, the control task is described with symbols similar to those used in circuit diagrams. For more details see chapter 3.2.11.2.

- **S7 for Windows**

In a **Ladder Diagram (LAD)**, the control task is described with symbols identical to the symbols used with *S5 for Windows*. This ensures a smooth transition from *S5 for Windows* to *S7 for Windows*. When selected, the editor window displays the network (segment) as a ladder diagram.

- **S5 for Windows**

In a **Ladder Diagram (LAD)**, the control task is described with symbols similar to those used in circuit diagrams. The symbols are basically NO and NC contacts. Complex functions are displayed with symbols based on DIN 40700. When selected, the editor window displays the segment (step, transition, or SUL in the Detail Display) as a ladder diagram.



◆ Click **Ladder Diagram (LAD)** in the presentation menu.



◆ Press **CTRL + F9 (ALT + P, L)**.

4.2.5.4 Block Statement List [Source Text] (Presentation Menu)

A complete block is displayed in the editor window. In the Block-STL, the search and replace functions may be used to search within an entire block.



◆ Click **Block Statement List** in the presentation menu.



◆ Press **ALT + P, B**.

- **S7 for Windows**

The **Block STL** presentation is often preferred to **Source Text** presentation. If the editor window is open, a complete block is displayed using statement list presentation. In front of the actual logic, the **Block Header** and the **Variable Declaration** are displayed.

The structure of the **Source Text** is based on the IEC 1131 standard. Files saved in the **Source Text** format with the file extension *.awl are used to exchange programs between *S7 for Windows* and the Siemens S7 programming unit (PU).

In *S7 for Windows* the **Source Text** is automatically compiled into the **Statement List** whenever the program or blocks are saved, transferred to the PLC, or displayed as a Statement List.

- **S5 for Windows**

In a **Block Statement List (Block STL)**, the control task is described with mnemonic abbreviations in the form of a list (same as STL). The programming language is based on DIN 19239. In the editor window a complete block is displayed using statement list presentation. Each segment is displayed with the segment number, and if entered, with the segment comment. The start of the segment is indicated with a bracket [followed by the segment number. The end of a segment is indicated with a closing bracket].

An extended segment comment is displayed after the closing bracket of the previous segment and the opening bracket of the segment the comment is assigned to.

Block STL is not available for step sequence programming (*G5 for Windows option*). With this option a graphical display is provided.

4.2.5.5 Symbolic Operands (Presentation Menu)

The operands may be displayed and entered in the editor window in a symbolic or absolute form.

If **Symbolic Operands** is marked, all the operands in the PLC Blocks, Segments, Steps, Transitions, etc. are displayed in their symbolic form. To display an operand in its symbolic form, the symbol must be defined in the symbolic table.

If **Symbolic Operands** is not marked, all the operands are displayed in their absolute form.

Operands may be entered in their absolute or symbolic form regardless of the presentation selected.



◆ Click **Symbolic Operands** in the presentation menu.



◆ Press **ALT + P, O**.

The operands will be displayed in the active editor window in their symbolic form.

- **S7 for Windows**

Symbolic Operands

A symbolic operand may have up to twenty-four (24) characters.

Example:	Symbolic Operands	Form to enter	Displayed Symbol
		INPUT-Byte-1	#INPUT-Byte-1
		OUTPUT-2	"OUTPUT-2"
		Flag-Word	"Flag-Word"

Symbols defined in the symbolic table are shown in quotation marks "...", if used in Statement List (STL), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

Symbols defined in the variable declaration are shown with the "#" character in front of the name, if used in Statement List (STL), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

Usually the quotation marks and the # character must be entered if the symbol is inserted into the logic. The symbol must be present and clearly identifiable in the symbolic table or the variable declaration.

Absolute Operands

Absolute operands have an address identifier, a byte or word number, and if addressing a bit, the bit number is separated by a period. The address numbering of bytes and words start with zero (0). The maximum number is dependant on the type of CPU. Bits are numbered from zero (0) to seven (7).

Example: Absolute Operands

I 5.3	Input Bit 3 in the Byte 5
Q 12.7	Output Bit 7 in the Byte 12
M 33.6	Memory Bit 6 in the Byte 33
IB 2	Input Byte 2
QB 19	Output Byte 19
MB 5	Memory Byte 5
IW 14	Input Word 14 (Byte 14 and 15)
QW 21	Output Word 21 (Byte 21 and 22)
MW 18	Memory Word 18 (Byte 18 and 19)
ID 7	Input Double-Word 7 (Byte 7, 8, 9, 10)
QD 3	Output Double-Word 3 (Byte 3, 4, 5, 6)
MD 8	Memory Double-Word 8 (Byte 8, 9, 10, 11)

- **S5 for Windows**

Symbolic Operands

A symbolic operand may have up to twenty-four (24) characters. *S5 for Windows* can display up to 24 characters (without a hyphen) in all presentations. The column width is adjustable to display the entire symbolic operand. The Siemens PU can handle up to 24 characters. In CSF and LAD only the first eight (8) characters are displayed.

Example:	Symbolic Operands	Form to enter	Displayed Symbol
		-INPUT-Byte-1	INPUT-Byte-1
		-OUTPUT-2	OUTPUT-2
		-Flag-Word	Flag-Word

Note:

When inserting a symbolic operand into a segment, a leading hyphen must be entered to identify the input as a symbolic operand. In the symbolic table the symbolic operands are entered without a leading hyphen.

Absolute Operands

Absolute operands have an identifier, a byte or word number, and if addressing a bit, the bit number is separated by a period. The numbering scheme of bytes and words start with zero (0). The maximum number is dependant on the type of CPU. Bits are numbered from zero (0) to seven (7).


Example: Absolute Operands

I 5.3	Input Bit 3 in the Byte 5
Q 12.7	Output Bit 7 in the Byte 12
F 33.6	Flag Bit 6 in the Byte 33
IB 2	Input Byte 2
FB 5	Flag Byte 5
FW 18	Flag Word 18 (Byte 18 and 19)
FD 22	Flag Double-Word 22 (Byte 22, 23, 24, 25)

4.2.5.6 Display Symbolic Comments (Presentation Menu)

When editing or displaying a PLC program in the statement list editor, it is possible to display the operand and the symbolic comments, of the operands from the symbolic table, in the same line. The symbolic comments are displayed in green. If an STL line comment is inserted, the symbolic comment of that line is automatically removed. The display of symbolic comments works in the same way for *S5 for Windows* and *S7 for Windows*.

 ◆ Click **Display Symbolic Comments** in the presentation menu.

 ◆ Press **ALT + P, Y**.

4.2.5.7 Display Symbolic Table (Presentation Menu)

The **Symbolic Table** may be displayed simultaneously with the selected segment (STL, CSF, LAD, Block-STL [Source Text] or step sequence presentation). The symbolic table may also be edited. A marked operand in the segment display is also highlighted in the symbolic table.

All editor windows display the **Symbolic Table** in the same form.


 ◆ Click **Display Symbolic Table** in the presentation menu.

 ◆ Press **ALT + P, T**.

4.2.5.8 Display Comments (Presentation Menu)

If the command **Display Comments** is marked, the extended segment comment will be displayed in a separate window below the segment logic. The comment display window has all the functions of a standard text editor. The windows clipboard is fully supported. You may use the cut, copy, and paste commands to exchange text within the *S5 / S7 for Windows* application or any other windows application.

 ◆ Click **Display Comments** in the presentation menu.

 ◆ Press **ALT + P, D**.

Note:

S5 for Windows In Block-STL presentation, the extended comment is displayed in front of the segment in the editor workplace. The comment may be edited directly in the workplace.

S7 for Windows In Block-STL (Source Text) presentation, the extended comment is displayed as a line comment (starting with //) directly below the segment (Network) title. The comment may be edited directly in the workplace.


4.2.5.9 Format STL Automatically (Presentation Menu)

If the command **Format STL Automatically** is marked, the syntax is automatically checked when the return key is pressed at the end of an edited line. The entered line is put into the correct format of statement list only if the syntax is correct. The next line may be edited whether or not the previous line fulfills the syntax.

The automatic format works the same way for *S5 for Windows* and *S7 for Windows*.

If the command is not marked, the syntax check and formatting is only done with the format command (key F9, command format from the modify menu).

 ◆ Click **Format STL Automatically** in the presentation menu.

 ◆ Press **ALT + P, A**.

4.2.5.10 Enlarge (Presentation Menu)

This command allows you to adjust the size of the displayed PLC logic (CSF and LAD). Each time you use the **Enlarge** command, the logic will be displayed in a larger scale. The **Enlarge** and the **Reduce** command provide the tools to momentarily scale the display of the logic.

 ◆ Click **Enlarge** in the presentation menu or click the icon in the tool bar.



 ◆ Press **CTRL + G, (Alt + P, E)**.

Note:

Only scaleable fonts may be enlarged or reduced. All True Type fonts are scaleable. The default **System** font is not scaleable

The **Reduce** and **Enlarge** function works in the same way for *S5 for Windows* and *S7 for Windows*.

The **Reduce** and **Enlarge** function is also available in the **Status** window.

4.2.5.11 Reduce (Presentation Menu)

This command allows you to adjust the size of the displayed PLC logic (CSF and LAD). Each time you use the **Reduce** command, the logic will be displayed in a smaller scale. The **Enlarge** and the **Reduce** command provide the tools to momentarily scale the display of the logic.

 ◆ Click **Reduce** in the presentation menu or click the icon in the tool bar.



 ◆ Press **CTRL + S, (Alt + P, R)**.

4.2.5.12 Enlarge Lower Window to Full Screen (Presentation Menu)

This command enlarges the lower window, displaying a portion of the symbolic table or the extended segment (network) comment, to fill the complete editor workspace for easier editing.

If the command is activated again, the window is reduced to its normal size.

 ◆ Click **Enlarges the Lower Window to Full Screen** in the presentation menu

 ◆ Press **CTRL + F, (Alt + P, W)**.

4.2.5.13 Display Variable Table (Presentation Menu)

This command opens up the variable table assigned to the block opened with the editor.

This command can only be used in conjunction with S7 Blocks having a variable table assigned to.


 ◆ Click **Display Variable Table** in the presentation menu

 ◆ Press **CTRL + T, (Alt + P, V)**.

4.2.5.14 Font Type (Presentation Menu) - Step Sequence programming

You can select the fonts for the selected PLC logic presentation (CSF and LAD) within the step sequence programming detail window. This allows you to momentarily adjust the fonts. As soon as the editor window is closed the preset font (chapter 3.2.11.4) will be active again. To enlarge or reduce the displayed PLC logic, a scaleable font (true type) must be selected. A dialog box will open to select the desired font

 ◆ Click **Font Type** in the presentation menu.

 ◆ Press **ALT + P, N**.

This command can only be used when an S5 graphical step sequence block is open in the editor window.

4.2.5.15 Column Width (Presentation Menu) - Step Sequence programming

This command allows you to adjust the column width (CSF and LAD) to accommodate the length of the symbolic operands and the selected font, to be displayed within the step sequence programming detail window. A dialog box will open to select the desired column width. As soon as the editor window is closed the preset column width (chapter 3.2.11.2) will be active again. A dialog box will open to select the desired font.

◆ Click **Column Width** in the presentation menu.

◆ Press **ALT + P, C**.



Figure 4-19 Column width dialog box (S5 graphical step sequence programming)

G5 for Windows (S5 Graphical Step Sequence Programming) can display a symbolic operand with up to 24 characters (without a hyphen). To display symbolic operands with their full-length name, the column width is adjustable. It is insured that the operand is correctly identified even when the symbolic name is truncated in the display.

The dialog box displays the limits of the column width setting. You can select a column width between 10 and 26 characters (including the leading hyphen) for the CSF display. LAD display allows a column width between 12 and 28 characters (including the leading hyphen).

The number, entered as the column width, is the number of characters spaces it is possible to display. The width of a character space varies with the font selected and does not always match the width of other characters. Usually the number of space characters is slightly higher than the number of characters possible to be displayed in any given column width.

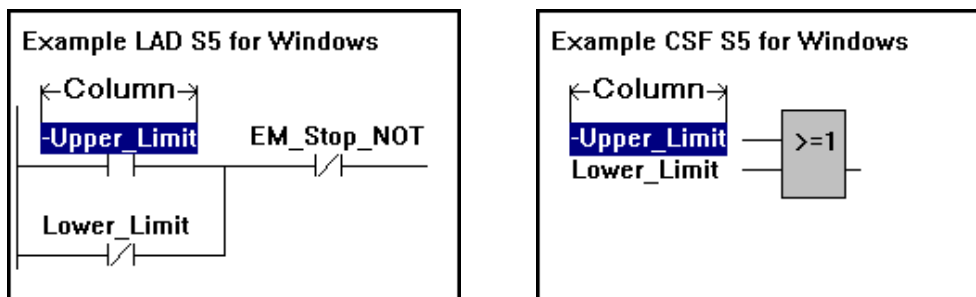


Figure 4-20 Column width example *G5 for Windows* (S5 graphical step sequence programming)

4.2.5.16 With Comments (Presentation Menu) - Step Sequence programming

A comment may be assigned to each segment of a step or transition. The comment is entered as a segment comment. The comment of the first segment of the steps and transitions are displayed in the Overview Display.

- ◆ Click **With Comment** in the presentation menu.
- ◆ Press **ALT + P, I**.

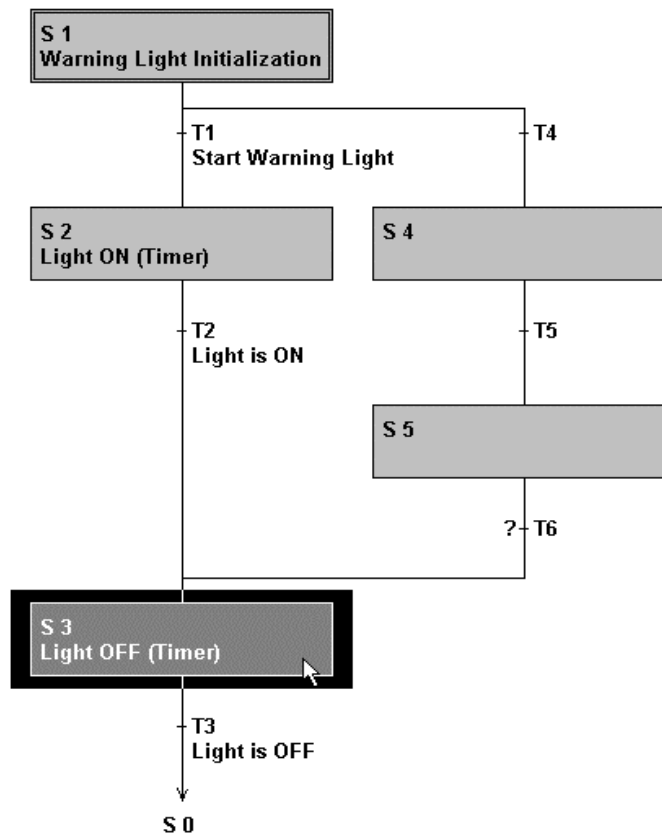


Figure 4-21 The steps S4, S5, and the transitions T4, T5, T6 are shown in the Overview Display without comments.

4.2.5.17 Comment Area (Presentation Menu) - Step Sequence programming

The size of the comment area may be adjusted. The command **Comment Area** from the presentation menu opens the **Comment Display** dialog box.

In the text field **Column Width** you can define the length of a line to display the comment. An automatic line wrap is provided.

In the text field **Comment Rows** you can define the number of lines to be displayed in the comment field.

- ◆ Click **With Comment** in the presentation menu.
- ◆ Press **ALT + P, M**.

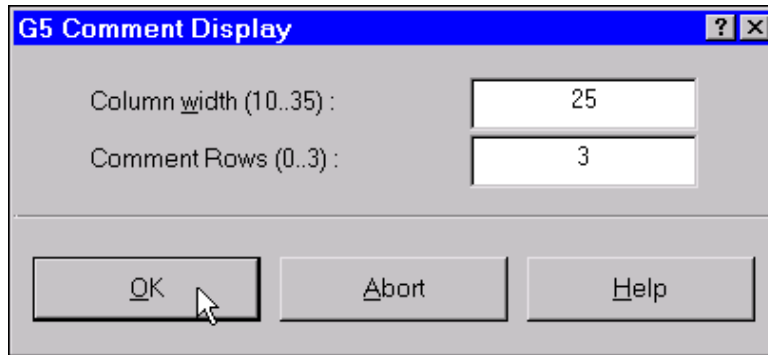


Figure 4-22 G5 Comment Display dialog box

This dialog box can only be opened when an S5 graphical step sequence block is open in the editor window.

4.2.5.18 Enlarge Detail Display to Full Screen (Presentation Menu)

This command enlarges the Detail Display that displays the logic of a step or transition in the selected presentation (STL, LAD, CSF) to fill the complete editor workspace for easier editing.

If the command is activated again, Detail Display is reduced to its normal size.

 ◆ Click **Enlarges Detail Display to Full Screen** in the presentation menu

 ◆ Press **CTRL + F, (Alt + P, G)**.

This command can only be used when an S5 graphical step sequence block is open in the editor window.

4.2.6 Window (Window Menu - Editor Window)

The **Window** menu from the editor window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

4.2.7 Help (Help Menu - Editor Window)

The **Help** menu from the editor window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

5 S7 Block Editor

In this chapter the methodology on how to create or modify a block, using the Step® 7 syntax, is described.

5.1 Editing an S7 Statement List (STL)

The **S7 Statement List Editor** is basically a text editor with some special functions. You can type without regard to the case, TAB, or SPACE. Typing in lower or upper case will have no effect on the results except when dealing with symbolic names. The symbolic names must be typed the same way as they are written in their definition list.

The command **Format** (key F9) performs a syntax check, converts the operation code, and changes the absolute operand into capital letters. The symbolic operand will remain the same. Each line of STL code is inserted into the appropriate columns.

5.2 S7 Statement List Instructions

An instruction statement is the smallest executable part of a PLC program and is made up of individual components. The statement is interpreted, according to its structure, and is executed by the CPU. Depending on the type of statements, the structure may vary.

Basically there are two types of statements. One is a statement made up of an instruction alone (e.g. NOP, NOT, etc.) and the other is a statement made up of an instruction and an address / parameter field (e.g. L +12, L 'Stop', etc.).

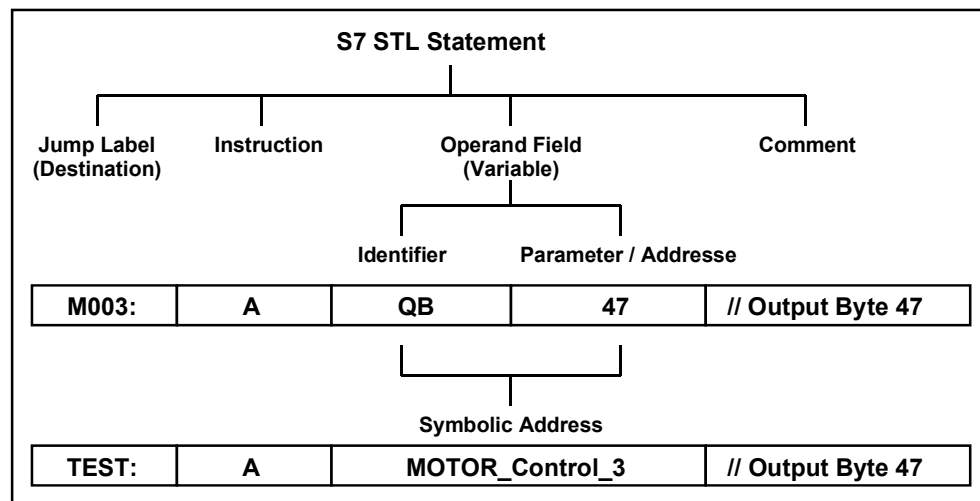


Figure 5-1 S7 STL Statement structure

- **Jump Label**

The destination of a jump instruction is indicated with a label. The label may have up to four (4) characters. The first character must be an alpha character. The destination label itself is terminated with a colon (:) (e.g. TEST:).

- **Instruction**

In the instruction field of a statement **what** the CPU should execute is defined (e.g. **A** for AND, **O** for OR, **XOR** for an exclusive OR, **T** for a transfer, etc.).

The *S7 for Windows* **Format (F9)** command converts all typed characters into capital letters and puts them into the instruction field column.

S7 for Windows supports all the instructions available in the Siemens S7-300 / 400 PLC series. A list of the instructions that your particular CPU can support will be found in the instruction list manual for that CPU.

- **Operand Field**

In the operand field of a statement **who** should participate, when the instruction is executed by the CPU, is defined. This could be an addressed absolute operand (e.g. **QB47**), a defined symbolic variable (e.g. **Limit_Switch**), or a constant (e.g. **DW#16#87000000**), etc. Some instructions do not require an operand.

- **Absolute Operands**

Identifiers:

S7 for Windows supports all the instructions available in the Siemens S7-300 / 400 PLC series.

The *S7 for Windows* command **Format (F9)** converts all identifier characters into capital letters and puts inserts them into the appropriate column.

Parameters:

A parameter is an address made up of numbers. The *S7 for Windows* **Format (F9)** command does not change the address but inserts it into the appropriate column.

- **Symbolic Addresses**

The S7 programming syntax differentiates between global and local symbols. These symbols are referred to in the literature as a **Global Variable** or a **Local Variable**, respectively. Symbolic Addresses (global and local variables must be typed in the statement in the same form as they are declared, with regard to lower and upper case letters. The *S7 for Windows* **Format (F9)** command does not change the variable but inserts them into the appropriate column.

Global Variable:

Global symbols (symbolic operands) are defined in the symbolic table. A symbolic operand is assigned to an absolute operand. This declaration must be done prior to using the symbolic operands in the STL editor. A Global variable must be clearly defined for all blocks and may be used throughout the whole PLC program.

Local Variable:

A Local variable is defined in the variable table assigned to a specific block and can only be used during the execution of that block. An exception to this rule is local

variables may be transferred to another block. A Local variable must be clearly defined for the assigned block and the block the variable may be transferred to.

● Comments

Each statement line may have a comment assigned to it. The optional comment starts with two (2) slash characters (//) and is valid up to the end of the line. The comment may have up to 160 printable characters.

A comment may also be entered into a separate line. This line must start with two (2) slash characters (//).

The *S7 for Windows* **Format (F9)** command does not change the comment but inserts it into the appropriate column.

```
L P##Measured_Value // This is a STL line comment
                        // This comment is entered in a separate line
```

Figure 5-2 S7 STL comments

Note:


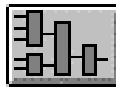

The maximum length of an STL line may not exceed 200 characters (including the command and any spaces).

In the Block-STL (Source Text) presentation, each statement must be terminated with a semicolon (;). The semicolon must be in front of the comment if a comment is present in a line.

Example:

```
M003: A Q 3.4; //This is a comment in an S7 Source Text line
```

The editor may be called from the **PC Block List** or the **PLC Block List** window using the same commands.

- 
 ◆ Double click a block (block name in the block list) or, if you have marked a block prior clicking the icon, the block editor window opens immediately.
 
- ◆ Activate the **New Block** command from the block menu.
- 
 ◆ Press **F10**. If you have marked a block prior clicking the icon the block editor window opens immediately.
- ◆ Press **ALT + B, M** to activate the **Modify** command from the block menu

If a block is open in the status display you may click the editor icon or press F10 to open the corresponding network in the editor.

5.3 S7 STL Editor Window

PLC logic programmed in STL presentation, may be converted to CSF or LAD presentation, if the programming follows a defined syntax. Complex logic may be converted to CSF but not to LAD presentation. Certain parts of a PLC program may only be programmed in STL presentation.

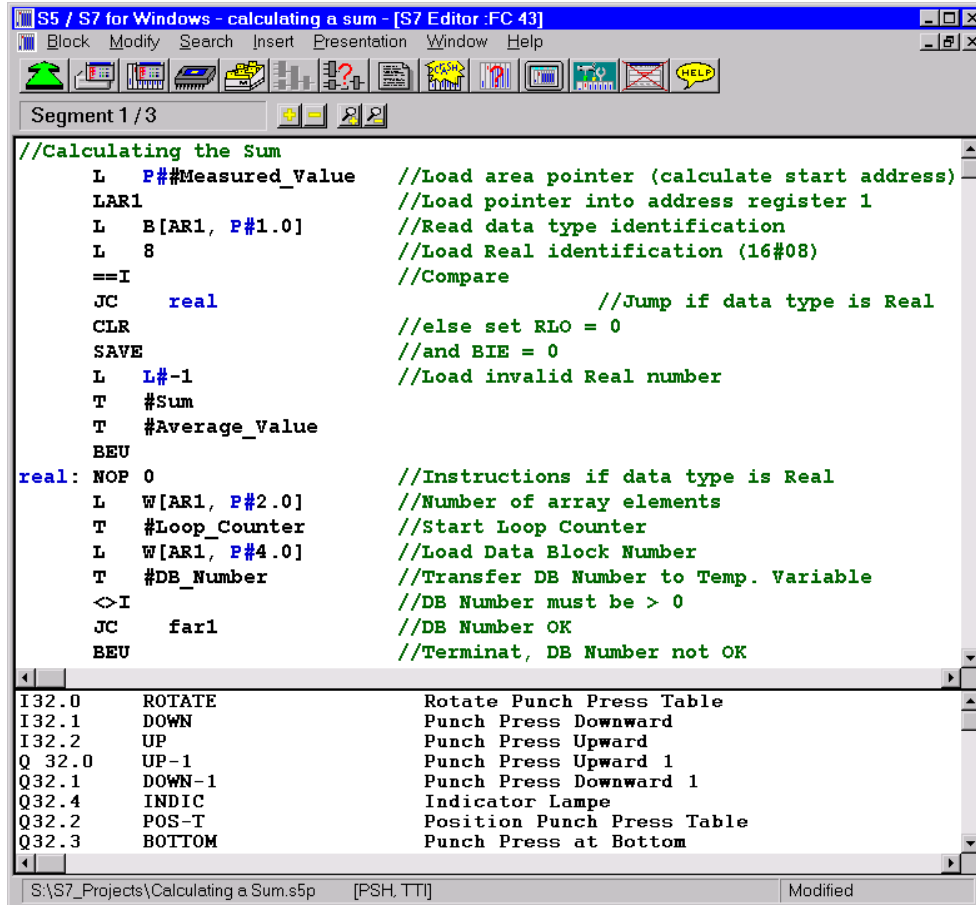


Figure 5-3 Editor window (example)

The Title Bar, Menu Bar, and the Tool Bar are described in chapter 4.2

5.3.1 Tool Bar II – Statement List (STL) Editor



Select the tools with a mouse or with the function keys (see S5 / S7 for Windows function - key template). The tool bar II displays the number of the open network (Segment) and the total number of networks. If tool bar II displays "**Variables Table**", the table is opened in the STL editor workplace and is ready to except local variable declarations. A dialog box is provided to enter local variable declarations (see chapter 5.4.2)



Open the **Next Network (Segment)**.

 Key **F8**.




Open the **Previous Network (Segment)** or the local variable definition table.

 Key **F7**.



Enlarge the text in the editor window workplace.

 Key **Ctrl + G**.



Reduce the text in the editor window workplace.

 Key **Ctrl + S**.

5.3.2 Keyboard and Mouse Functions (STL Editor)

Within the workplace you can enter text at any position by moving the insertion point to that position.

With the **INSERT** key you can switch in and out the type over mode. By default, *S7 for Windows* makes room for new characters that you type by moving existing characters to the right. You can change the insert mode and have *S7 for Windows* replace existing characters with new characters. This is called type over and is indicated by the insertion point cursor.

- **Insert mode** The cursor appears as a small, blinking, vertical line. The insertion cursor fits between two characters.
- **Type Over mode** The cursor appears as a blinking black rectangle. The over type cursor covers one character.









◆ Moving the insertion point using the mouse

- ◆ Use the scroll bars until you reach the location you want is displayed in the workplace.
- ◆ Click (press and release the left mouse button) the location where you want to position the insertion point.




◆ Moving the insertion point using the keyboard

- ◆ Do one of the following:


To move	Press
One character to the left	
One character to the right	
One line up	
One line down	
Workplace one character to the left	CTRL + 
Workplace one character to the right	CTRL + 

To move	Press
Workplace one line up	CTRL + ↑
Workplace one line down	CTRL + ↓
To the end of a line	END
To the beginning of a line	HOME
Up one screen	PAGE UP
Down one screen	PAGE DOWN
To the end of the network	CTRL + END
To beginning of the network	CTRL + HOME

 ◆ **Selecting text using the mouse**

◆ **Do one of the following:**

To select	Do this
Any amount of text	Drag over the text you want to select.
A word	Double-click the word.

 ◆ **Selecting text using the keyboard**

◆ **Do one of the following:**

To select	Press
One character to the left	↑ Shift + ←
One character to the right	↑ Shift + →
One line up	↑ Shift + ↑
One line down	↑ Shift + ↓
To the end of a line	↑ Shift + END
To the beginning of a line	↑ Shift + HOME

Note:

The **right mouse button** may be used within the S7 STL Editor. If the **right mouse button** is clicked, a menu with commands to be used in the S7 STL Editor is opened.

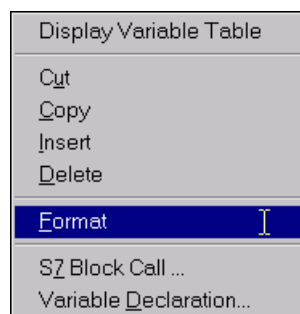


Figure 5-4 Menu opened with the click of the right mouse button

5.3.3 Block (Block Menu – S7 STL Presentation)

With the commands from the **Block** menu you can save a block and close the block editor. The block menu for the block editor S7 PC STL - presentation and S7 PLC block editor STL - presentation, are the same. Also the commands for the STL and the Block STL (source text) editors are the same.

For more details on the commands of the Block menu see chapter 4.2.1.

5.3.4 Modify (Modify Menu – S7 STL Presentation)

The commands from the **Modify** menu in the editor window are used to work with an existing segment (network) and/or create a new segment (network).

In STL and the Block STL (source text), text may be displayed in bold black. The commands for the STL and the Block STL (source text) editors are the same.

For more details on the commands of the Modify menu see chapter 4.2.2.

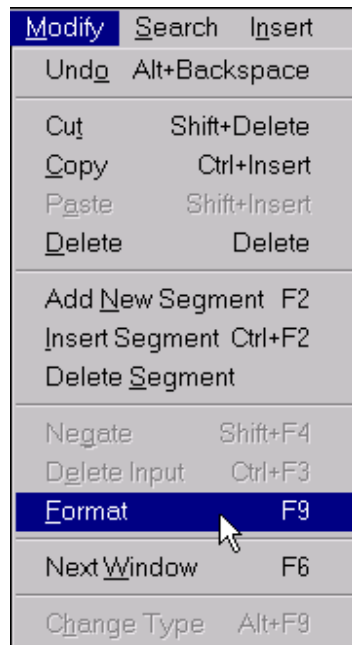


Figure 5-5 Modify Menu – S7 STL Presentation

5.3.5 Search (Search Menu – S7 STL Presentation)

The commands from the **Search** menu are used to search and replace text strings and operands in a segment or a block. Also another segment may be opened. The search menu for the block editor S7 PC STL - presentation and S7 PLC block editor STL - presentation, are the same. Also the commands for the STL and the Block STL (source text) editors are the same.

For more details on the commands of the Block menu see chapter 4.2.1.

5.4 Insert Menu (STL - Presentation)

In STL presentation the **Insert** menu provides the command **S7 Block Call** and the command **Variable Declaration**. These two (2) commands are also available in the **Block-STL (Source Text)** presentation. For more details on how to edit a block in the **Block-STL (Source Text)** presentation, see chapter 5.5.

Both commands open dialog boxes to ease the handling of S7 block calls and the declaration of local variables.

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

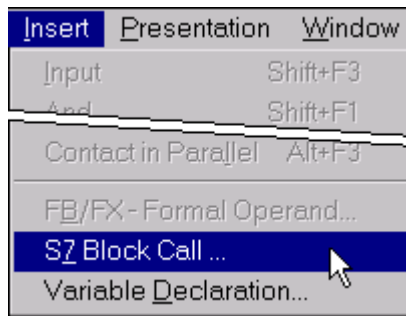


Figure 5-6 **Insert** menu, **STL Editor** and **Block-STL (Source Text) Editor**

The commands displayed in light gray are not available when the **STL Editor** or the **Block-STL (Source Text) Editor** are open. They are reserved and are available with the LAD or the CSF editor.

5.4.1 S7 Block Call (Insert Menu)

The command **S7 Block call** opens a dialog box displaying a list of the available blocks that it is possible to call. These are not only the blocks displayed in the PC block list but also all **System Functions (SFC)** and the **System Function Blocks (SFB)**.

◆ Click **S7 Block Call** in the insert menu.

◆ Press **ALT + I, 7**.

The command can only be executed if a block or network has been opened with the **STL Editor**. The command is not available if the **Declaration Table** is open.

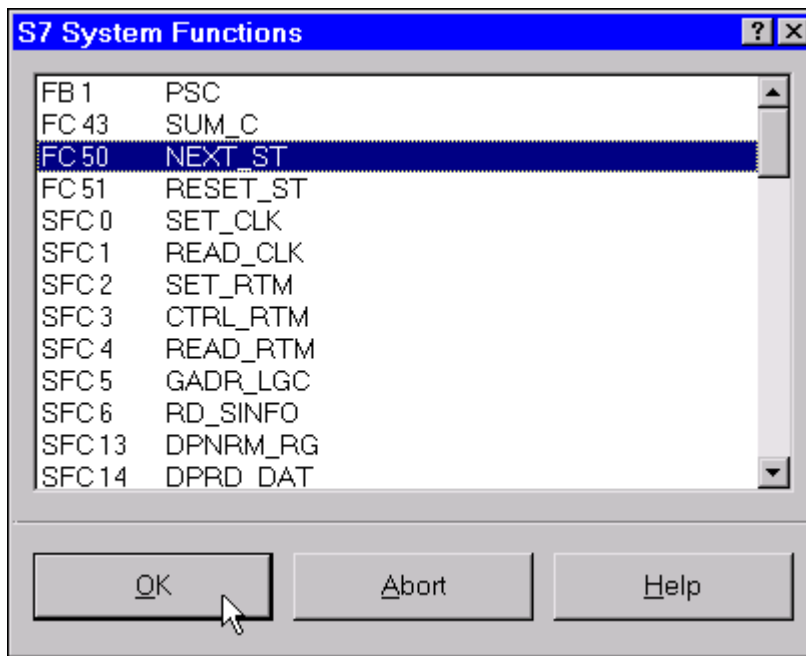


Figure 5-7 The command **S7 Block call** opens an **S7 System Functions** dialog box

The CALL instruction is used for an absolute block call. With a CALL instruction, Functions (FC), Function Blocks (FB), System Functions (SFC), and System Function Blocks (SFB) can be opened for execution. The call is independent of any condition and is always executed. Organization blocks (OB) cannot be opened with the CALL instruction. Organization Blocks (OB) are only called for execution by the PLC operating system. The CALL instruction is also used to open the Instance Data Block assigned to a Function Block.

The insertion mark must be placed at the beginning of the line you want to place the CALL instruction prior to the opening of the dialog box.

- ◆ Mark the block (blue background) that you want to call with the **CALL** instruction and confirm with the **OK** button.

If a Function Block (FB) is selected, an additional dialog box is opened to select the Instance Data Block (DB). When calling a Function Block (FB) an Instance Data Block must be assigned.

- ◆ Mark the Data Block that you want to assign to the Function Block (FB) as its Instance Data Block and confirm with the **OK** button.

An example of the Select Instance Data Block (DB) is shown in figure 5-8. The figure 5-11 shows the STL presentation of an FB Call with an Instance DB.

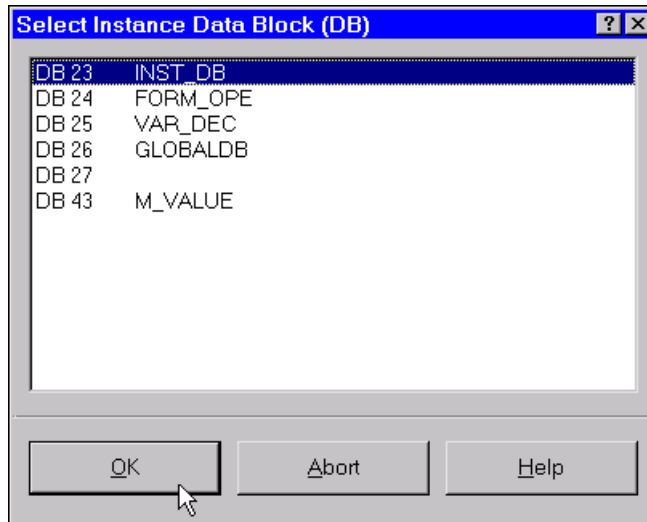


Figure 5-8 Select Instance Data Block (DB) dialog box

The CALL instruction is inserted if a Function (FC) is called and the assigned block

```

//CALL instruction example
CALL FC 43
Measured_Value := P#M 0.0 BYTE 1 //INPUT ANY
Sum := MD 0 //OUTPUT REAL
Average_Value := MD 0 //OUTPUT REAL

```

parameters are listed underneath the CALL instruction.

Figure 5-9 Example of a CALL instruction (Function with parameters)

By editing the **Place Holders** (M 0.0, MD 0) you can enter the actual variables that are handling the assignment to the block parameters. Figure 5-10 shows an example of the edited block CALL with the actual variables assigned to the block parameters.

```

//CALL instruction example
CALL FC 43
Measured_Value := P#DB43.DBX0.0 REAL 8 //INPUT ANY
Sum := "Sum" Calculated Sum Output
Average_Value := "Average" Calculated Average Output

```

Figure 5-10 Function CALL with the assignment of the actual variables

STL Code	Explanation
CALL FC 43	Call function FC 43
Measured_Value :=P#DB43.DBX0,0 REAL 8	Measured_Value (formal parameter supplied with DB43.DBX0,0 REAL 8 (actual parameter) – Data Word 0 of Data Block 43, Data type REAL, 8 Byte
Sum :="Sum"	Sum (formal parameter supplied with "Sum" (actual parameter)
Average_Value :="Average"	Average_Value (formal parameter supplied with "Average" (actual parameter)

Table 5-1 Function CALL with the assignment of the actual variables

```

//Calling a Function Block (FB 53) with Instance Data Block (DB33)
CALL FB 53, DB 33
Input_Value := P#M0.0 BYTE 1           //INPUT ANY
Output_Sum := "Data_1"                 Calculated Data
Calc_Value := "Data_2"                 Calculated Output

```

Figure 5-11 CALL of the Function Block (FB53) with Instance Data Block (DB33) and with the assignment of the actual variables


The actual parameters (M0.0, Data_1, and Data_2) are supplying the data for the formal parameter (Input_Value, Output_Sum, and Calc_Value).

5.4.2 Variable Declaration (Insert Menu)

The command **Variable Declaration** opens a dialog box to assign the variable name and select the data type and its format.

The insertion mark must be placed at the beginning of a line prior to the opening of the dialog box. The variables are automatically sorted by type when the format command (key F9) is executed.

 ◆ Click **Variable Declaration** in the insert menu.

 ◆ Press **ALT + I, D**.

The command can only be executed if the **Declaration Table** is opened with the **STL Editor**. The command is not available if the block or a network is open.

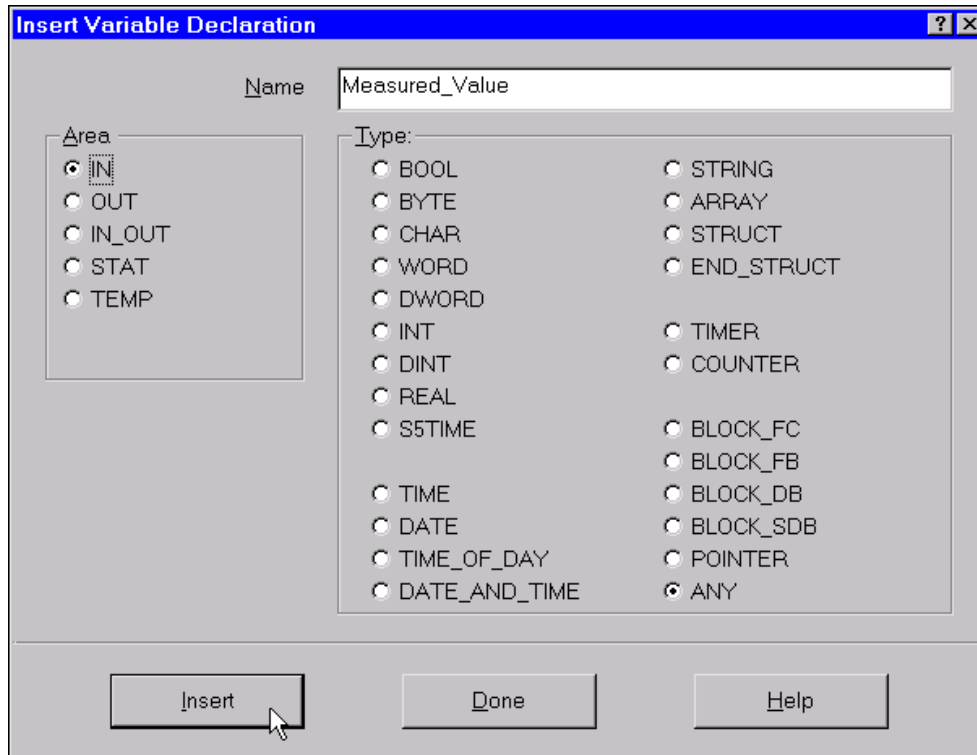


Figure 5-12 Insert Variable Declaration dialog box

Name:

Name

Type the name of the variable into the input field. The name can have up to 24 alphanumeric characters (ASCII 33 up to ASCII 126). The first character must be an alpha character. Special characters (e.g. space) are not permitted.

- **Area (Variable Format):**

Formal Parameter	Area (Declaration)	Available with the following block type		
		FB	FC	---
Input Parameter	<input checked="" type="radio"/> IN	FB	FC	---
Output Parameter	<input checked="" type="radio"/> OUT	FB	FC	---
In / Out Parameter	<input checked="" type="radio"/> IN_OUT	FB	FC	---
Static Data	<input checked="" type="radio"/> STAT	FB	---	---
Temporary Data	<input checked="" type="radio"/> TEMP	FB	FC	OB

Table 5-2 Variable Declaration area

The declaration (Area) defines how the block being called uses the variable. Depending on the block type a variable may be used in five (5) different ways

IN Variable

The Input Parameter **IN** defines that the parameter is an input. The block called can only read the input parameter.

OUT Variable

The Output Parameter **OUT** defines that the parameter is an output. The block called can only write to the output parameter.

IN_OUT Variable

The In /Out Parameter **IN_OUT** defines that the parameter can be used as an input and an output. The block called can read, modify and write back to the in / out parameter.

STAT Variable

The static local variables **STAT** are used only within a Function Block. The static local variable saves data by storing its value in the instance data block (retentive data).

TEMP Variable

The temporary variables **TEMP** are saved in the local L-Stack. They are only used within the block and are valid as long as the block is executed. The data is cleared after the execution of the block is terminated (non retentive data).

- **Type (Basic Data Types):**

	Key Word	Possible Values/ Example
<input checked="" type="radio"/> BOOL	BOOL 1 Bit	TRUE or FALSE
<input checked="" type="radio"/> BYTE	BYTE 8 Bit 8 Bit hex	B#16#00 (min) B#16#FF (max)
<input checked="" type="radio"/> CHAR	CHAR 8 Bit	'S'
<input checked="" type="radio"/> WORD	WORD 16 Bit 16 Bit hex 16 Bit bin Counter value 3 Decades. BCD 2 x 8 Bit decimal without Sign	W#16#0000 (min) W#16#FFFF (max) 2#0000_0000_0000_0000 (min) 2#1111_1111_1111_1111 (max) C#000 (min) C#999 (max) B(0,0) (min) B(255,255) (max)
<input checked="" type="radio"/> DWORD	DWORD 32 Bit Double Word 32 Bit hex 32 Bit bin 4 x 8 Bit decimal without Sign	DW#16#0000_0000 (min) DW#16#FFFF_FFFF (max) 2#0000_0000_0000_0000_0000_0000_0000_0000 (min) 2#1111_1111_1111_1111_1111_1111_1111_1111 (max) B(0,0,0,0) (min) B(255,255,255,255) (max)
<input checked="" type="radio"/> INT	INT 16 Bit Integer	-32 768 (min) +32 767 (max)

Type (Basic Data Types): (continued)

	Key Word	Possible Values/ Example
<input checked="" type="radio"/> DINT	DINT 32 Bit double Integer	-2 147 483 648 (min) +2 147 483 647 (max) Also presented as L#4711
<input checked="" type="radio"/> REAL	REAL 32 Bit	47.11 presented as a number with a decimal point or in the exponential form 47.11E-23
<input checked="" type="radio"/> S5TIME	S5TIME 16 Bit Time value in S5 Format	S5T#0MS (min) S5T#2H_46M_30S (max)
<input checked="" type="radio"/> TIME	TIME 32 Bit Time value in IEC Format	T#-24D_-20H_-31M_-23S_-648MS (min) T#24D_20H_31M_23S_647MS (max)
<input checked="" type="radio"/> DATE	DATE 16 Bit Date	D#1990-01-01 (min) D#2168-12-31 (max)
<input checked="" type="radio"/> TIME_OF_DAY	TIME_OF_DAY 32 Bit Time of day	TOD#00:00:00 (min) TOD#23:59:59.999 (max)

Table 5-3 Basic Data Types

BOOL

A variable of the data type **BOOL** (binary operand) is represented as a single bit value. The variable may have the values TRUE (0) or FALSE (1).

BYTE, WORD, DWORD

Variables of the data type **BYTE, WORD, DWORD** (digital operands) are represented as a bit pattern comprising 8, 16 or 32 Bits. A single bit in these data types are not individually evaluated.

BCD Numbers

BCD Numbers and the counting values of the counters are special forms of the data type **BYTE, WORD, DWORD**. They also are comprised of 8, 16 or 32 Bits. The value range available for a 16 bit BCD number is 0 to +/- 999 and 0 to +/- 9 999 999 for a 32 bit BCD number.

CHAR

A variable of the data type **CHAR** (digital operand) is a bit pattern of 8 bits and is used to represent ASCII characters.

- **Number Presentations:**

INT

A variable of the data type **INT** is an integer number (fixed point value). The integer number uses a 16 bit wide word. Numbers with a sign between -32 768 (min. value) and +32 767 (max. value) can be represented.

DINT

A variable of the data type **DINT** is an integer (double integer) number (fixed point value). The double integer number uses two (2) 16 bit wide words with a total of 32 bits. Numbers with a sign between -2 147 483 648 (min. value) and +2 147 483 647 (max. value) can be represented. Values entered are automatically converted when unequivocally defined in the presentation **L#(value)**.

REAL

A variable of the data type **REAL** represents a fraction (number with a decimal point). The variable is stored as a 32 bit floating point number with a 23 bit mantissa as an exponent (to base 10) with 8 bits, and a sign with 1 bit.

The range value of the normalized floating point numbers are as followed:

-3,402 828 x 10⁺³⁸ up to **-1,175 494 x 10⁻³⁸**
±0

+1,175 494 x 10⁻³⁸ up to **+3,402 828 x 10⁺³⁸**

This value range can be used with all S7-300 / 400 CPU's with the maximum accuracy.

S7-400 CPU's also have an extended range of normalized floating point numbers with reduced accuracy. The range value with the reduced accuracy of the normalized floating point numbers are as followed:

-1,175 494 x 10⁻³⁸ up to **-1,401 298 x 10⁻⁴⁵**
 and

+1,401 298 x 10⁻⁴⁵ up to **+1,175 494 x 10⁻³⁸**

In a PC the floating point numbers are represented in a different form than in the S7-300/400 CPU's. Therefore, it is possible, because of rounding inaccuracies during the conversion, the floating point numbers displayed are theoretically accurate. The inaccuracy of the floating point number that is displayed has no influence in the S7-300/400 CPU's. They always calculate internally with their maximum accuracy.

- **Date and Time presentations:**

S5TIME

A variable of the data type **S5TIME (S5T)** enables the use of a time constant presentation equal to the format used with Step® 5. The variable occupies a 16 bit word divided into 1 + 3 decades.

The single decade represents the multiplication factor and the three (3) remaining decades represent the time value in BCD (000 up to 999). The multiplication factor may have the following values: 0 = 10ms, 1 = 100ms, 2 = 1s und 3 = 10s

The S5TIME (S5T) is always entered in the following presentation:

S5T#0MS (minimum) up to **S5T#2H_46M_30S** (maximum).

The accuracy can be 10ms, 100ms, 1s or 10s.

Value Range	Accuracy	Internal Presentation	Example
10ms up to 9s 990ms	10ms	0 000 0 999	L S5T#9S_990MS L W#16#0999
100ms up to 1m 39s 900ms	100ms	1 000 1 999	L S5T#1M_39S_900MS L W#16#1999
1s up to 16m 39s	1s	2 000 2 999	L S5T#16M_39S L W#16#2999
10s up to 2h 46m 30s	10s	3 000 3 999	L S5T#2H_46M_30S L W#16#3999

Table 5-4 **S5TIME** presentation**DATE**

A variable of the data type **DATE** is internally stored in a 16 bit word as an integer (fixed point) value without a sign. The fixed point number represents the number of days since the 01.01.1990.

The variable DATE is presented in the form; Year, Month, Day separated from each other with a hyphen (-). *S7 for Windows* allows you to enter the character "**D**" or "**d**" to identify the key word **DATE**. The characters "**D**" or "**d**" are automatically converted in the key word **DATE**.

Example: L DATE#1999-04-12 L W#16#0D3C
L DATE#2000-01-01 L W#16#0E44

TIME

A variable of the data type **TIME** (time duration) is internally stored in a 32 bit double word as an integer (fixed point) value with a sign.

The fixed point number represents the number of days (d), hours (h), minutes (m), seconds (s), and milliseconds (ms) of the time duration. Single information may be omitted.

S7 for Windows allows you to enter the character "**T**" or "**t**" to identify the key word **TIME**.

The characters "**T**" or "**t**" are automatically converted in the key word **TIME**. Also the underlined character () separating the individual pieces of information may be omitted. The characters (d, h, m, s, ms) define the information clearly.

Example: L TIME#2D_12H_16M_12S_13MS L DW#16#0CEE_BAED
L TIME#-16M_12S L DW#16#FFF1_2B20

TIME_OF_DAY

A variable of the data type **TIME_OF_DAY** (time of the day) is internally stored in a 16 bit word as an integer (fixed point) value without a sign. The fixed point number represents the number of milliseconds (ms) since the beginning of the day (midnight 0:00 hour).

The variable `TIME_OF_DAY` is presented in the form; Hour, Minute, and Second separated from each other with a colon (:) followed by the milliseconds separated with a decimal point. The milliseconds information may be omitted.

S7 for Windows allows you to enter the short form "**TOD**" or "**tod**" to identify the key word `TIME_OF_DAY`. The short form "**TOD**" or "**tod**" is automatically converted in the key word `TIME_OF_DAY`.

Example: L TOD#17:37:11.120 L DW#16#03C7_E1D0
 L TOD#08:22:14 L DW#16#01CB_CEF0

● Complex Data Types (Composite Data Types)

Composite Data Types (Table 5-5) cannot be directly executed in a Statement List instruction do to their complexity. Only the length of the data type "**DATE_AND_TIME**" is predefined and can be directly executed in a STL instruction.

The length of the data types `STRING`, `ARRAY`, `STRUCT` and `UDT` are set by the declaration of the variable. Also, along with the declaration, the types of the data variables are set that the `ARRAY`, `STRUCT` and `UDT` use. `STRUCT` and `UDT` can be made up of different data types.

Variables with **Complex Data Types** can only be declared in Data Blocks (global or instance Data Blocks), in the local stack area (L-Stack) or as a block parameter.

	Key Word	Size	Explanation
<input checked="" type="radio"/> <code>DATE_AND_TIME</code>	<code>DATE_AND_TIME</code>	8 Bytes	<code>DT#99-04-13-14:15:25</code>
<input checked="" type="radio"/> <code>STRING</code>	<code>STRING</code>	(n+2) Bytes	Character string with n characters
<input checked="" type="radio"/> <code>ARRAY</code>	<code>ARRAY</code>	n Bytes	A field built up of the same data type variables
<input checked="" type="radio"/> <code>STRUCT</code> <input checked="" type="radio"/> <code>END_STRUCT</code>	<code>STRUCT</code>	n Bytes	A <code>STRUCT</code> is a data area built up out of the different data type variables
<input checked="" type="radio"/> <code>STRUCT</code> <input checked="" type="radio"/> <code>END_STRUCT</code>	<code>UDT</code> User Defined Data Type	n Bytes	User Defined Data Type is the frame for to hold data made out of Basic Data Types and / or Complex Data Types

Table 5-5 Composite Data Types

DATE_AND_TIME

A variable of the data type **DATE_AND_TIME** (date and time) represents a specific moment (time). The key word is structured from the information; Year, Month, Day, Hour, Minute, Second, and Millisecond. The year, month, day, and hour are separated with a hyphen (-).

Between the hour, the minute and second a colons (:) must be set followed by the milliseconds separated by a decimal point. The millisecond information may be omitted.

S7 for Windows allows you to enter the short form "**DT**" or "**dt**" to identify the key word **DATE_AND_TIME**. The short form "**DT**" or "**dt**" is automatically converted in the key word **DATE_AND_TIME**.

Example: April 13th 1999, 15:35, 46s, 160ms

DT#99-04-13-15:35:46.16 **DATE_AND_TIME**#1999-04-13-15:35:46.160

STRING

A variable of the data type **STRING** is a character string made up of ASCII characters. **STRING** can reserve memory space for up to 254 characters.

With the variable declaration the number of characters can be set. If the numbers of characters are not defined, the **STRING** sets the field length to 254 characters.

Within a Function (FC) **STRING** must always be set to a length of 254 characters. In other words, within a Function the **STRING** may not have a length definition or the length definition must be set to 254.

Example

This is a character string	STRING [26]	the reserved memory space (26 characters) is completely used by the characters of the string.
Test	STRING [10]	the reserved memory space (10 characters) is only occupied by four (4) characters. Space for six (6) more characters is available in the string.

ARRAY

A variable of the data type **ARRAY** is made up of variables having the same data type that forms a field. The size of the field is set in the declaration. Multi dimensional fields with up to six (6) dimensions are possible.

Declaration:

Field name : **ARRAY** [*Start* .. *End*] **OF** *Data type* : = Preset

Field name : **ARRAY** [*Start*₁ .. *End*₁, .. , *Start*₆ .. *End*₆] **OF** *Data type* : = Preset

ARRAY and **OF** are key words. They may be typed using upper or lower case characters. *S7 for Windows* format command (key F9) converts key word characters into upper case characters.

Field name is the name of the **ARRAY** (field).

Start is the lower limit and *End* is the upper limit of the declared field. Both limits are defined with 16 bit integer numbers (fixed point numbers between -32 768 and +32 767).

The upper limit *End* must always be higher than or equal to the lower limit *Start*. Multi dimensional fields have multiple lower (*Start*) and upper (*End*) limits. They are separated with commas (,). Up to six (6) dimensions are possible.

Data type is the data type of the single field element and all field elements must be the same.

STRUCT

A variable of the data type **STRUCT** is made up of variables having different data types to form a field. The size of the field is set in the declaration.

With the declaration, the keywords, **STRUCT** and **END_STRUCT**, are the limits of the "**Structured Field**".

Between the key words (limits) the single elements of the field are defined with their data types.

Example:

```
Structured field name : STRUCT
  Element_1 : Data type : = Preset
  Element_2 : Data type : = Preset
  Element_3 : Data type : = Preset
  .....
```

```
  Element_n : Data type : = Preset
```

```
END_STRUCT
```

Multi-dimensional structured fields with up to six (6) dimensions are possible

Structured field name is the name of the STRUCT (field).

Address	Name	Type	StartingValue	Comment
0.0	_STRUCT	STRUCT		
0.0	_BOOL	BOOL	TRUE	
1.0	_BYTE	BYTE	B#16#35	
2.0	_CHAR	CHAR	'S'	
4.0	_WORD	WORD	W#16#4711	
6.0	_DWORD	DWORD	DW#16#ABCD1234	
10.0	_INT	INT	-12345	
12.0	_DINT	DINT	L#-1234567890	
16.0	_REAL	REAL	12345.67	
20.0	_S5TIME	S5TIME	S5T#1H_16M_10S	
22.0	_TIME	TIME	TIME#10D_23H_14M_16S_5MS	
26.0	_DATE	DATE	DATE#1999-11-26	
28.0	_TIME_OF_DAY	TIME_OF_DAY	TOD#19:44:38.120	
32.0	_DATE_AND_TIME	DATE_AND_TIME	DT#99-11-26-19:48:18.1	
40.0	_STRING	STRING	'This is an example to preset values'	
		END_STRUCT		
296.0	_ARRAY	ARRAY[1..1,1..2,1..3,1..4]	OF WORD	
344.0	_BOOL	BOOL		

Figure 5-13 Variable declarations in a Data Block with starting values (presets)

Address

The address column displays the relative starting address of the variable. The difference between two addresses is the amount of bytes the variable occupies in memory.

Name

The name is freely selectable. In the example, the variable type, with an underline character () in the front has been used for the name.

Type

In the Type column the type of declared variable is displayed.

Starting Value

In the example, a starting value (preset) has been assigned to the variables. The value of the preset is shown in the column.

UDT

User defined data types (**UDT**) are used whenever a name should be assigned to a "**Data Structure**". This is required whenever Composite Data Types, having no name, should be used several times in the declaration.

In the Symbolic Table, names are assigned to the user defined data types (**UDT**) (UDT 0 up to UDT 65 535). The UTD's are valid globally and may, after being declared, be used in all blocks of the PLC program.

A UTD is programmed much like a Data Block that has. According to its structure the UDT can only use the data type STRUCT.

- **Parameter types**

In addition to the **Basic Data Types** and the **Composite Data Types** for parameterized Blocks, **Formal Operands** can be declared. The size (in bits) defines the amount of memory the Block Parameter would use in a Function Block (FB). The key words TIMER and COUNTER are also used as a data type in the symbolic table to define timer functions and counter functions.

Parameter type	Size	Explanation	Example of the Actual Operand
TIMER	16 Bit	Timer function. The specific timer the PLC Block that is called should use.	T 12
COUNTER	16 Bit	Counter function. The specific counter the PLC Block that is called should use.	C 15
BLOCK_FC	16 Bit	A Function name, a Function Block name, a Data Block name, and / or a System Data Block name, to be used by the PLC Block that is called.	FC 18
BLOCK_FB	16 Bit		FB 19
BLOCK_DB	16 Bit		DB 20
BLOCK_SDB	16 Bit		SDB 22
POINTER	48 Bit	A POINTER is a variable containing the address of another variable.	P#M20.0 (Pointer)
ANY	80 Bit	ANY is used whenever the data type of the Actual Operand is defined to be "any data type"	P#M40.0 BYTE 6

Table 5-6 Parameter types

Timer, Counter

These parameter types are used to define the Formal Operand parameter of the timer functions (TIMER) and the counter functions (COUNTER).

BLOCKxx

PLC Blocks (Code Blocks) can be transferred with the help of the parameter types BLOCK_FC or BLOCK_FB as a parameter of the called Block. Only Blocks not having a transfer parameter and / or static variables (BLOCK_FB), can be transferred (handed over) as an Actual Operand (FCn; FBn).

From the Block that is called the formal PLC Blocks (Code Blocks) can only be called by using the instructions **UC** or **CC**. It is not permitted to use the instruction **"CALL"** to call the formal PLC Block (Code Block)

The transfer (hand over) of Data Blocks (DBn) and System Data Blocks (SDBn) and the transfer of the related instructions has no limitations according to the formal parameter.

POINTER

A pointer of the type POINTER is a variable containing the address of another variable. If a formal parameter of the type POINTER is defined, the address is given by the actual parameter.

Example: P#M20.0 The POINTER points to the memory bit M20.0. Starting with this position the memory bit M20.0 the contents of the memory is interpreted to be data.

ANY

In a pointer of the type ANY, the data type of the actual parameter can be "any data type". An actual parameter transferred (handed over) as a pointer that has the type ANY, defines the beginning and the size of a data area.

Example: P#M40.0 BYTE6 The pointer type ANY points to the memory bit M40.0 and defines the data area size with six (6) bytes. The contents of the memory bytes MB40 up to MB45 are interpreted to be data.

5.5 Editing an S7 Block Statement List (Source Text)

A PLC Block programmed with the *S7 for Windows* Block Statement List presentation (Source Text) is a pure text file. This text file contains all the information necessary to make up an S7 300/400 PLC block, the block header, the variable declarations, and the actual STL code.

When switching the presentation from **S7 Block STL** to the **STL** presentation the source text is automatically converted. The block is then divided into single networks and the variable declaration table.

The information from the block header may be displayed and edited in a separate dialog box (see chapter 3.3.8 – Block Properties).

To generate a block using the **Source Text** format a specific structure and special key words must be used. *S7 for Windows* permits the use of lower and upper case characters within the key words.

When formatting the source text (key F9) the key words are converted into upper case characters. See also chapter 3.2.11.2 for information about an automatic formatting at the line end.

If the setting **Emphasize S7 Syntax** is marked (chapter 3.2.11.2), the key words will be displayed in a blue color. The change of color of the key words is done as soon as *S7 for Windows* can identify the key word that is being typed.

Block Header

Information about the block is entered in the block header. The block header starts with the identification of the block type (see table 5 – 7) followed by the block title (key word TITLE). The title may be up to 64 characters long.

Block Type Identifier	Explanation	Example
ORGANIZATION_BLOCK <i>OB No</i> or <i>OB name</i>	<i>OB No</i> → block number <i>OB name</i> → symbolic block name defined in the symbolic table	OB 100 Power_Up
FUNCTION_BLOCK <i>FB No</i> or <i>FB name</i>	<i>FB No</i> → block number <i>FB name</i> → symbolic block name defined in the symbolic table	FB 43 Sum_Calulation
FUNCTION <i>FC No</i> or <i>FC name</i> : <i>FC type</i>	<i>FC No</i> → block number <i>FC name</i> → symbolic block name defined in the symbolic table <i>FC type</i> → specifies the data type of the return value of the function. It can be a basic, a composite data type or VOID	FC 104 Step_Upward RET_VAL
DATA_BLOCK <i>DB No</i> or <i>DB name</i>	<i>DB No</i> → block number <i>DB name</i> → symbolic block name defined in the symbolic table	DB 44 Measured_Value

Table 5-7 Block Type Identifier

The optional block comment starts with two slash characters (//) and can be up to 18 kBytes long. If the **Emphasize S7 Syntax** has been marked all optional comments are displayed in green color.

All the information in the block header, except the block type, is optional. If a block title is entered the title must be entered in the line following the block type. All other information may be entered without regard to any fixed order.

The format command (key F9) of *S7 for Windows* sorts all the additional information into the required lines (see table 5 – 7). Special care must be taken when entering the key word **KNOW_HOW_PROTECTION**. See chapter 5.5.1 for a detailed description.

Key Word	Explanation	Example
TITLE =	Block comment (name) or description of the block listed in the PC Block List. (max. 64 characters until <CR>)	TITLE = S7 Manual
AUTHOR :	Name of the author, company name, or any other name (max. 8 characters)	AUTHOR : PSH
FAMILY :	Name of the block family (max. 8 characters)	FAMILY : S7W
NAME :	Block name (max. 8 characters)	NAME : Test
VERSION :	Block version number (Number before the decimal point ≥ 0 , Number after decimal point between 0 up to 15)	VERSION : 1.06

Table 5-8 Block header key words

Block	Organization Block	Function Block	Function
Block Type	ORGANIZATION_BLOCK OB nn	FUNCTION_BLOCK FB nn	FUNCTION FC nn : <i>Function Value</i>
Block Header	TITLE= <i>Block title</i> // <i>Block comment</i> KNOW_HOW_PROTECT NAME : <i>Block name</i> FAMILY : <i>Block family</i> AUTHOR : <i>Author name</i> VERSION : <i>Version number</i>	TITLE= <i>Block title</i> // <i>Block comment</i> KNOW_HOW_PROTECT NAME : <i>Block name</i> FAMILY : <i>Block family</i> AUTHOR : <i>Author name</i> VERSION : <i>Version number</i>	TITLE= <i>Block title</i> // <i>Block comment</i> KNOW_HOW_PROTECT NAME : <i>Block name</i> FAMILY : <i>Block family</i> AUTHOR : <i>Author name</i> VERSION : <i>Version number</i>
Variable Declaration		VAR_INPUT <i>Input parameter</i> END_VAR	VAR_INPUT <i>Input parameter</i> END_VAR
		VAR_OUTPUT <i>Output parameter</i> END_VAR	VAR_OUTPUT <i>Output parameter</i> END_VAR
		VAR_IN_OUT <i>In / Out parameter</i> END_VAR	VAR_IN_OUT <i>In / Out parameter</i> END_VAR
		VAR <i>Static local data</i> END_VAR	VAR <i>Static local data</i> END_VAR
	VAR_TEMP <i>temporary local data</i> END_VAR	VAR_TEMP <i>temporary local data</i> END_VAR	VAR_TEMP <i>temporary local data</i> END_VAR
User PLC Program	BEGIN (Beginning) NETWORK (Segment) TITLE = <i>Network title</i> // <i>Network comment</i> ...STL Instructions // <i>Line comment</i>	BEGIN (Beginning) NETWORK (Segment) TITLE = <i>Network title</i> // <i>Network comment</i> ...STL Instructions // <i>Line comment</i>	BEGIN (Beginning) NETWORK (Segment) TITLE = <i>Network title</i> // <i>Network comment</i> ...STL Instructions // <i>Line comment</i>
	NETWORK (Segment) ...STL Instructions // <i>Line comment</i>	NETWORK (Segment) ...STL Instructions // <i>Line comment</i>	NETWORK (Segment) ...STL Instructions // <i>Line comment</i>
Block End	END_ORGANIZATION_BLOCK	END_FUNCTION_BLOCK	END_FUNCTION

Table 5-9

Structure and Key Words of Blocks in Source Text Presentation

Variable Declaration

In the Variable Declaration all the local variables of the block are defined. The variable types must be defined in the order given in the table 5 – 7. No order within the variable type is required. Unused variable types must be omitted. Not all variable types can be used in all blocks.

A variable is declared as followed:

Variable Name	Data Type	Preset	// Comment
---------------	-----------	--------	------------

The **Preset** of the variable and the **Comment** can be omitted. Not all variables can have a preset value. Specifically, temporary local variables cannot have a preset value.

Example of a Variable Declaration:

```
Sum : INT = +4711; //Calculated Sum
```

Spaces between the single components can be omitted. The format command (key F9) of *S7 for Windows* puts additional spaces into the variable declaration for easier reading and deletes spaces not required.

User PLC Program

The key word **BEGIN** indicates the beginning of the actual **User PLC Program** written in the STEP® 7 Statement List (STL) syntax. The end of the block (user PLC program code) is indicated with the key word **END_xxx**.

The character xxx stand for the name of the block type (ORGANIZATION_BLOCK, FUNCTION_BLOCK, FUNCTION, or DATA_BLOCK). *S7 for Windows* permits the use of lower and upper case characters within the key words.

When formatting the source text (key F9), the key words are converted into upper case characters. Also, spaces between the single components can be omitted.

The format command (key F9) of *S7 for Windows* puts additional spaces between the components for ease of reading and deletes spaces not required and checks the syntax. Incorrect components are marked.

Each instruction must be in a separate line and has to be terminated with a semicolon (;). An optional comment, indicated with two (2) slash characters (//), may follow the semicolon (instruction) in the same line.

An additional line comment may also be inserted. The optional line comment starts with two (2) slash characters (//) at the beginning of the line and may be up to 160 characters long. Special control characters (e.g. TAB, Ctrl + ... etc.), those which usually can not be printed, are not permitted.

The complete block, including the header, the variable declarations, and all the comments may be up to 64 kByte.

Declarations within Data Blocks

The declaration section of a Data Block contains the definitions of the local variables. The local variables can only be used in that particular Data Block. A Data Block can be defined to be a global Data Block having several single variables. Also a Data Block may be globally defined with UDT (user defined data types) variables or the Data Block can be defined to be an Instance Data Block. The type of the declaration defines the Data Block type.

Block	Global Data Block	Global Data Block with UDT	Instance Data Block
Block Type	DATA_BLOCK DB nn	DATA_BLOCK DB nn	DATA_BLOCK DB nn
Block Header	TITLE= <i>Block title</i> // <i>Block comment</i> KNOW_HOW_PROTECT NAME : <i>Block name</i> FAMILY : <i>Block family</i> AUTHOR : <i>Author name</i> VERSION : <i>Version number</i> READ_ONLY UNLINKED	TITLE= <i>Block title</i> // <i>Block comment</i> KNOW_HOW_PROTECT NAME : <i>Block name</i> FAMILY : <i>Block family</i> AUTHOR : <i>Author name</i> VERSION : <i>Version number</i> READ_ONLY UNLINKED	TITLE= <i>Block title</i> // <i>Block comment</i> KNOW_HOW_PROTECT NAME : <i>Block name</i> FAMILY : <i>Block family</i> AUTHOR : <i>Author name</i> VERSION : <i>Version number</i>
Declaration	STRUCT <i>Name : Type: = Preset</i>	<i>UDT name</i>	<i>Input parameter</i>
Initialization	VAR_TEMP <i>temporary local data</i> END_VAR	VAR_TEMP <i>temporary local data</i> END_VAR	VAR_TEMP <i>temporary local data</i> END_VAR
Block End	END_DATA_BLOCK	END_DATA_BLOCK	END_DATA_BLOCK

Table 5-10 Data Block declarations and key words

Declaration Section of a Global Data Block

A variable is declared as followed:

Variable Name **Data Type** **Preset** **// Comment**

The **Preset** of the variable and the **Comment** can be omitted. All variables can have a preset value.

Example of a Variable Declaration:

```
Sum : INT = +4711; //Calculated Sum
```

No order within the variable type is required. Spaces between the single components can be omitted. The format command (key F9) of *S7 for Windows* puts additional spaces into the variable declaration for ease of reading and deletes spaces not required.


```

DATA_BLOCK DB 26
TITLE=Global Data Block
//Global Data Block with variable declarations and presets
AUTHOR : PSH
FAMILY : S7W
NAME : GLOBALDB
VERSION : 1.3
STRUCT
  Type__STRUCT : STRUCT           # Beginning of the Structure
  Type__BOOL : BOOL := TRUE;
  Type__BYTE : BYTE := B#16#35;
  Type__CHAR : CHAR := 'S';
  Type__WORD : WORD := W#16#4711;
  Type__DWORD : DWORD := DW#16#ABCD1234;
  Type__INT : INT := -12345;
  Type__DINT : DINT := L#-1234567890;
  Type__REAL : REAL := 12345.67;
  Type__S5TIME : S5TIME := S5T#1H_16M_10S;
  Type__TIME : TIME := TIME#10D_23H_14M_16S_5MS;
  Type__DATE : DATE := DATE#1999-11-26;
  Type__TIME_OF_DAY : TIME_OF_DAY := TOD#19:44:38.120;
  Type__DATE_AND_TIME : DATE_AND_TIME := DT#99-11-26-19:48:18.1;
  Type__STRING : STRING := 'This is an example to preset values ';
  END_STRUCT;
  Type__ARRAY : ARRAY[1..1,1..2,1..3,1..4] OF WORD;
  Type__BOOL : BOOL;
  END_STRUCT;
BEGIN
END_DATA_BLOCK

```

Figure 5-14 Global Data Block

Declaration Section from a UDT derived Global Data Block

Only an absolute address (e.g. UDT 23) or a symbolic address may be defined as a variable.

```

DATA_BLOCK DB 23
//User defined data type (UDT 23) reference
UDT23
BEGIN
  Temp_Store : DWORD := DW#16#FED74;
  Val_Buffer : WORD := W#16#F9E;
  Today : DATE := DATE#1999-11-26;
  Character : CHAR := 'T';
  Temp : TIME_OF_DAY := TOD#19:46:50;
END_DATA_BLOCK

```

Figure 5-15 UDT derived Global Data Block

Declaration Section of an Instance Data Block

In the declaration section of an Instance Data Block, only the associated Function Block is defined. This could be in the absolute or the symbolic form.

```
DATA_BLOCK DB 27
// Function Block (FB 27) Reference
FB27
BEGIN
  Type__Word := W#16#456;
  Type__DWord := DW#16#ABCD1234;
  Type__Real := 4711.471;
END_DATA_BLOCK
```

Figure 5-16 Instance Data Block example

5.5.1 Block Protection

With STEP® 7 it is possible to set an attribute in the block header that will disable the access to the instruction section of a block.

The attribute is entered in the source text with the key word **KNOW_HOW_PROTECT**. As soon the block is compiled into STL format, the instruction section of a block is hidden. Only the block header and the variable declaration section can be accessed (opened and modified). The compilation of a block cannot be reversed.

Attention

Make sure that the block you want to protect has been **exported prior** to the setting the attribute **KNOW_HOW_PROTECT** in the block header.

To reverse the protection you may import the unprotected block, anytime, without renaming the whole program. Only the protected block is overwritten.

If the exported Block is deleted it is NOT possible to reverse the protection and gain access to the instruction section.

Of course it is also possible to save the whole project with the unprotected blocks under a different name and use this project for future modifications.

To protect a block by setting the attribute **KNOW_HOW_PROTECT** you should make sure you follow the instructions below:

1. Export the block you want to protect into a ***.AW7** text file. For information on how to export a block see chapter 3.3.19.3 – Export Marked Blocks (Absolute Identifiers).
2. Save the exported block at a secure location. The block must be imported to enable the access of the instruction section. The import overrides the protected block.
3. Open the block you want to protect in the S7 Block Editor with the Block – STL (Source Text) presentation (see chapter 4.2.5.4).

Example:

Function FC 43 with full access. The attribute KNOW_HOW_PROTECT is not set. The block header, the declaration, and the instruction section are displayed.

```

FUNCTION FC 43 : VOID
TITLE=Sum Calculating
//This Block has no Protection. Block Header, Variable Declarations,
// and the Instruction Section are displayed and ready for modifications.
AUTHOR : PSH
FAMILY : S7W
NAME : SUM_C
VERSION : 1.0
VAR_INPUT
  Measured_Value : ANY;
END_VAR
VAR_OUTPUT
  Sum : REAL;
  Average_Value : REAL;
  Test : BYTE;
END_VAR
VAR_TEMP
  Loop_Counter : WORD;
  Number_of_Elements : WORD;
  DB_Number : WORD;
END_VAR
BEGIN
NETWORK
TITLE=Calculating the Sum
  L P##Measured_Value; //Load area pointer (calculate start address)
  LAR1; //Load address register 1
  L B[AR1, P#1.0]; //Read data type identification
  L B; //Real identification (16#08)
  ==I; //Compare
//-----
  JC real; //Jump if data type is Real
  CLR; //else set RLO = 0
  SAVE; //and BIE = 0
  L L#-1; //Load invalid Real number

```

Table 5-11 Function not protected

4. In the next line directly underneath the block title (TITLE) – the title is normally in the second line – enter the attribute key word KNOW_HOW_PROTECT.

Note:

You may enter the attribute keyword KNOW_HOW_PROTECT in any separate line of the block header as long as this line is after the TITLE line.

The format command (key F9) puts all the header attributes in the desired lines and changes all lower case key word letters into upper case letters.

5. After entering the attribute key word KNOW_HOW_PROTECT in a separate line format the block.



◆ Click **Format** in the Modify menu



◆ Press **F9**

The editor will only display the block header and the declaration part. The attribute key words

```

FUNCTION FC 43: VOID
TITLE=Sum Calculating
// This Block has is Protected. Only the Block Header
// and the , Variable Declarations are displayed.
// Modifications are not possible.
AUTHOR: PSH
FAMILY: S7W
NAME: SUM_C
VERSION: 1.0
KNOW_HOW_PROTECT
VAR_INPUT
  Measured_Value : ANY;
END_VAR
VAR_OUTPUT
  Sum : REAL;
  Average_Value : REAL;
  Test : BYTE;
END_VAR
BEGIN
END_FUNCTION

```

Table 5-12 Protected Block FC 43

6. Save the protected block on disk. You may now close the block editor window.

To cancel the protection you must import the unprotected block to override the protected block.

5.5.2 Presentation (Presentation Menu - S7 STL Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. All commands are available in STL presentation. For details on the commands of the presentation menu see chapter 4.2.5

5.5.3 Window (Window Menu - Editor Window)

The **Window** menu of the editor window is identical with the window menu of the PC block list window. For more details see chapter 3.5.

5.5.4 Help (Help Menu - Editor Window)

The **Help** menu of the editor window is identical with the help menu of the PC block list window. For more details see chapter 3.6.

5.6 Editing an S7 Control System Flowchart (CSF)

The **Editor** for the **Control System Flowchart (CSF)** presentation is a special graphics editor. In addition a separate window is integrated to define local variables.

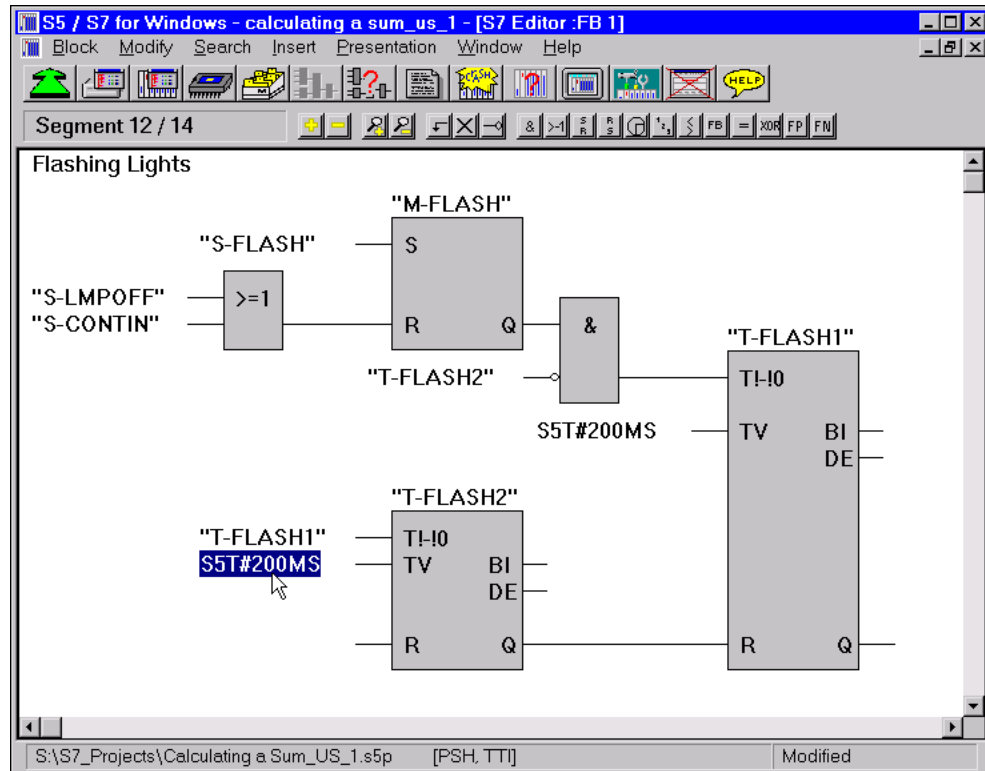


Figure 5-17 Example of an S7 editor window in CSF presentation

PLC logic programmed in CSF presentation may be converted to LAD or STL presentation any time. Converting PLC logic programmed in LAD presentation into CSF presentation is always possible.

PLC logic programmed in STL presentation may be converted to CSF presentation if the programming follows the appropriate syntax. A complex logic may not be converted into CSF presentation. Certain parts of PLC programs may only be programmed in STL presentation.

The workplace is divided into eleven (11) columns. The column borders are not shown. A function symbol (AND, OR, Timer, etc.) occupies one (1) column. Scroll bars are available to move parts of the segment into view when the entire segment doesn't fit into the allotted space.

A separate window is integrated to define local variables. This window is automatically opened whenever a new block is generated.

5.6.1 Keyboard and Mouse Functions (CSF Editor)

In the CSF editor you can build PLC logic by moving the insertion point to a given position and inserting function symbols.

The *S7 for Windows* CSF graphical editor works in the insertion mode only. The CSF editor differentiates between the comment position (network comment), the operand positions, and the function symbol positions.

The **Network** (Segment) **Comment** field starts in the upper left corner of the workplace. The field is a single line and may be up to sixty (60) characters wide. The width can currently be adjusted with the *S5 for Windows* selection; Maximum Command Comment (see chapter 3.2.11.5).

The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.

The **Operand** position fields are defined by the function symbols. The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.

The **Function Symbol** positions are defined as follows:

The first function symbol is positioned automatically. The position of the insertion mark is ignored.

To add a function symbol the insertion mark must be positioned at the desired input or output of the function symbol. To insert a function symbol in an existing segment the insertion mark must be positioned at the output of the function symbol that the inserted function should follow.



Moving the insertion point using the mouse

- ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want.
 - ◆ Click (press and release the left mouse button) the location where you want to position the insertion point.
- The possible locations to position the insertion mark are described above.



Moving the insertion point using the keyboard

- ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want. Use the keys **PAGE UP**, **PAGE DOWN**, **CTRL+←**, **CTRL+→**, **CTRL+↑**, **CTRL+↓** to move the scroll bars.

Within the segment comment field or an operand field

To move	Press
One character to the left	←
One character to the right	→

In a function symbol from one operand position to the next

To move	Press
One position up (or left)	↑
One position down (or right)	↓

Within the complete segment

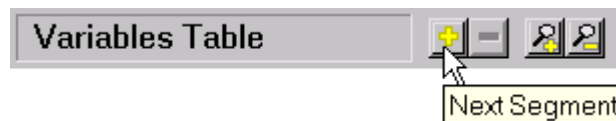
To move	Press
From one operand to the next	TAB or \bar{E}
One position up (or left)	\uparrow
One position down (or right)	\downarrow
To the beginning of the segment comment	HOME

5.6.2 Tool Bar II – S7 Control System Flowchart (CSF) Editor



Select the tools with the mouse or with the function keys (see *S7 for Windows* Function - Key Template). The segment (network) number and the total number of segment (network) are displayed.

The selected variable declaration table is also indicated.



Open the **Next Network**.

 Key **F8**.



Open the **Previous Network**. If Network one (1) is opened the variable declaration table is opened

 Key **F7**.



Activating this function will **Enlarge** the PLC logic displayed in CSF presentation. The selected font must be scaleable.

 Key **CTRL + G**.




Activating this function will **Reduce** the PLC logic displayed in CSF presentation. The selected font must be scaleable.

 Key **CTRL + S**.



Insert an Additional Input at the selected function symbol (AND, OR).

 Key \uparrow Shift + **F3**.



Delete an Input at the selected function symbol (AND, OR).

 Key **CTRL + F3**.



Invert the selected **Input** at the function symbol (AND, OR). The input to be negated could be an output of another function (AND, OR). To negate an intermediate result the command **Change Type** (Modify menu, Key ALT + F9) must be used.

 Key  + F4.



Insert an **AND** function.

 Key  + F1.



Insert an **OR** function.

 Key  + F2.



Insert a **SR Flip Flop** (latch) with a dominating reset input.

 Key  + F5.



Insert a **RS Flip Flop** (latch) with a dominating set input.

 Key ALT + F5.



This icon opens a dialog box to select **Timers**.

 Key  + F6.



This icon opens a dialog box to select **Counters**.

 Key  + F7.





This icon opens a dialog box to select **Comparators**.

 Key CTRL + F9.





Insert a **Block Call**.

 Key  + F10.



Insert an **Assignment** (Result, Intermediate Result).

 Key  + F9.



Insert an **XOR** function.

 Key ALT + I, X.



Insert a **Positive Edge Evaluation**.



Key **ALT + I, E**.



Insert a **Negative Edge Evaluation**.



Key **ALT + I, N**.

Note:

The **right mouse button** may be used with the S7 Control System Flowchart (CSF) Editor. If the **right mouse button** is clicked, a menu of the commands available in the S7 CSF Editor is opened.

The commands available are all the commands from the **Insert menu** plus some commands from the **Modify menu**. These commands give you full control to generate or change the PLC logic, displayed in the workspace, of the S7 Control System Flowchart (CSF) Editor window.

5.6.3 Block (Block Menu – S7 CSF Presentation)

With the commands from the **Block** menu you can save a block and close the block editor. The block menu for the block editor, S7 PC CSF - presentation, and S7 PLC block editor CSF - presentation, are the same.

For more details on the commands of the Block menu see chapter 4.2.1.

5.6.4 Modify (Modify Menu - S7 CSF Presentation)

The commands from the **Modify** menu in the CSF presentation are used to work with an existing network and/or create a new network.

- ◆ Click **Modify** in the menu bar.
- ◆ Press **ALT + M**.

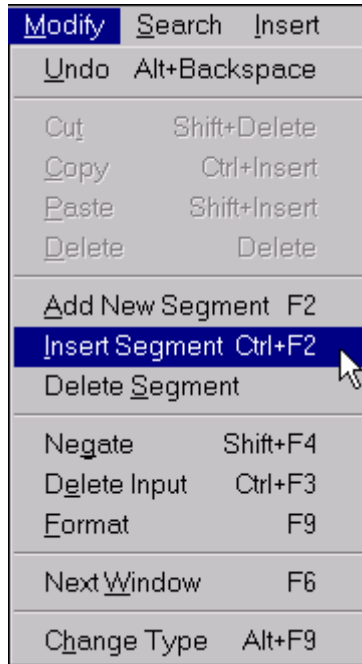


Figure 5-18 The **Modify** menu S7 CSF presentation

The commands **Cut**, **Copy**, **Paste**, and **Delete** are not available in CSF presentation. The commands **Undo**, **Add New Segment**, **Insert Segment**, **Delete Segment**, and **Next Window** are commands that can also be used with other presentations. For detailed information on these commands from the modify menu see chapter 4.2.3.

The commands **Negate / Invert**, **Delete Input**, **Format** and **Change Type** have special functions in the S7 Control System Flowchart presentation and are described below.

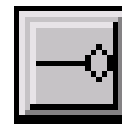
5.6.4.1 Negate (Modify Menu)

The **Negate** command, from the modify menu, changes the selected input from a normal input to an inverted input or vice versa (inverted input to normal input). Inputs being connected to another logical device may also be negated.

- ◆ Mark the input (the name of the input) or the logic connected to the input of another logical device. The selected logic connected to the input is displayed in dark blue (see figure 5-19).

- ◆ Click the **Negate** icon in the tool bar or the **Negate** command in the modify menu.

- ◆ Press **Shift + F4**.



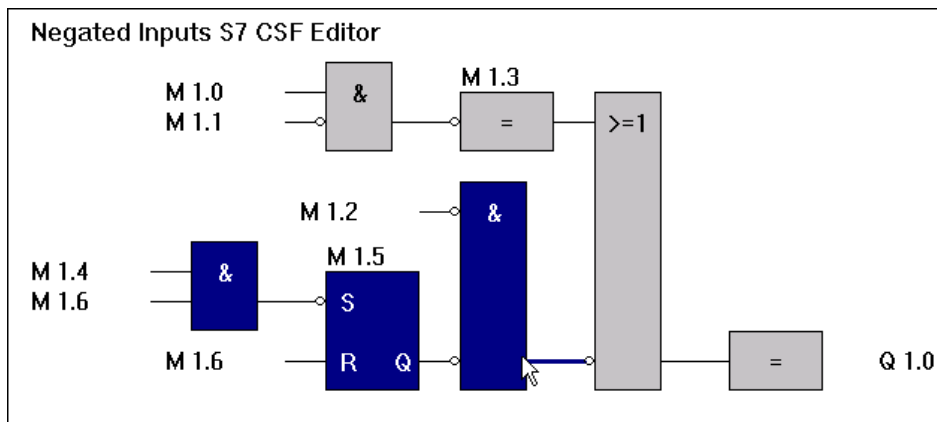


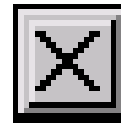
Figure 5-19 Negated Inputs S7 CSF Editor

5.6.4.2 Delete Input (Modify Menu)

The **Delete Input** command, from the modify menu, deletes the selected input or the selected logical connection. A selected input or logical connections (one or more function symbols) are displayed in dark blue. Only inputs from an **AND** function symbol or an **OR** function symbol may be deleted.



- ◆ Click the **Delete** icon in the tool bar or the **Delete Input** command in the modify menu.



- ◆ Press **CTRL + F3**.

Examples:

A marked input may be deleted with the **Delete Input** command.

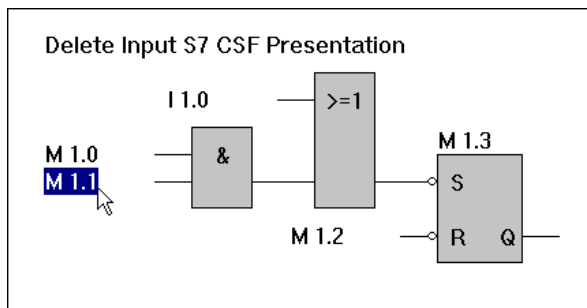


Figure 5-20 Delete Input S7 CSF Presentation (example 1)

A logical connection was marked (displayed in dark blue). The OR function symbol and the AND function symbol with all its inputs will be deleted.

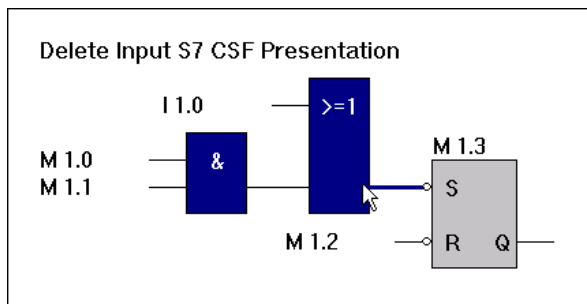


Figure 5-21 Delete Input S7 CSF Presentation (example 1)

5.6.4.3 Format (Modify Menu)

The **Format** command, from the modify menu, in the S7 CSF Editor is used to format and to check the syntax of the variable declaration table. The variables are sorted into their predefined order and the starting addresses are assigned.


 ◆ Click **Format** in the modify menu.

 ◆ Press **F9 (ALT + M, F)**.

5.6.4.4 Change Type (Modify Menu)

The **Change Type** command, from the modify menu, allows you to modify the type of a logical function. This command also changes the type of an assignment to an **S** (set) or **R** (reset) type. You may activate the change type command several times to change, for example, a pulse timer into a latched on-delay timer.

 ◆ Click **Change Type** in the modify menu.

 ◆ Press **ALT + F9**.

Example: The following logical functions may change their type:

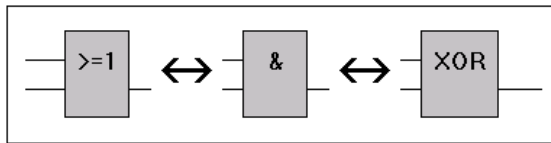


Figure 5-22 Change Type AND, OR, XOR

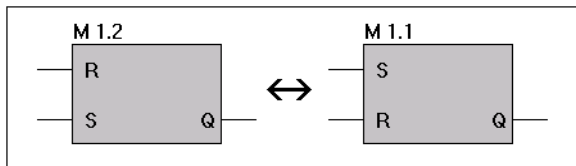


Figure 5-23 Change Type, RS Flip Flop, SR Flip Flop

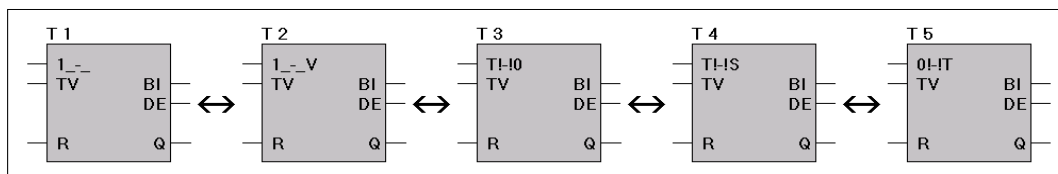


Figure 5-24 Change Type, Pulse Timer, Extended Pulse Timer, ON-Delay Timer, Latching ON-Delay Timer, OFF-Delay Timer

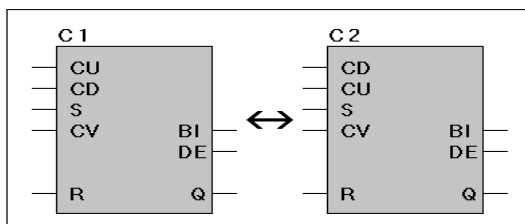


Figure 5-25 Change Type, Upward Counter, Downward Counter

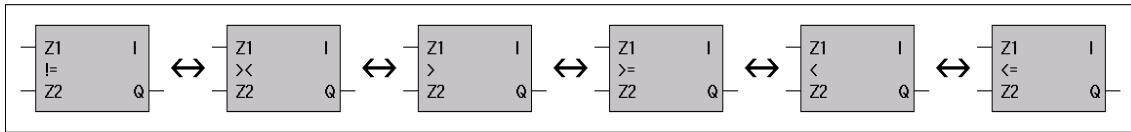


Figure 5-26 Change Type, Equal, Not Equal, Bigger, Bigger or Equal, Less, Less or Equal

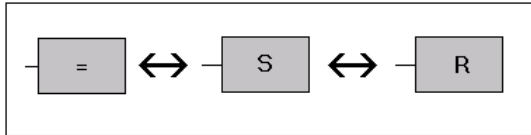


Figure 5-27 Change Type, Assignment, Set Assignment, Reset Assignment

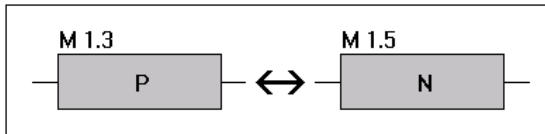


Figure 5-28 Change Type, Positive Edge Evaluation, Negative Edge Evaluation

5.6.5 Search (Search Menu – S7 CSF Presentation)

The commands from the **Search** menu in the CSF presentation are used to review or change text in the displayed segment and to move to another segment.

In CSF presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, LAD, and /or Block-STL (Source Text) presentation.

◆ Click **Search** in the menu bar.

◆ Press **ALT + S**.



Figure 5-29 Search menu S7 - CSF presentation

The commands Search for, Replace, and Search again are not available in CSF presentation. For detailed information on the commands from the modify menu see chapter 4.2.5.4 – 4.2.58.

5.6.6 Insert (Insert Menu – S7 CSF Presentation)

The commands from the **Insert** menu in the CSF Editor are used to insert logical functions into the workplace to build a segment. The commands are identical with the corresponding icons from the S7 - CSF Editor Toolbar (see chapter 5.6.2). The commands Timer, Counter, Comparator, and FB Call, open dialog boxes. In CSF presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, LAD and /or Block-STL (Source Text) presentation.

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

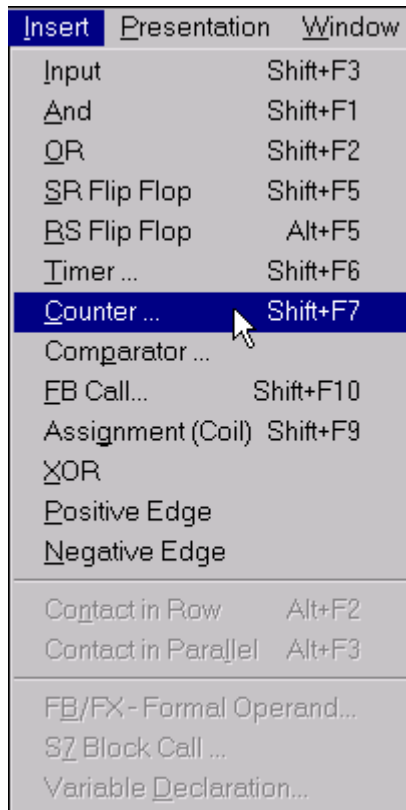


Figure 5-30 Insert menu S7 - CSF presentation

The commands Contact in Row, Contact in Parallel, FB / FX - Formal Operands, S7 Block Call, and Variable Declaration are not available in CSF presentation.

Note:

The command **Variable Declaration** is available as soon as the variable declaration table is displayed in the S7 Block Editor (CSF presentation) work place.

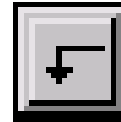
The command **FB Call...** opens a dialog box to select all types of blocks to call.

5.6.6.1 Input (Insert an additional Input)

The command **Input** adds an additional input to an existing AND function symbol or an OR function symbol.

To add an input mark one of the inputs of the function symbol. The operand (placeholder) at this input is displayed with a blue background. If an input connected to an output of the previous function symbol was marked, the entire function symbols beyond the input are displayed in blue.

- ◆ Click the **Input** icon in the tool bar or the **Input** command in the insert menu.



- ◆ Press **Shift + F3**

Example:

An AND function symbol with an additional input. One input is marked to add an additional input.

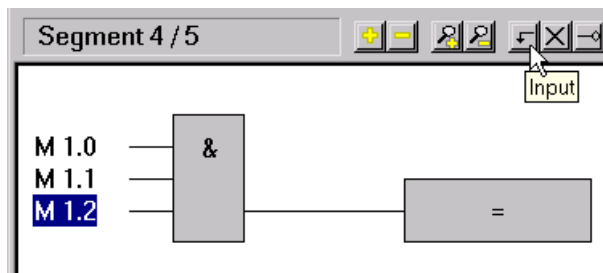


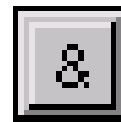
Figure 5-31 Insert additional input

5.6.6.2 AND (Insert an AND Function Symbol)

The command **And** inserts an AND function symbol.

To add an AND function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

- ◆ Click the **And** icon in the tool bar or the **And** command in the insert menu.



- ◆ Press **Shift + F1**.

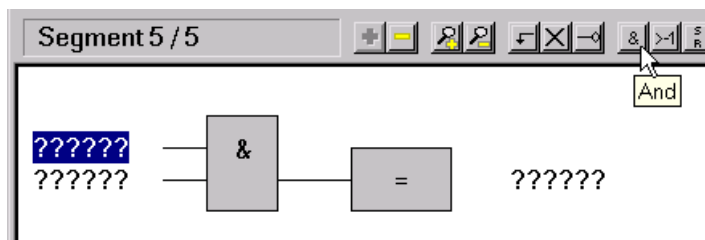


Figure 5-32 Insert AND Function

5.6.6.3 OR..(Insert an OR Function Symbol)

The command **OR** inserts an OR function symbol.

To add an OR function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

- ◆ Click the **OR** icon in the tool bar or the **OR** command in the insert menu.
- ◆ Press **(Shift) + F2**.

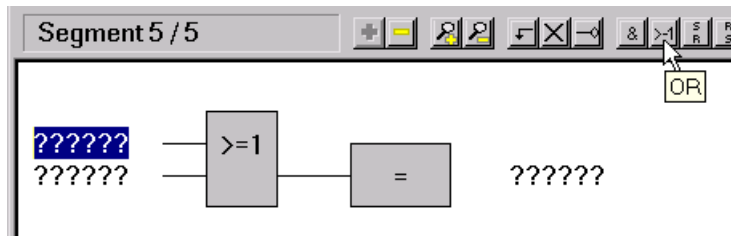
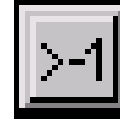


Figure 5-33 Inserts an OR Function

5.6.6.4 SR Flip Flop (Insert a SR Flip Flop (Latch) Function Symbol)

The command **SR Flip Flop** inserts a SR Flip Flop with a dominating reset input.

To add a SR Flip Flop function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

- ◆ Click the **SR Flip Flop** icon in the tool bar or the **SR Flip Flop** command in the insert menu.
- ◆ Press **(Shift) + F5**.

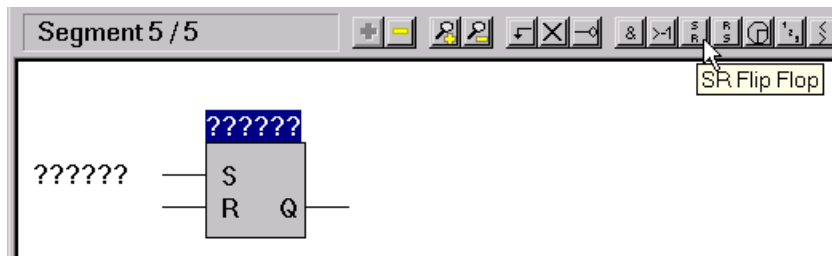
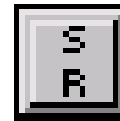


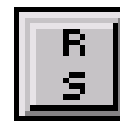
Figure 5-34 Insert SR Flip Flop (Latch)

5.6.6.5 RS Flip Flop (Insert a RS Flip Flop (Latch) Function Symbol)

The command **RS Flip Flop** inserts a RS Flip Flop with a dominating set input.

To add a RS Flip Flop function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

- ◆ Click the **RS Flip Flop** icon in the tool bar or the **RS Flip Flop** command in the insert menu.
- ◆ Press **ALT + F5**.



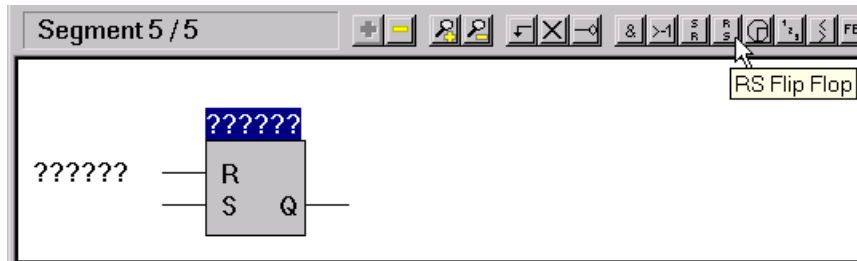


Figure 5-35 Insert RS Flip Flop (Latch)

5.6.6.6 Timer (Insert a Timer Function Symbol)

The command **Timer** opens a dialog box to select the timer function. Five different timers are available.

To add a timer function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

◆ Click the **Timer** icon in the tool bar or the **Timer** command in the insert menu.

◆ Press **Shift + F6**.

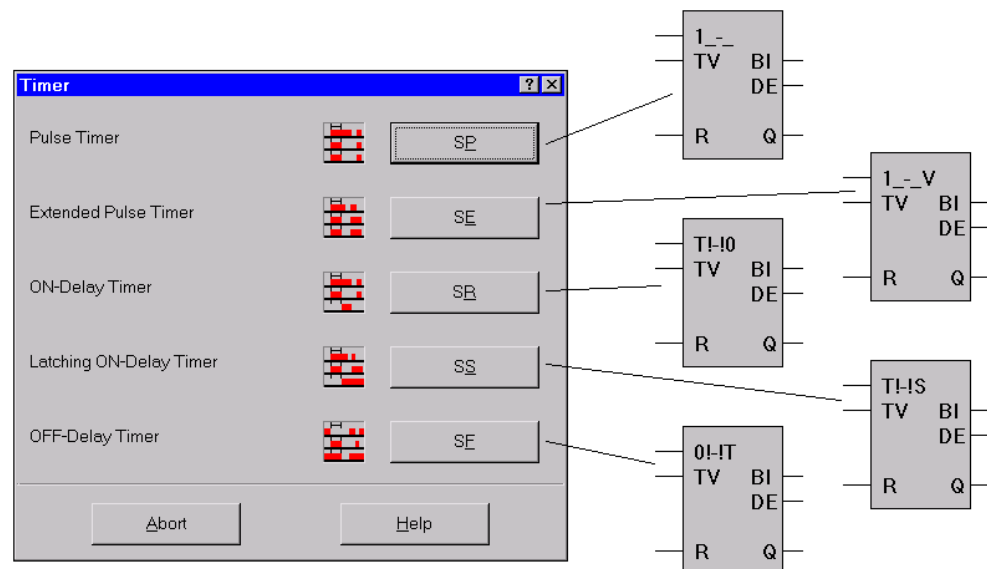
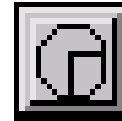


Figure 5-36 Timer selection dialog box

- The **Pulse** timer outputs a maximum length pulse.
- The **Extended Pulse** timer outputs a minimum length pulse.
- The **On-Delay** timer outputs a pulse after the time has elapsed (the start pulse must still be present).
- The **Latched On-Delay** timer outputs a pulse after the time has elapsed.
- The **Off-Delay** timer outputs a pulse with a fixed length after the starting pulse goes to zero.

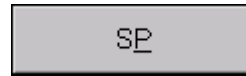
Timer signals overview

SP, SE, SR, SS, SF	Start timer															
TV	<p>The Time Value is entered as a time constant S5TIME (S5T). The S5T value occupies a 16 bit word divided into 1 + 3 decades. The single decade represents the multiplication factor and the three (3) remaining decades represent the time value in BCD (000 up to 999). the multiplication factor may have values of: 0 = 10ms, 1 = 100ms, 2 = 1s und 3 = 10s.</p> <p>The S5TIME (S5T) is always entered in the following manner: S5T#0MS (minimum) up to S5T#2H_46M_30S (maximum).</p> <p>The following S5TIME (S5T) values are available:</p> <table border="1"> <thead> <tr> <th>Value Range</th> <th>Accuracy</th> <th>Example</th> </tr> </thead> <tbody> <tr> <td>10ms up to 9s 990ms</td> <td>10ms</td> <td>S5T#9S_990MS</td> </tr> <tr> <td>100ms up to 1m 39s 900ms</td> <td>100ms</td> <td>S5T#1M_39S_900MS</td> </tr> <tr> <td>1s up to 16m 39s</td> <td>1s</td> <td>S5T#16M_39S</td> </tr> <tr> <td>10s up to 2h 46m 30s</td> <td>10s</td> <td>S5T#2H_46M_30S</td> </tr> </tbody> </table>	Value Range	Accuracy	Example	10ms up to 9s 990ms	10ms	S5T#9S_990MS	100ms up to 1m 39s 900ms	100ms	S5T#1M_39S_900MS	1s up to 16m 39s	1s	S5T#16M_39S	10s up to 2h 46m 30s	10s	S5T#2H_46M_30S
Value Range	Accuracy	Example														
10ms up to 9s 990ms	10ms	S5T#9S_990MS														
100ms up to 1m 39s 900ms	100ms	S5T#1M_39S_900MS														
1s up to 16m 39s	1s	S5T#16M_39S														
10s up to 2h 46m 30s	10s	S5T#2H_46M_30S														
R	Reset															
BI	Current counter value (Binary)															
DE	Current counter value (BCD)															
Q	Output															

Table 5-13 Time Value S5TIME (S5T)

● Insert a Pulse Timer

◆ Click the **SP** button.



◆ Press **P**.

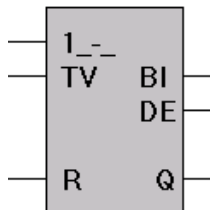


Figure 5-37 Pulse timer function symbol

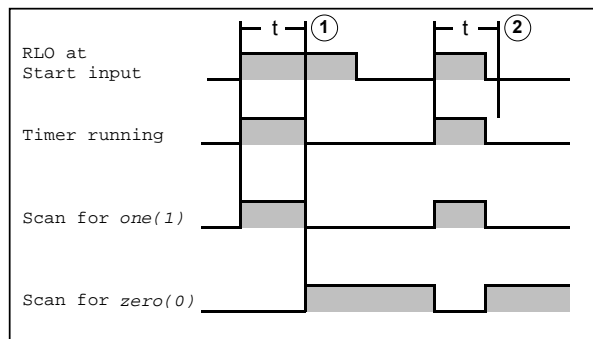
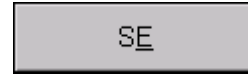


Figure 5-38 Pulse Timer characteristics

● **Insert an Extended Pulse Timer.**

◆ Click the **SE** button.



◆ Press **E**.

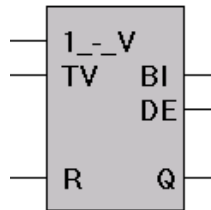


Figure 5-39 Extended Pulse timer function symbol

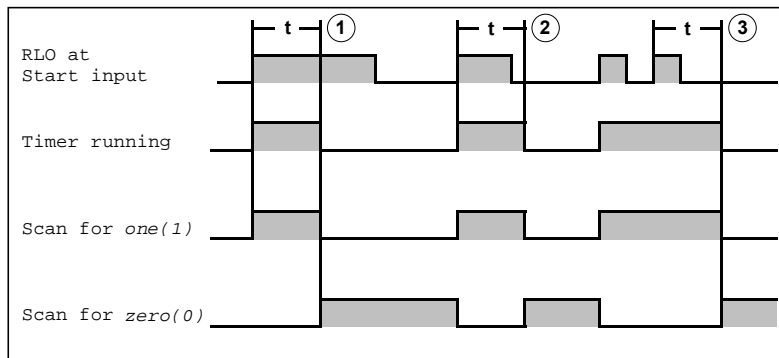
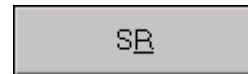


Figure 5-40 Extended Pulse Timer characteristics

● **Insert an On-Delay Timer**

◆ Click the **SR** button.



◆ Press **R**.

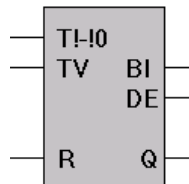


Figure 5-41 On-Delay timer function symbol

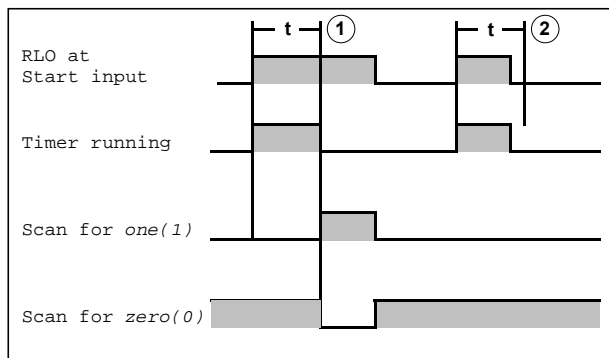
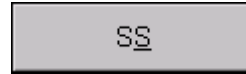


Figure 5-42 **On-Delay Timer** characteristics

● **Insert a Latching On-Delay Timer**

◆ Click the **SS** button.



◆ Press **S**.

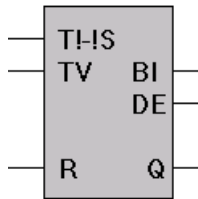


Figure 5-43 Latching On-Delay timer function symbol

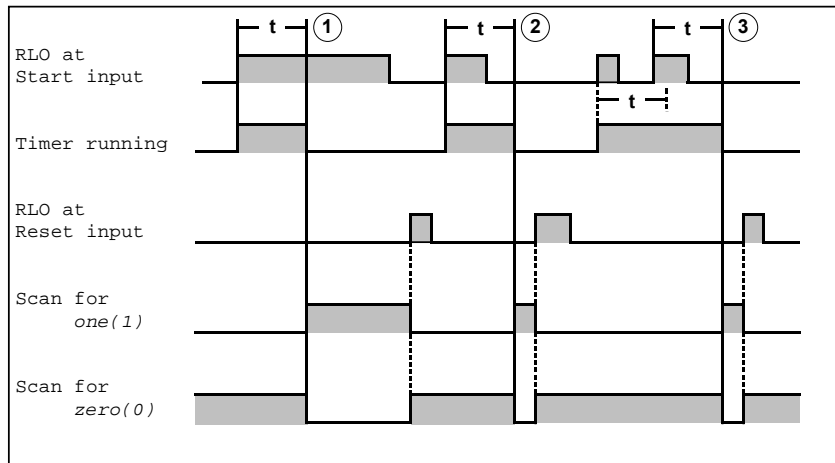
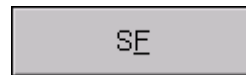


Figure 5-44 Latching On-Delay Timer characteristics

● **Insert an Off-Delay Timer**

◆ Click the **SF** button.



◆ Press **F**.

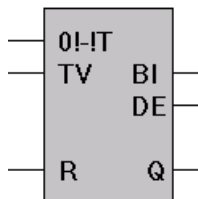


Figure 5-45 Off-Delay timer function symbol

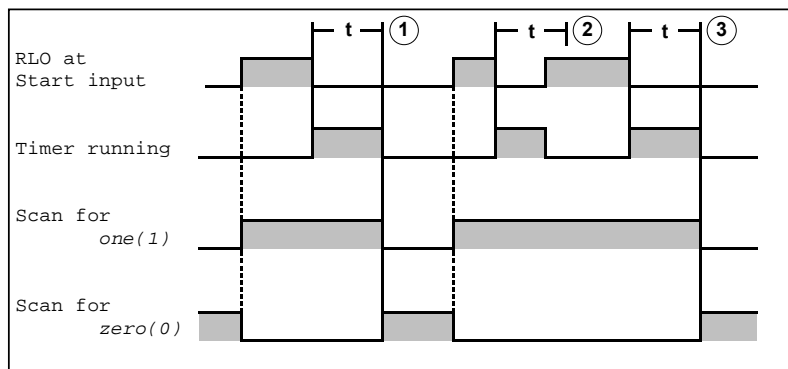


Figure 5-46 Off-Delay Timer characteristics

5.6.6.7 Counter (Insert a Counter Function Symbol)

The command Counter opens a dialog box where you can select the counter function. Two different counters are available, an up counter and a down counter.

Basically both counters are the same. Because of the arrangement of the function symbol the first input must be used. For the up counter this is the input that increments the counts. For the down counter this is the input that decrements the counts. Both counters provide a second input (this input doesn't have to be used) for the opposite count direction.

◆ Click the **Counter** icon in the tool bar or the **Counter** command in the insert menu.

◆ Press **Shift + F7**.

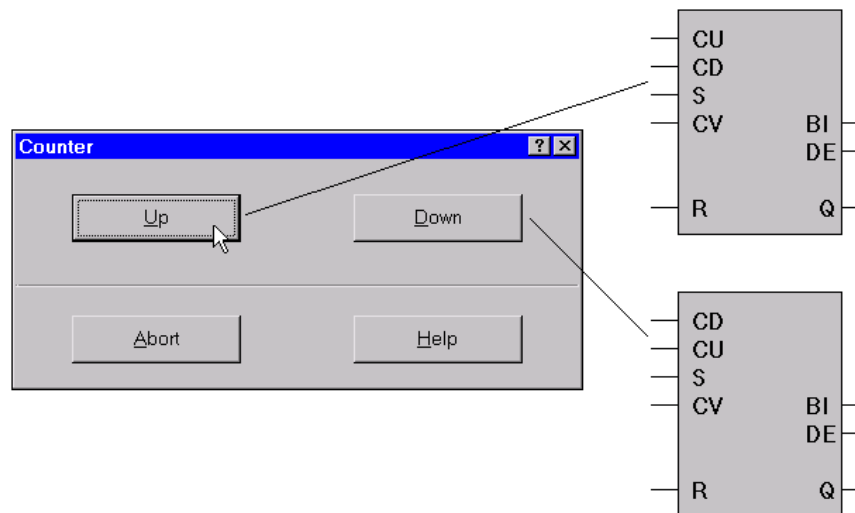


Figure 5-47 Counter dialog box

Counters signals overview	
CU	Count up (increment)
CD	Count down (decrement)
S	Set
CV	Load counter (value in BCD)
R	Reset
BI	Current counter value (Binary)
DE	Current counter value (BCD)
Q	Output

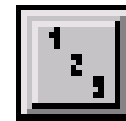
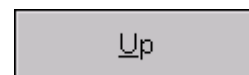


Table 5-14 Counter inputs and outputs

● Insert an Up Counter

◆ Click the **Up** button.

◆ Press **U**.



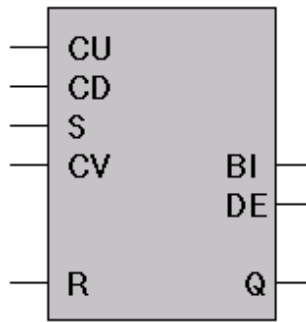



Figure 5-48 Up Counter function symbol

● Insert a Down Counter

 ◆ Click the **Down** button.

 ◆ Press D.

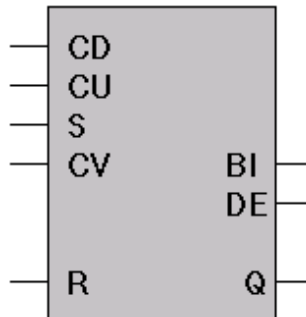



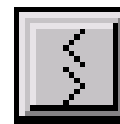
Figure 5-49 Down Counter function symbol

5.6.6.8 Comparator (Insert a Comparator Function Symbol)

The command **Comparator** opens a dialog box to select the compare functions. Six (6) different comparators are available.

 ◆ Click the **Comparator** icon in the tool bar or the **Comparator** command in the insert menu.

 ◆ Press **ALT + I, P**.



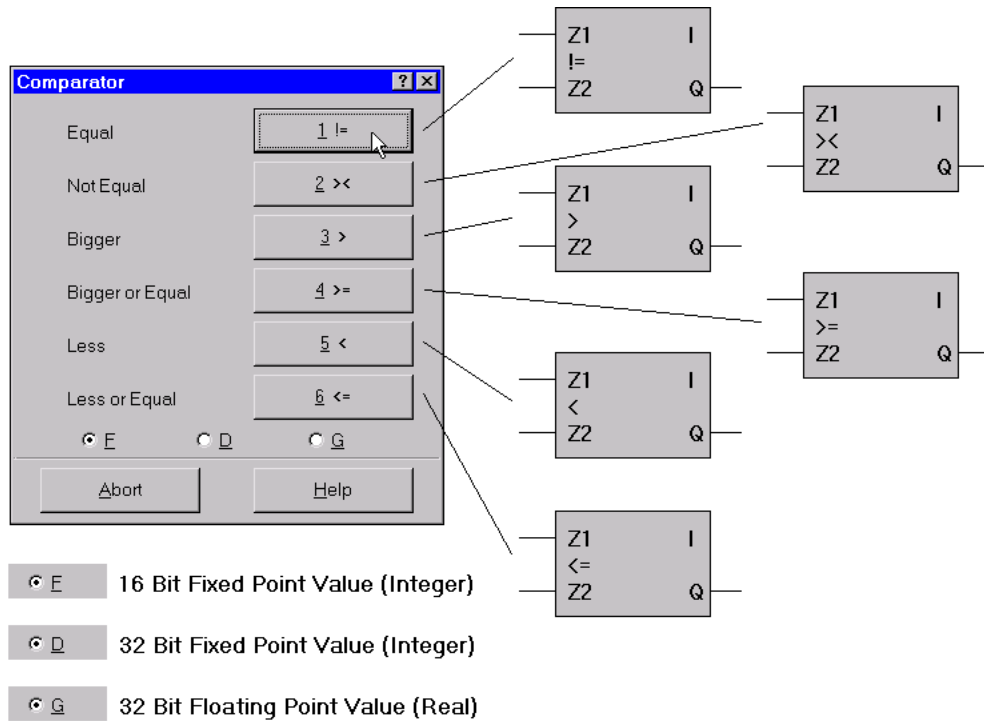


Figure 5-50 Comparator dialog box

Symbol	Function	Fixed point (Integer) F	Fixed point (Integer) D	Floating point (Real) G
!=	Compare for equal	16 Bit	32 Bit	32 Bit
><	Compare for not equal	16 Bit	32 Bit	32 Bit
>	Compare for greater than	16 Bit	32 Bit	32 Bit
>=	Compare for greater than or equal	16 Bit	32 Bit	32 Bit
<	Compare for less than	16 Bit	32 Bit	32 Bit
<=	Compare for less than or equal	16 Bit	32 Bit	32 Bit

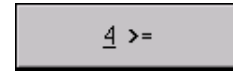
Table 5-15 Compare functions

Comparator signals overview	
Z 1	Input 1
Z 2	Input 2
Q	Output (one for equal, zero for not equal)
F, D, G	The letter (F, D, G) in the right upper corner of the comparator function symbol indicates the value representation of the inputs (16 bit integer, 32 bit integer or 32 bit real).

Table 5-16 Comparator Inputs and Outputs

● Insert a Comparator

- ◆ Click the appropriate button to select the value representation of the inputs (**F** - 16 bit integer, **D** - 32 bit integer or **G** - 32 bit floating point).
- ◆ Click the appropriate button to select the desired comparator (**1**, **2**, **3**, **4**, **5**, or **6**).
- ◆ Press **F**, **D**, or **G**.
- ◆ Press **1**, **2**, **3**, **4**, **5**, or **6**.



A Comparator function symbol is inserted.

5.6.6.9 FB Call (Insert a Block Call Symbol)

The command **FB Call** opens a dialog box displaying a list with all the blocks available to be called. These are not only the blocks displayed in the PC block list but also all **System Functions (SFC)** and the **System Function Blocks (SFB)**.

The CALL function symbol is used for an absolute block call. With a CALL function symbol; Functions (FC), Function Blocks (FB), System Functions (SFC), and System Function Blocks (SFB) can be opened for execution. The call is independent of any condition and is always executed. Organization blocks (OB) cannot be opened with the CALL instruction. Organization Blocks (OB) are only called for execution by the PLC operating system. The CALL function symbol may also be used to open the Instance Data Block assigned to a Function Block.

The Call function symbol can only be placed in a separate network.

- ◆ Click the **FB Call** icon in the tool bar or the **FB Call** command in the insert menu.
- ◆ Press **SHIFT + F10**.

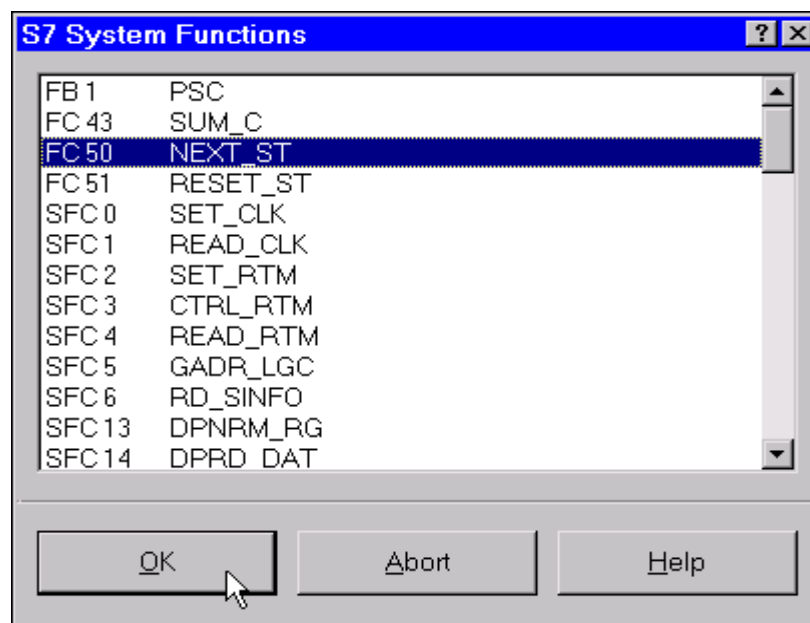


Figure 5-51 The command **FB Call** opens a **S7 System Functions** dialog box

- ◆ Mark the block (blue background) you want to call with the **CALL** function symbol and confirm with the **OK** button.

If a Function Block (FB) is selected, an additional dialog box is opened to select the Instance Data Block (DB). When calling a Function Block (FB), an Instance Data Block must be assigned. Mark the Data Block you want to assign to the Function Block (FB) as its Instance Data Block and confirm with the **OK** button. An example of the Select Instance Data Block (DB) is shown in figure 5-52. The figure 5-53 shows the function symbol of an FB Call.

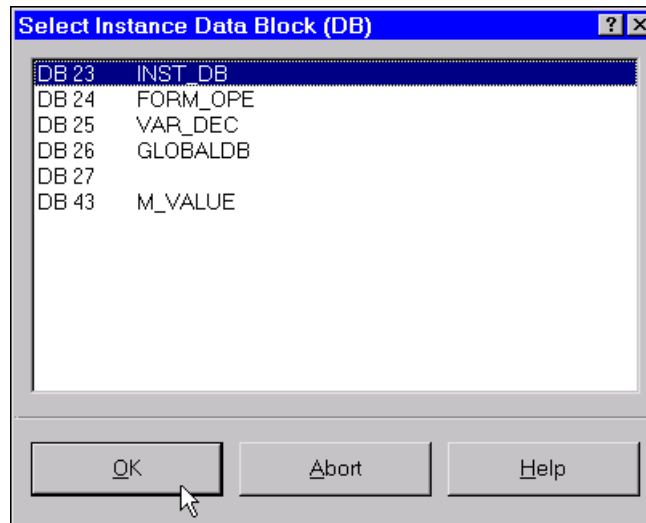


Figure 5-52 Select Instance Data Block (DB) dialog box

The CALL function symbol is inserted if a block with its assigned block parameters is called (e.g. Function (FC), etc.). The name of the block and the assigned parameters are displayed in the CALL function symbol. Input parameter are shown at the left side, output parameter are shown on the right side. The names of the parameters (operands) may not be displayed in their full length. Truncated names are indicated with a colon after the truncated name.

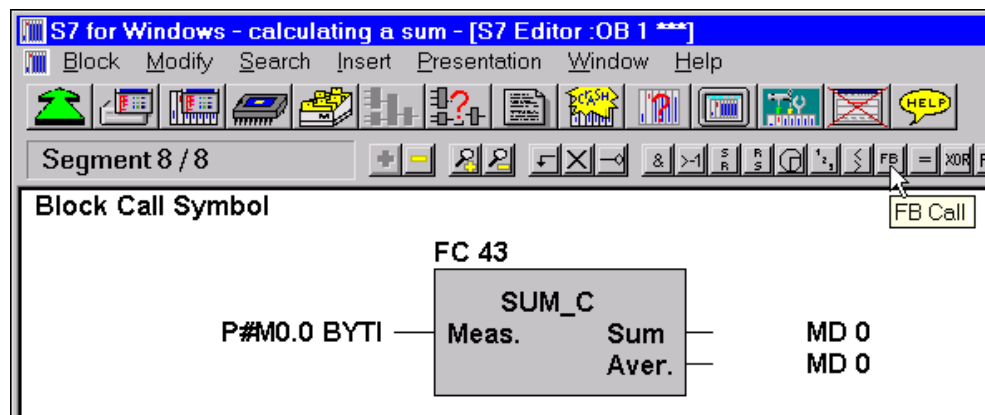


Figure 5-53 CALL function symbol

By editing the **Place Holders** (M 0.0, MD 0) you can enter the actual variables handling the assignment to the block parameters.

Figure 5-54 shows an example of the edited block CALL with the actual variables assigned to the block parameters. The parameters may be displayed or edited in their symbolic or absolute form.

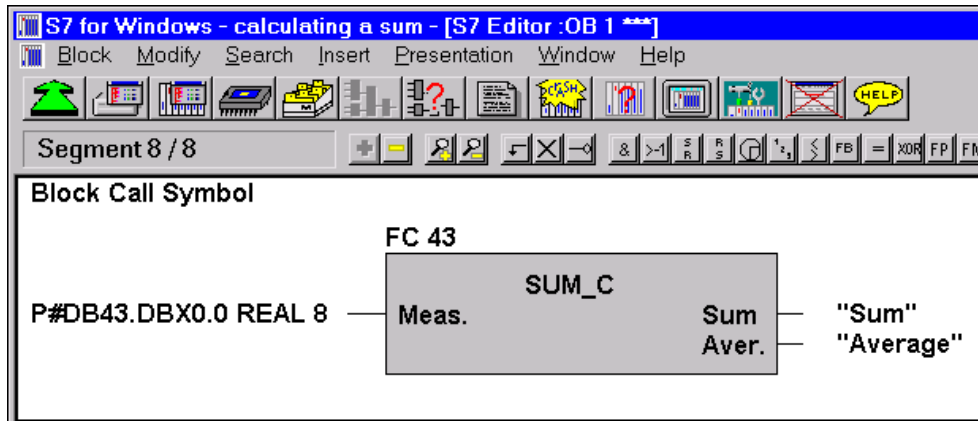


Figure 5-54 CALL function symbol with the assignment of the actual variables

CALL Function Symbol			
Name		Parameter	Explanation
FC 43			Call function FC 43
Meas.	Measured_Value	P#DB43.DBX0,0 REAL 8	Measured_Value (formal parameter supplied with DB43.DBX0,0 REAL 8 (actual parameter) – Data Word 0 of Data Block 43, Data type REAL, 8 Byte
Sum	Sum	"Sum"	Sum (formal parameter supplied with "Sum" (actual parameter)
Aver.	Average_Value	"Average"	Average_Value (formal parameter supplied with "Average" (actual parameter)

Table 5-17 Function CALL with the assignment of the actual variables

● Calling a Function Block with its assigned Instance Data Block

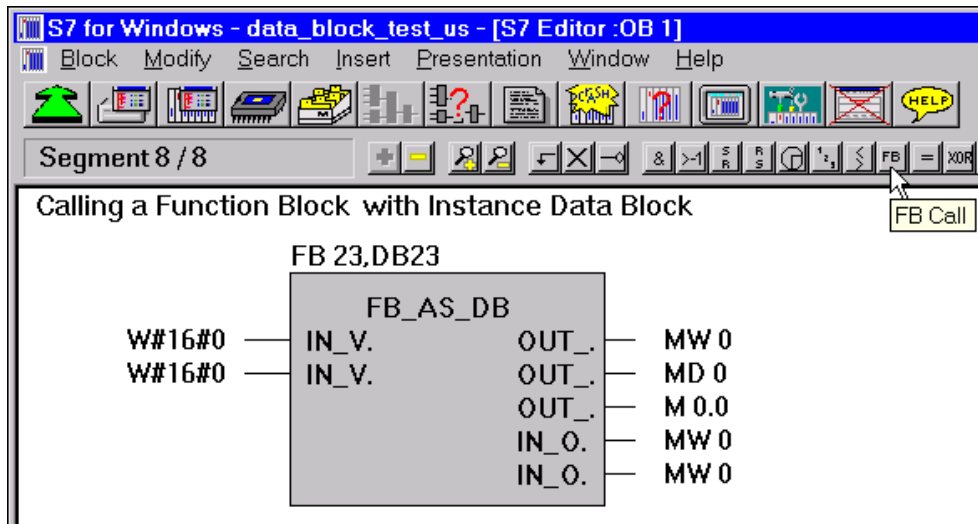


Figure 5-55 CALL of the Function Block (FB23) with instance Data Block (DB23)

By editing the **Place Holders** (W#16#0, MW0, MD0, M0.0) you can enter the actual variables handling the assignment to the block parameters.

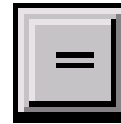
The actual parameters (W#16#0, MW0, MD0, M0.0) supplying the data for the formal parameter (IN_V., OUT_., and IN_O.).

5.6.6.10 Assignment (Coil) (Insert an Assignment)

The command **Assignment (Coil)** inserts an assignment function symbol (result, intermediate result).

To add an assignment function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1. To change the assignment mark the assignment name (e.g. Q 1.1 etc.).

- ◆ Click the **Assignment** icon in the tool bar or the **Assignment (Coil)** command in the insert menu.



- ◆ Press **Shift + F9**.

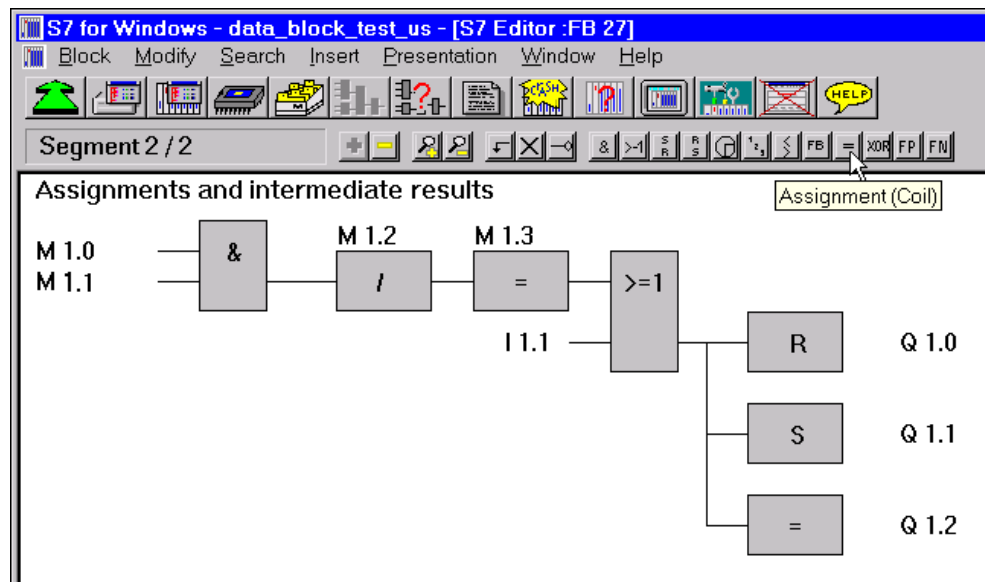


Figure 5-56 Assignment function symbols as results and intermediate results

The assignment as a result may have an **Equal (=)**, a **Set (S)** or a **Reset (R)** function.

The assignment as an intermediate result may be **Equal (=)** or **Negated (/)**.

Changing the result function and / or the intermediate result is done with the **Change Type (ALT+F9)** command from the modify menu (see chapter 5.6.3.4).

5.6.6.11 XOR (Insert an XOR Function Symbol)

The command **XOR** inserts an exclusive OR function symbol.

To add an XOR function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

- ◆ Click the **XOR** icon in the tool bar or the **XOR** command in the insert menu.
- ◆ Press **Shift + F9**.

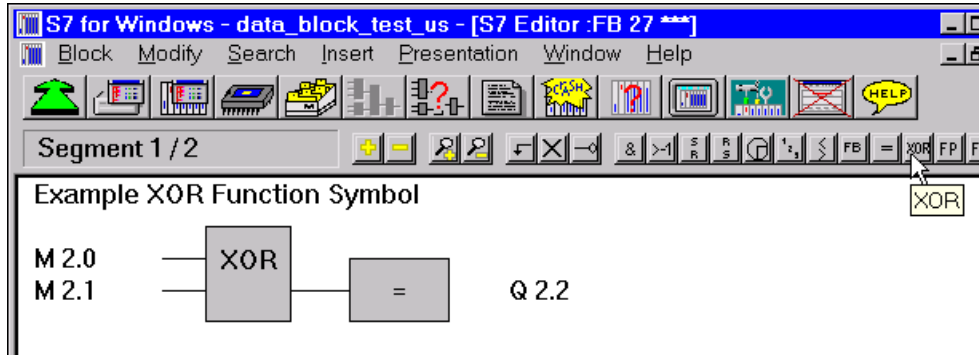


Figure 5-57 XOR function symbol

5.6.6.12 Positive Edge (Insert an Positive Edge Evaluation Function Symbol)

The command **Positive Edge** inserts a positive edge evaluation function symbol (Flange Positive - FP). The edge evaluation function detects the change in a signal state. The positive edge is detected if the signal is changing from "0" to "1".

- ◆ Click the **FP** icon in the tool bar or the **Positive Edge** command in the insert menu.
- ◆ Press **ALT + I, P**.

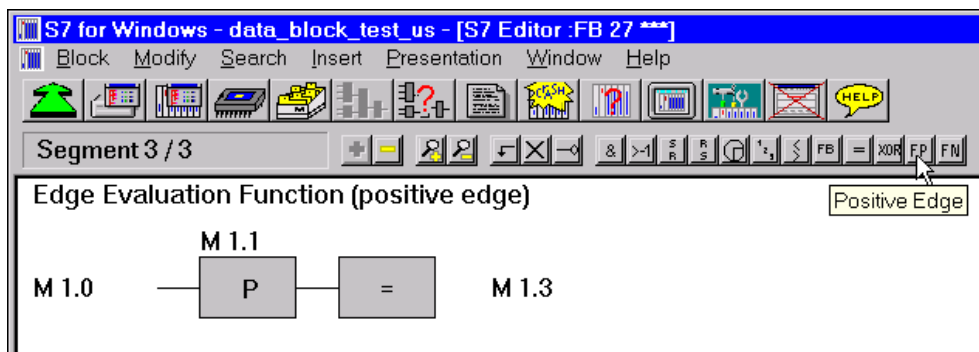


Figure 5-58 Positive edge evaluation function

To add an edge evaluation function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

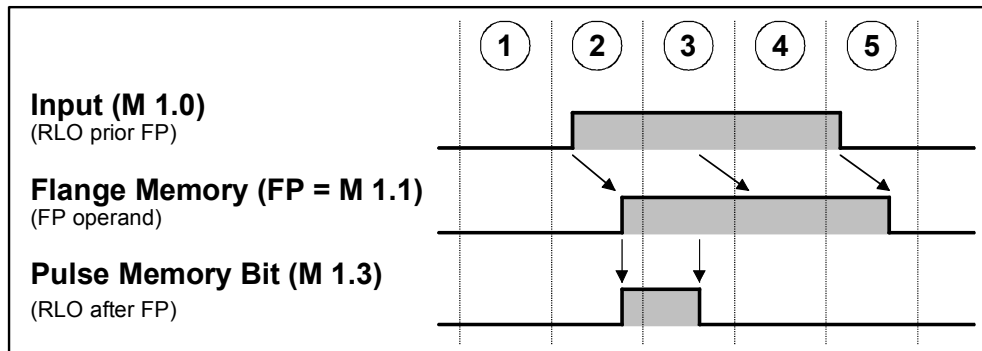


Figure 5-59 Positive edge evaluation function Pulse Diagram

- ① The Input signal (M1.0) and the Flange Memory (FP=M1.1) are low. The Pulse Memory (M1.3) remains reset.
- ② The Input signal (M1.0) changes to its high level. The CPU detects the "Positive Flange" by comparing the current RLO (M1.0) with the Flange Memory (FP=M1.1). If the current RLO (M1.0) is "1" and the Flange Memory (FP=M1.1) status low (0) the Flange Memory (FP=M1.1) is set to high (1). Also the current RLO and the Pulse Memory (M1.3) are set to high (1).
- ③ During the next cycle, the CPU detects whether or the levels of the Input signal (M1.0) and the Flange Memory (FP=M1.1) are the same. Therefore, the current RLO and the Pulse Memory (M1.3) are reset to low (0).
- ④ As long as the levels of the Input signal (M1.0) and the Flange Memory (FP=M1.1) are the same the current RLO and the Pulse Memory (M1.3) levels are not changed.
- ⑤ If the Input signal (M1.0) changes its level back to low (0) the CPU will reset the Flange Memory (FP=M1.1). The current RLO is not changed and therefore the conditions are now the same as when the cycle started.

5.6.6.13 Negative Edge (Insert an Negative Edge Evaluation Function Symbol)

The command **Negative Edge** inserts a negative edge evaluation function symbol (**Flange Negative - FN**). The edge evaluation function detects the change in a signal state. The negative edge is detected if the signal is changing from "1" to "0".

To add an edge evaluation function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.6.1.

- ◆ Click the **NP** icon in the tool bar or the **Negative Edge** command in the insert menu.
- ◆ Press **ALT + I, N**.

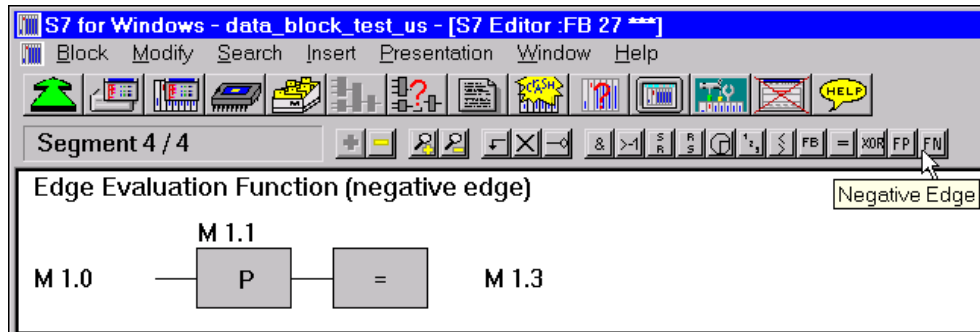


Figure 5-60 Negative edge evaluation function

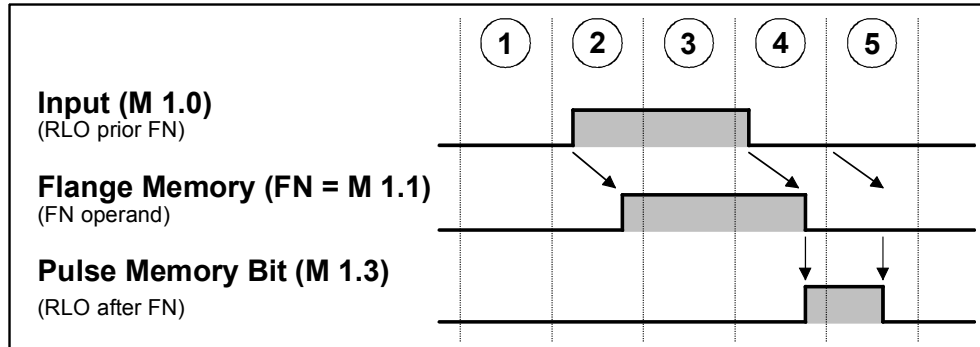


Figure 5-61 Negative edge evaluation function Pulse Diagram

- ① The Input signal (M1.0) and the Flange Memory (FP=M1.1) are low. The Pulse Memory (M1.3) remains reset.
- ② The Input signal (M1.0) changes to its high level. The CPU detects the change in level by comparing the current RLO (M1.0) with the Flange Memory (FP=M1.1). If the current RLO (M1.0) is "1" and the Flange Memory (FP=M1.1) status low (0) the Flange Memory (FP=M1.1) is set to high (1). The current RLO and the Pulse Memory (M1.3) remain in its low (0) stage.
- ③ As long as the levels of the Input signal (M1.0) and the Flange Memory (FP=M1.1) are the same the current RLO and the Pulse Memory (M1.3) levels are not changed.
- ④ During the next cycle, the CPU detects that the level of the Input signal (M1.0) is changed to low (0) and will reset the Flange Memory (FP=M1.1) to low (0). The current RLO and the Pulse Memory (M1.3) are set to high (1).
- ⑤ In the next cycle the Input signal (M1.0) and the Flange Memory (FP=M1.1) are low (0) and the CPU will reset The current RLO and the Pulse Memory (M1.3) are reset to low (0) and therefore the conditions are now the same as when the cycle started.

5.6.7 Presentation (Presentation Menu - S7 CSF Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. Not all commands are available in CSF presentation. For details on the commands from the presentation menu see chapter 4.2.7

◆ Click **Presentation** in the menu bar.

◆ Press **ALT + P**.

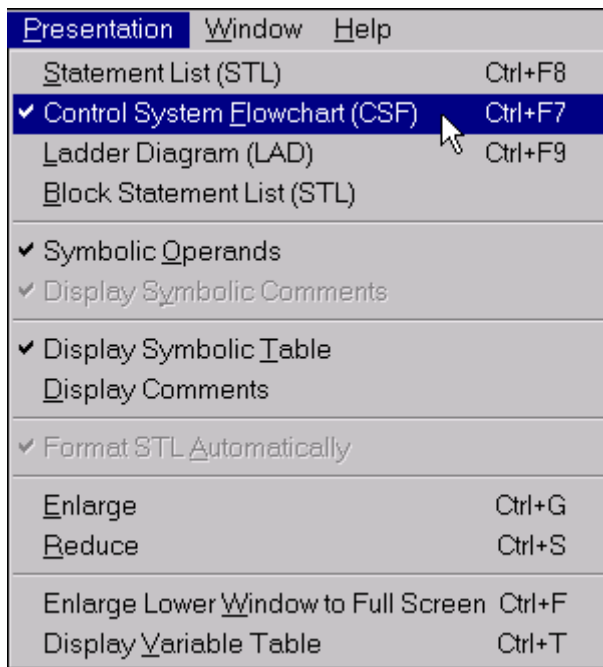


Figure 5-62 Presentation menu S7 CSF presentation

5.6.8 Window (Window Menu - Editor Window)

The **Window** menu from the editor window is identical with the window menu from the PC block list window. For more details see chapter 3.6.

5.6.9 Help (Help Menu - Editor Window)

The **Help** menu from the editor window is identical with the help menu from the PC block list window. For more details see chapter 3.7.

5.7 Editing an S7 Ladder Diagram (LAD)

S7 for Windows offers, as an option, **Ladder Diagram (LAD)** presentation. If the LAD option is installed, it is an integral part of the *S7 for Windows* software package. PLC logic programmed in LAD presentation may be converted into CSF or STL presentation any time. PLC logic programmed in STL presentation (Source Text) may be converted into LAD presentation if the programming follows a defined syntax. Complex logic may not be converted into LAD presentation. PLC logic programmed in CSF presentation cannot always be converted into LAD presentation.

Certain parts of PLC programs may only be programmed in STL (Source Text) presentation.

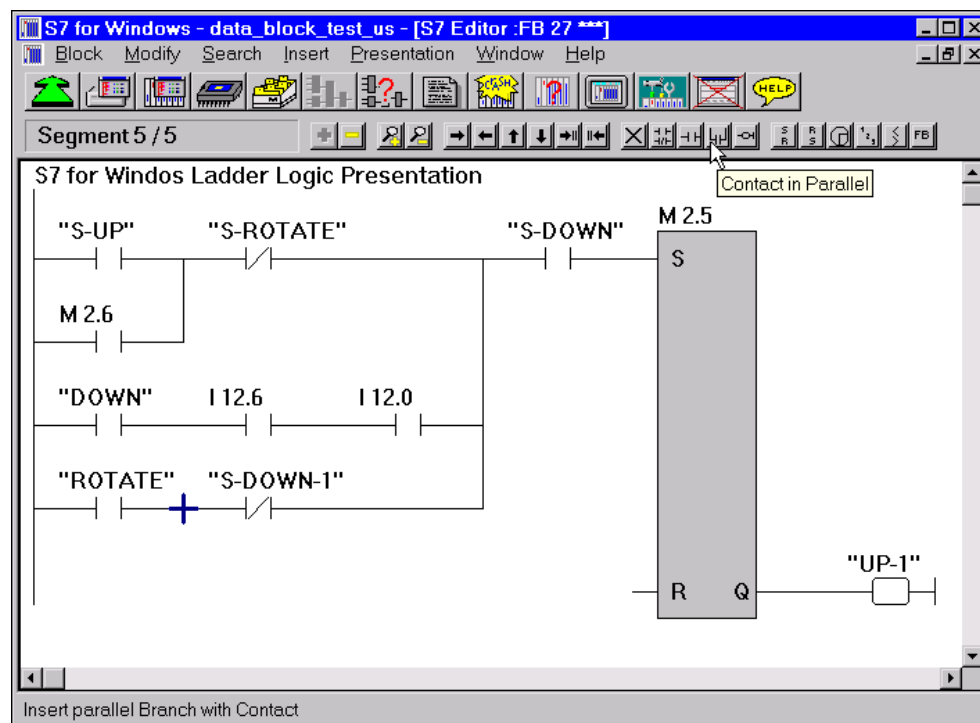


Figure 5-63 **Ladder Diagram (LAD)** presentation example

The **Editor** in the **Ladder Diagram (LAD)** presentation is a special graphics editor. The workplace of the LAD editor is organized as a matrix. Up to 20 elements (lines, contacts, Flip Flops, etc.) may be displayed horizontally. Vertically up to 30 elements (lines, Flip Flops, etc. but no contacts) may be displayed.

The tool bar is divided into five blocks. With icons from the first block you can move to other segments. The second block provides the icons to enlarge or reduce the displayed logic.

The third block allows you to draw lines and contacts. Each icon has multiple functions. Clicking an arrow icon will draw a line (in the direction of the arrow). Drawing over an existing line deletes the line (in the direction of the arrow). Drawing over a contact replaces the contact with a line.

The arrow icons with the contact symbol operate the same way. Clicking the icon will draw a contact (in the direction of the arrow). Drawing over an existing contact will delete the contact. Drawing over a line will replace the line with a contact.

The icons from block four and five are used to delete and to insert function symbols

During the ladder diagram generation the segment may be in one of two different stages. In one stage the segment is in a logically operational mode. The other stage of the segment is a logically non-operational mode.

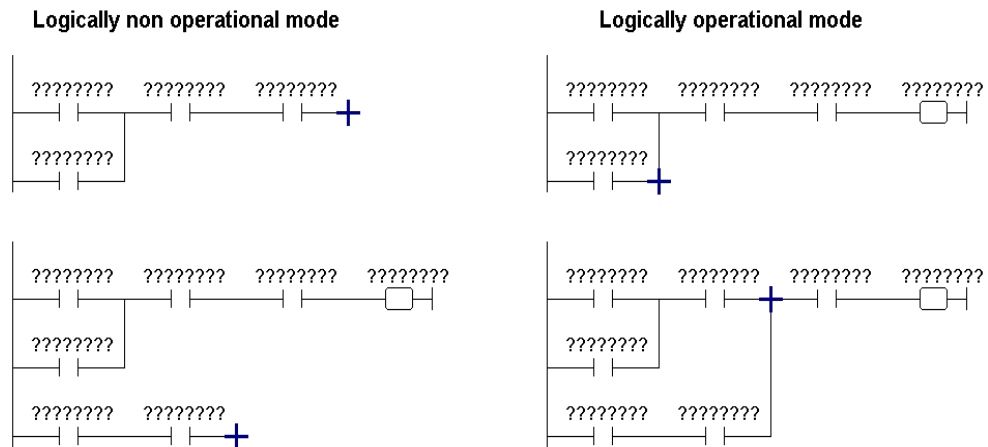


Figure 5-64 Example, logically operational mode and logically non operational mode

The edit functions that are available, depends on the functional stage of the segment. Edit functions that are not operational in the current mode are indicated by light gray icons.

The **Graphical Elements** from the third group in the toolbar may always be used to insert, add, or overwrite contacts and lines. It is irrelevant if the segment is in a logical operational mode or not.

Inserting function symbols from the fifth group is only possible in a logical operational mode.

- **Adding** function symbols are always possible.
- **Overwriting** contacts is always possible. It is not possible to overwrite function symbols.
- **Deleting** function symbols is not possible. You may change the type of the function symbol using the **Change Type** command (**ALT + F9**) from the modify menu (see chapter xxx).

5.7.1 Keyboard and Mouse Functions (LAD Editor)

In the LAD editor you can build PLC logic by moving the insertion point to given positions and inserting contacts, connecting lines, and function symbols.

The *S7 for Windows* LAD graphical editor differentiates between the comment position (segment [network] comment), the operand positions, and the function symbol positions (contacts, timers, etc.).




The **Network** (Segment) **Comment** field starts in the upper left corner of the workplace. The field is a single line and may be up to sixty (60) characters wide. The

width may currently be adjusted with the *S5 for Windows* selection Maximum Command Comment (see chapter 3.2.11.5).

The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.







The **Function Symbol** (contact) positions are defined as follows:

To insert the first contact (function symbol) you must position the insertion mark (blue cross) on the vertical line in the upper left corner of the workplace (below the segment comment field).



-  ◆ Click the vertical line below the network (segment) comment field.
-  ◆ Press **HOME**, the insertion mark moves to the beginning of the segment field.
- ◆ Press  the insertion mark moves on the vertical line below the comment field.

● Moving the insertion point





To add a contact (function symbol) the insertion mark must be positioned at the desired position.

-  ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want.
- ◆ Click (press and release the left mouse button) the location where you want to position the insertion point. The blue cross indicates the position of the insertion mark.
-  ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want. Use the keys **PAGE UP**, **PAGE DOWN**, **CTRL + **, **CTRL + **, **CTRL + **, **CTRL + ** to move the scroll bars.

Within a network (segment), comment field, or an operand field

To move	Press
One character to the left	
One character to the right	

In the logic area (outside the comment field or an operands field)

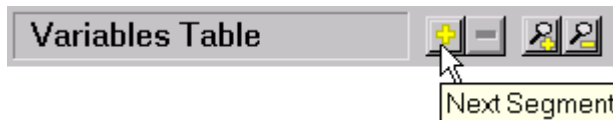
To move	Press
One position up	
One position down	
One position left	
One position right	
From one operand to the next	TAB or ↵
To the beginning of the segment comment	HOME

5.7.2 Tool Bar II – S7 Ladder Diagram (LAD) Editor



Select the tools with the mouse or with the function keys (see *S7 for Windows* Function - Key Template). The segment (network) number and the total number of segment (network) are displayed.

The selected variable declaration table is also indicated.



Open the **Next Network**.

 Key **F8**.



Open the **Previous Network**. If Network one (1) is opened the variable declaration table is opened

 Key **F7**.



Activating this function will **Enlarge** the PLC logic displayed in LAD presentation. The selected font must be scaleable.

 Key **CTRL + G**.



Activating this function will **Reduce** the PLC logic displayed in LAD presentation. The selected font must be scaleable.

 Key **CTRL + S**.



Draw a Line to the Right. Erase a line to the right of the marked position. Overwrite a contact with a line to the right of the marked position.

 Key **(↑ Shift) + (→)**.




Draw a Line to the Left. Erase a line to the left of the marked position. Overwrite a contact with a line to the left of the marked position.

 Key **(↑ Shift) + (←)**.




Draw a Line Upward. Erase a line upward of the marked position.

 Key **(↑ Shift) + (↑)**.



Draw a Line Downward. Erase a line downward of the marked position.

 Key **(↑ Shift) + (↓)**.



Add a Contact (NO) to the Right. Erase a contact (NO) to the right of the marked position. Overwrite a line with a contact to the right of the marked position.

 Key **ALT + →**.



Add a Contact (NO) to the Left. Erase a contact (NO) to the left of the marked position. Overwrite a line with a contact to the left of the marked position.

 Key **↑ Shift + ←**.




Delete a Contact to the right of the marked position.

 Key **CTRL + F3**.



Negate (Change) the selected **Contact** from normally open (NO) to normally closed (NC) or vice versa (NC to NO).

 Key **↑ Shift + F4**.



Insert a Contact to the right of the marked position.

 Key **ALT + F2**.




Insert a Contact Parallel to the contact to the right of the marked position.

 Key **ALT + F3**.




Insert a Coil or an intermediate resolute to the right of the marked position.

 Key **↑ Shift + F3**.



Insert a **RS Flip Flop** (latch) with a dominating reset input.

 Key **↑ Shift + F5**.



Insert a **SR Flip Flop** (latch) with a dominating set input.

 Key **ALT + F5**.




This icon opens a dialog box to select **Timers**.

 Key **↑ Shift + F6**.



This icon opens a dialog box to select **Counters**.

 Key **↑ Shift + F7**.



This icon opens a dialog box to select **Comparators**.



Key **CTRL + F9**.



Insert a **Block Call**.



Key **Shift + F10**.

Note:

The **right mouse button** may be used within the S7 Ladder Diagram (LAD) Editor. If the **right mouse button** is clicked, a menu with commands available in the S7 LAD Editor is opened.

The commands available are, all the comments from the **Insert menu** plus some of the commands from the Modify menu. These commands give you full control to generate or change the PLC logic displayed in the workspace of the S7 Ladder Diagram (LAD) Editor window.

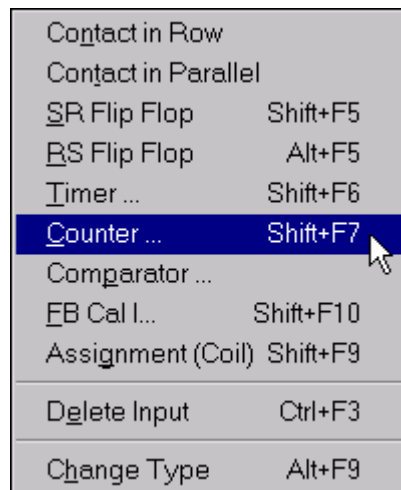


Figure 5-65 The right mouse menu (S7 Ladder Diagram (LAD) Editor)

5.7.3 Block (Block Menu – S7 LAD Presentation)

With the commands from the **Block** menu you can save a block and close the block editor. The block menu for the block editor, S7 PC LAD - presentation, and S7 PLC block editor LAD - presentation, are the same.

For more details on the commands of the Block menu see chapter 4.2.1.

5.7.4 Modify (Modify Menu - S7 LAD Presentation)

The commands from the **Modify** menu in the LAD presentation are used to work with an existing segment and/or create a new segment.

◆ Click **Modify** in the menu bar.

◆ Press **ALT + M**.

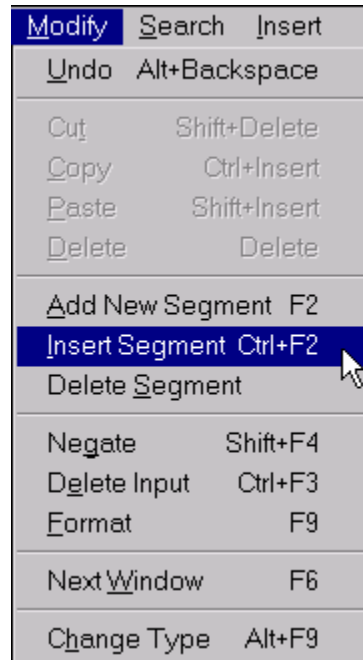


Figure 5-66 The **Modify** menu S7 LAD presentation

The commands **Cut**, **Copy**, **Paste**, and **Delete** are not available in LAD presentation.

The commands **Undo**, **Add New Segment**, **Insert Segment**, **Delete Segment**, and **Next Window** are commands that can also be used with other presentations. For detailed information on these commands from the modify menu see chapter 4.2.3.

The commands **Negate / Invert**, **Delete Input**, **Format** and **Change Type** have special functions in the S7 Ladder Diagram (LAD) presentation and are described below.

5.7.4.1 Negate (Modify Menu)

The **Negate** command, from the modify menu, changes the selected contact from a NO to a NC contact (normally open to a normally closed) or vice versa (normally closed to a normally open).

Note:

Only contacts having an operand assigned, symbolic or absolute, may be changed from a NO to a NC contact (normally open to a normally closed) or vice versa (normally closed to a normally open).

- ◆ Mark the contact (the name of the contact) or position the insertion mark (blue cross) to the left of the contact.
- ◆ Click the **Negate (Change)** icon in the tool bar or the **Negate** command in the modify menu.
- ◆ Press **Shift + F4**.

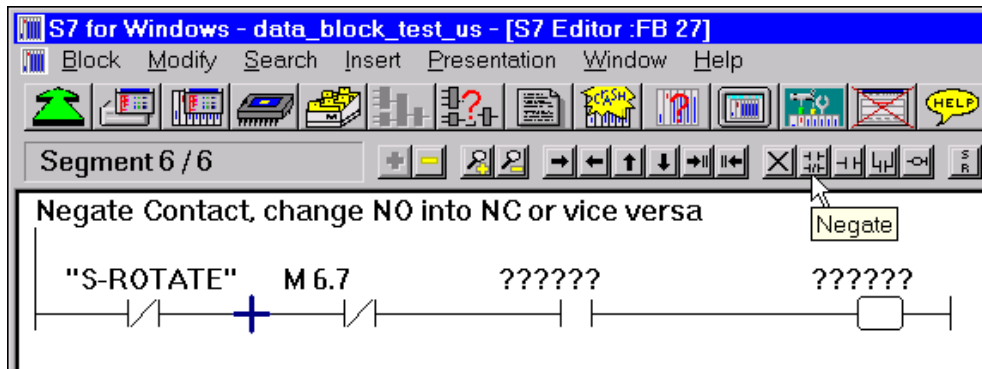
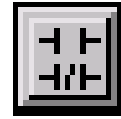


Figure 5-67 Change the NO to a NC contact or vice versa

5.7.4.2 Delete Input (Contact) (Modify Menu)

The **Delete Input (Contact)** command, from the modify menu, deletes the selected contact to the right of the insertion point (blue cross). Only contacts may be deleted.

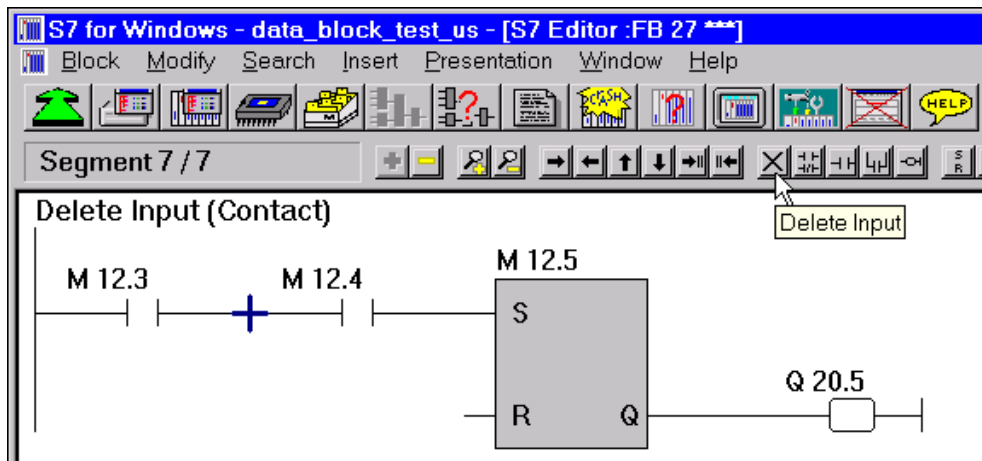


Figure 5-68 Delete contact (example)

- ◆ Click the **Delete** icon in the tool bar or the **Delete Input (Contact)** command in the modify menu.
- ◆ Press **CTRL + F3**.


5.7.4.3 Format (Modify Menu)

The **Format** command, from the modify menu, is used to format and to check the syntax of the variable declaration table. The variables are sorted into their predefined order and the starting addresses are assigned.

The format command is also used to format the PLC logic created in LAD presentation. The segment is redrawn and formatted. A syntax check of the construction of the segment is performed. If *S7 for Windows* detects an error, an error message will be displayed.

◆ Click **Format** in the modify menu.

◆ Press **F9**.



Address	Area	Name	Type	StartingValue	Comment
0.0	IN	Type_Word	WORD	W#16#4711	# In Value 1
2.0	OUT	Type_DWord	DWORD	DW#16#1999	# In Value 2
6.0	IN_OUT	Type_Real	REAL	4711.2	# Calculated Value

Figure 5-69 Formatted variable declaration table

5.7.4.4 Change Type (Modify Menu)

- ◆ The **Change Type** command, from the modify menu, allows you to modify the type of logical functions. This could be a result (Coil), a Flip Flop (RS / SR latch), a timer, a counter, or a comparator. You may have to activate the change type command several times to change, for example, a pulse timer into a latched on-delay timer.

Note:

Only logical functions having an operand assigned, symbolic or absolute, may be changed by using the **Change Type** command.

◆ Click **Change Type** in the modify menu.

◆ Press **ALT + F9**.

Example: The following logical functions may change their type:

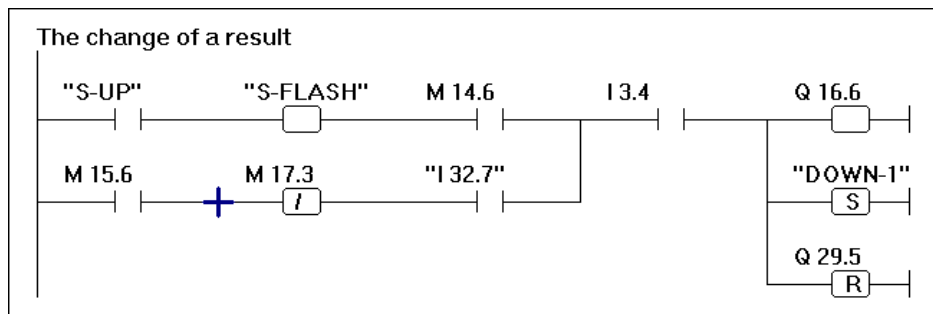


Figure 5-70 Change type of a result (coil) and an intermediate result

The result (coil) may be changed from **Normal** to an **S** (set) or **R** (reset) type. The intermediate result may be changed from **Normal** to **Negated**.

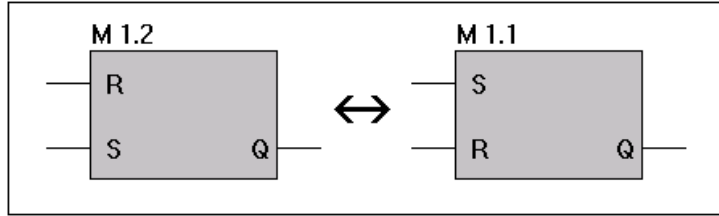


Figure 5-71 Change Type, RS Flip Flop, SR Flip Flop

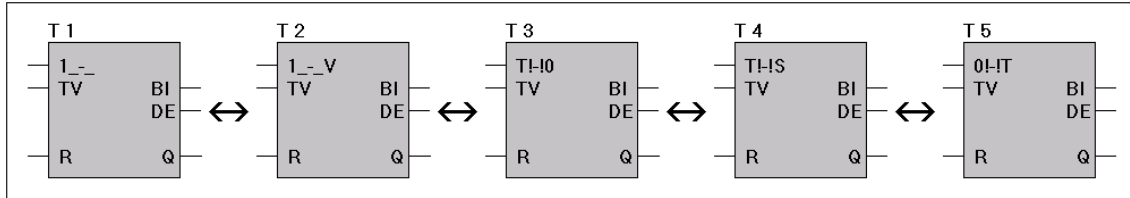


Figure 5-72 Change Type, Pulse Timer, Extended Pulse Timer, ON-Delay Timer, Latching ON-Delay Timer, OFF-Delay Timer

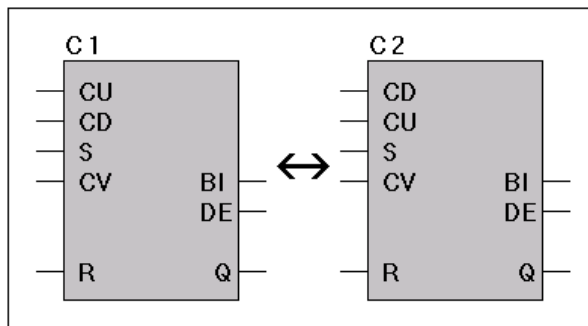


Figure 5-73 Change Type, Upward Counter, Downward Counter

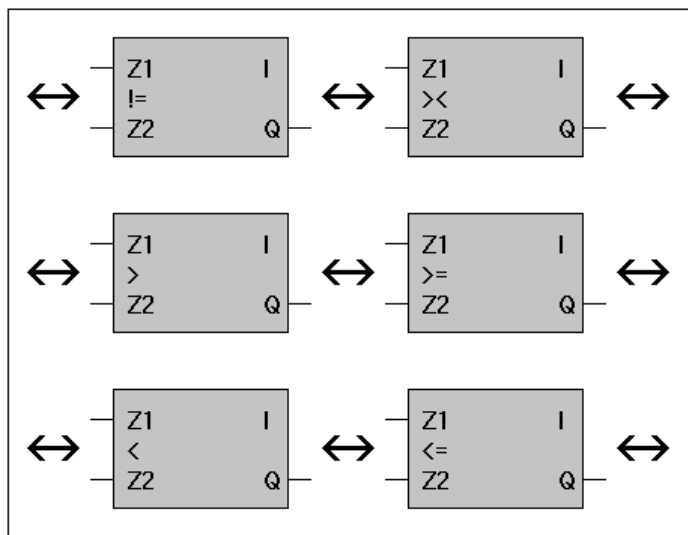


Figure 5-74 Change Type, Equal, Not Equal, Bigger, Bigger or Equal, Less, Less or Equal

5.7.5 Search (Search Menu – S7 LAD Presentation)

The commands, from the **Search** menu, in the LAD presentation, are used to review or change text in the displayed segment and to move to another segment.

In LAD presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, CSF, and /or Block-STL (Source Text) presentation.

The commands Search for, Replace, and Search again are not available in LAD presentation. For detailed information on the commands from the modify menu see chapter 4.2.5.4 – 4.2.5.8.

 ◆ Click **Search** in the menu bar.

 ◆ Press **ALT + S**.

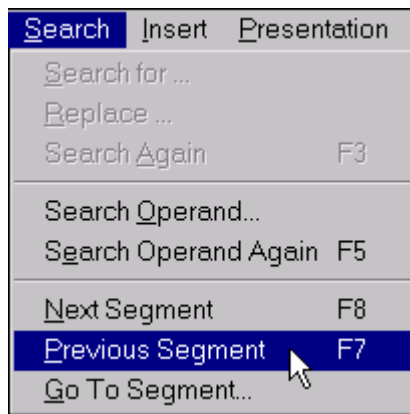


Figure 5-75 Search menu S7 - LAD presentation

5.7.6 Insert (Insert Menu – S7 LAD Presentation)

The commands from the **Insert** menu in the LAD Editor are used to insert logical functions in the workplace to build a segment. The commands are identical with the corresponding icons from the S7 - LAD Editor Toolbar (see chapter 5.7.2).

The commands Timer, Counter, Comparator, and FB Call, open dialog boxes. In LAD presentation the commands displayed in bold black may be used.

The commands displayed in light gray may be used in STL, LAD and /or Block-STL (Source Text) presentation. The commands Input, And, Or, FB / FX - Formal Operands, and S7 Block Call are not available in LAD presentation.

 ◆ Click **Insert** in the menu bar.

 ◆ Press **ALT + I**.

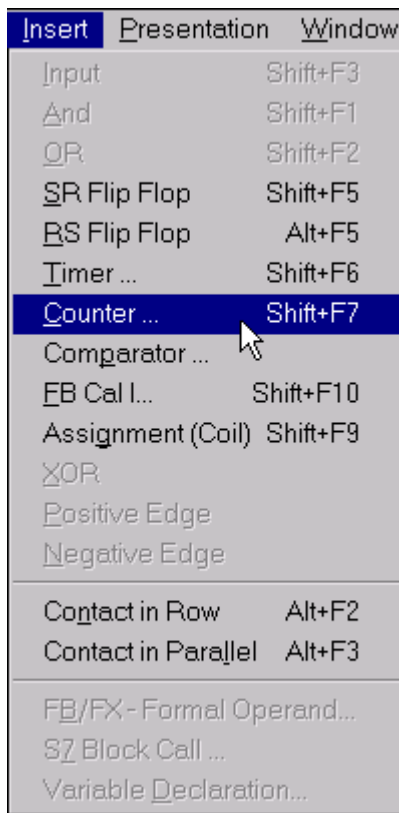


Figure 5-76 Insert menu S7 - LAD presentation

Note:

The command **Variable Declaration** is available as soon as the variable declaration table is displayed in the S7 Block Editor (LAD presentation) work place.

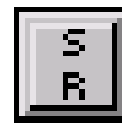
The command **FB Call...** opens a dialog box to select all types of blocks to call.

5.7.6.1 SR Flip Flop (Insert a SR Flip Flop (Latch) Function Symbol)

The command **SR Flip Flop** inserts a SR Flip Flop with a dominating reset input.

To add a SR Flip Flop function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.7.1

- ◆ Click the **SR Flip Flop** icon in the tool bar or the **SR Flip Flop** command in the insert menu.



- ◆ Press  + **F5**.

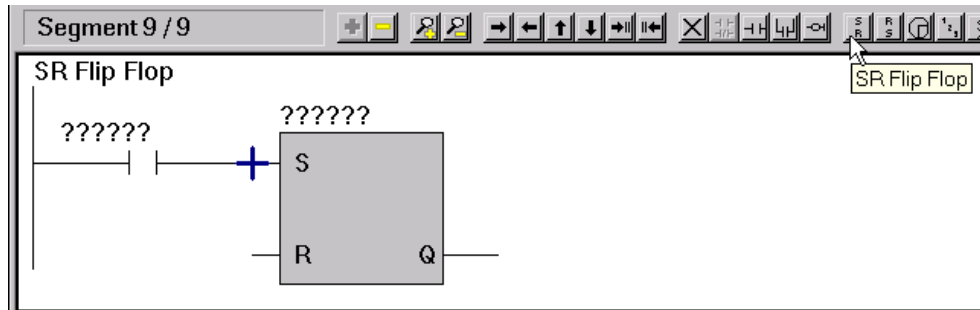


Figure 5-77 Insert SR Flip Flop (Latch)

5.7.6.2 RS Flip Flop (Insert a RS Flip Flop (Latch) Function Symbol)

The command **RS Flip Flop** inserts a RS Flip Flop with a dominating set input.

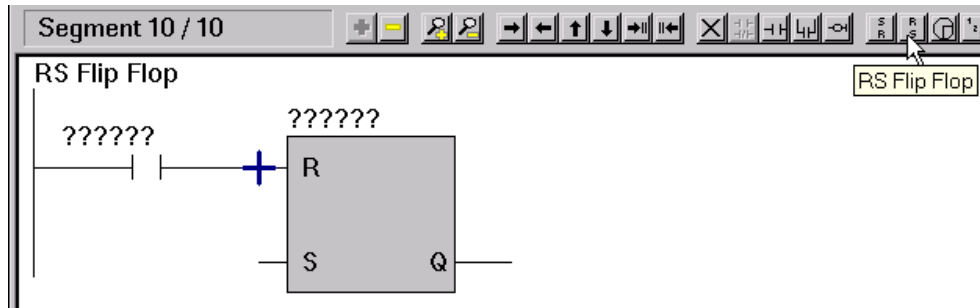
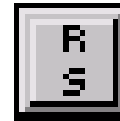


Figure 5-78 Insert RS Flip Flop (Latch)

To add a RS Flip Flop function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.7.1.

◆ Click the **RS Flip Flop** icon in the tool bar or the **RS Flip Flop** command in the insert menu.

◆ Press **ALT + F5**.



5.7.6.3 Timer (Insert a Timer Function Symbol)

The command **Timer** opens a dialog box to select the timer function. Five different timers are available.

To add a timer function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.7.1.

- ◆ Click the **Timer** icon in the tool bar or the **Timer** command in the insert menu.
- ◆ Press **Shift + F6**.

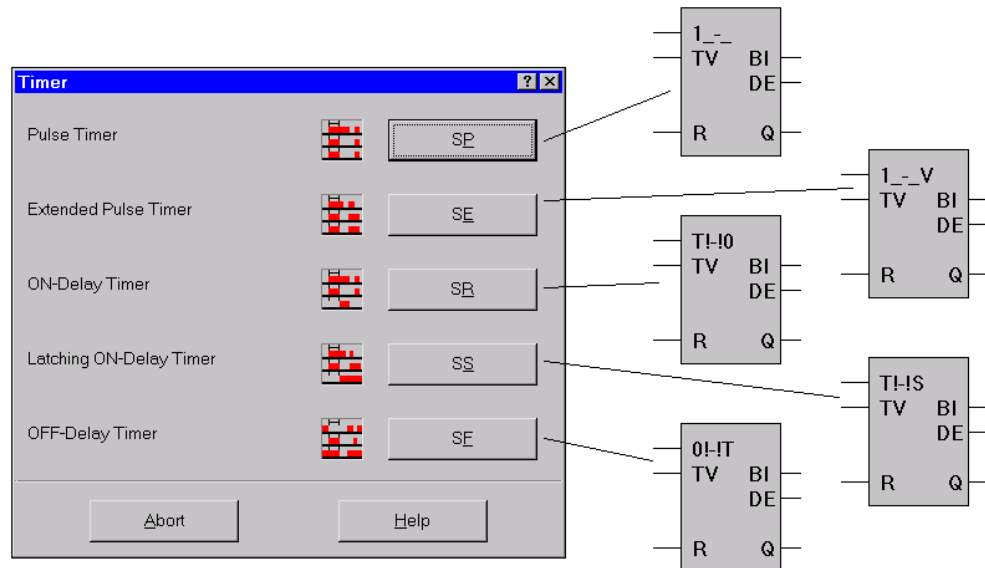
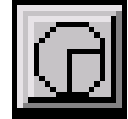


Figure 5-79 Timer selection dialog box


- The **Pulse** timer outputs a maximum length pulse.
- The **Extended Pulse** timer outputs a minimum length pulse.
- The **On-Delay** timer outputs a pulse after the time has elapsed (the start pulse must still be present).
- The **Latched On-Delay** timer outputs a pulse after the time has elapsed.
- The **Off-Delay** timer outputs a pulse with a fixed length after the starting pulse goes to zero.

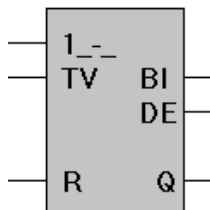
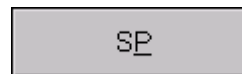
Timer signals overview

SP, SE, SR, SS, SF	Start timer															
TV	<p>The Time Value is entered as a time constant S5TIME (S5T). The S5T value occupies a 16 bit word divided into 1 + 3 decades. The single decade represents the multiplication factor and the three (3) remaining decades represent the time value in BCD (000 up to 999). The multiplication factor can have values of: 0 = 10ms, 1 = 100ms, 2 = 1s und 3 = 10s.</p> <p>The S5TIME (S5T) is always entered in the following presentation: S5T#0MS (minimum) up to S5T#2H_46M_30S (maximum).</p> <p>The following S5TIME (S5T) values are available:</p> <table border="1"> <thead> <tr> <th>Value Range</th> <th>Accuracy</th> <th>Example</th> </tr> </thead> <tbody> <tr> <td>10ms up to 9s 990ms</td> <td>10ms</td> <td>S5T#9S_990MS</td> </tr> <tr> <td>100ms up to 1m 39s 900ms</td> <td>100ms</td> <td>S5T#1M_39S_900MS</td> </tr> <tr> <td>1s up to 16m 39s</td> <td>1s</td> <td>S5T#16M_39S</td> </tr> <tr> <td>10s up to 2h 46m 30s</td> <td>10s</td> <td>S5T#2H_46M_30S</td> </tr> </tbody> </table>	Value Range	Accuracy	Example	10ms up to 9s 990ms	10ms	S5T#9S_990MS	100ms up to 1m 39s 900ms	100ms	S5T#1M_39S_900MS	1s up to 16m 39s	1s	S5T#16M_39S	10s up to 2h 46m 30s	10s	S5T#2H_46M_30S
Value Range	Accuracy	Example														
10ms up to 9s 990ms	10ms	S5T#9S_990MS														
100ms up to 1m 39s 900ms	100ms	S5T#1M_39S_900MS														
1s up to 16m 39s	1s	S5T#16M_39S														
10s up to 2h 46m 30s	10s	S5T#2H_46M_30S														
R	Reset															
BI	Current counter value (Binary)															
DE	Current counter value (BCD)															
Q	Output															

Table 5-18 Time Value S5TIME (S5T)

- **Insert a Pulse Timer**

 ◆ Click the **SP** button.




 ◆ Press **P**.

Figure 5-80 Pulse timer function symbol

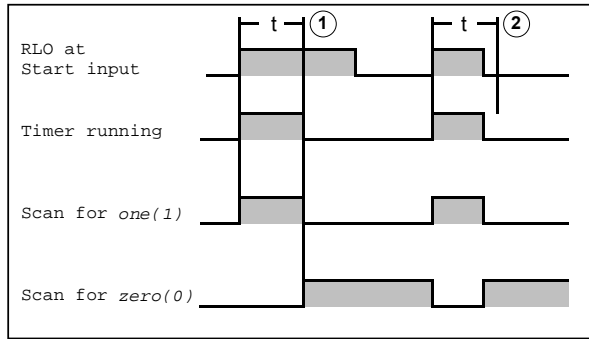


Figure 5-81 Pulse Timer characteristics

● **Insert an Extended Pulse Timer.**

◆ Click the **SE** button.



◆ Press **E**.

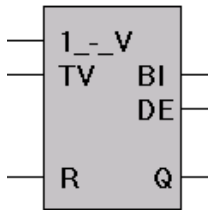


Figure 5-82 Extended Pulse timer function symbol

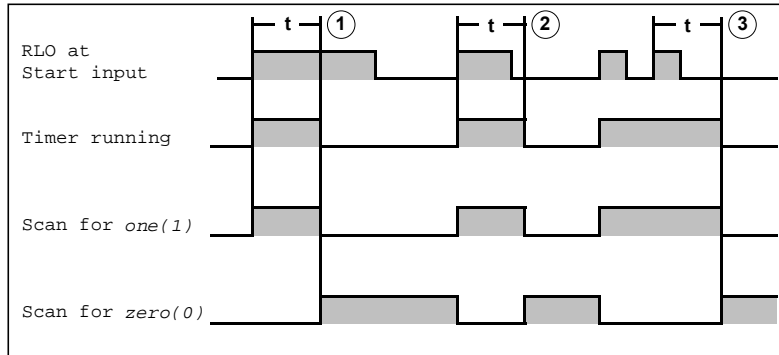
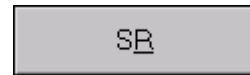


Figure 5-83 Extended Pulse Timer characteristics

● **Insert an On-Delay Timer**

◆ Click the **SR** button.



◆ Press **R**.

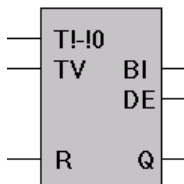


Figure 5-84 On-Delay timer function symbol

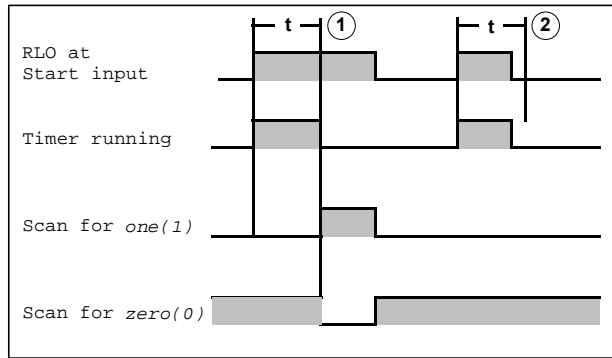
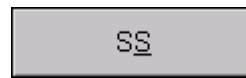


Figure 5-85 On-Delay Timer characteristics

● Insert a Latching On-Delay Timer

◆ Click the **SS** button.



◆ Press **S**.

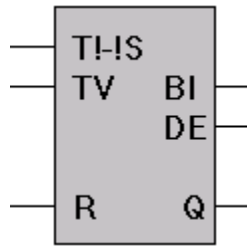


Figure 5-86 Latching On-Delay timer function symbol

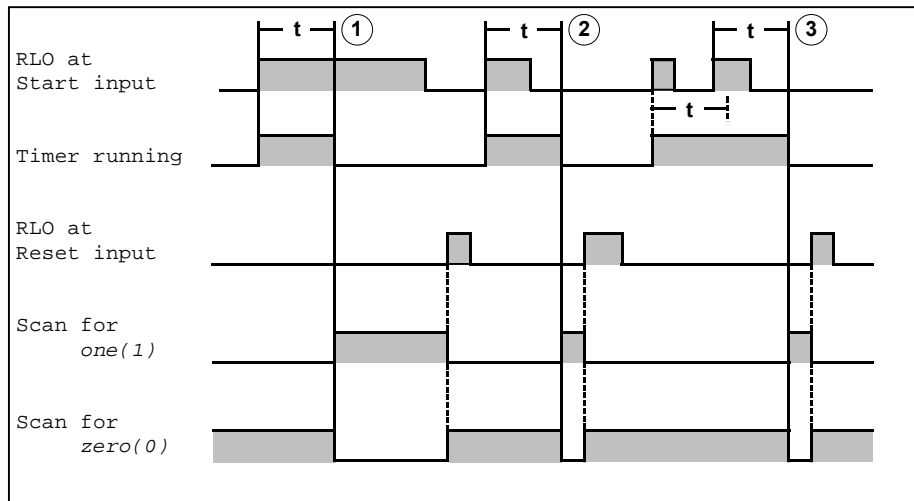


Figure 5-87 Latching On-Delay Timer characteristics

- **Insert an Off-Delay Timer**

- ◆ Click the **SF** button.



- ◆ Press **F**.

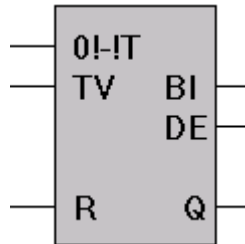


Figure 5-88 Off-Delay timer function symbol

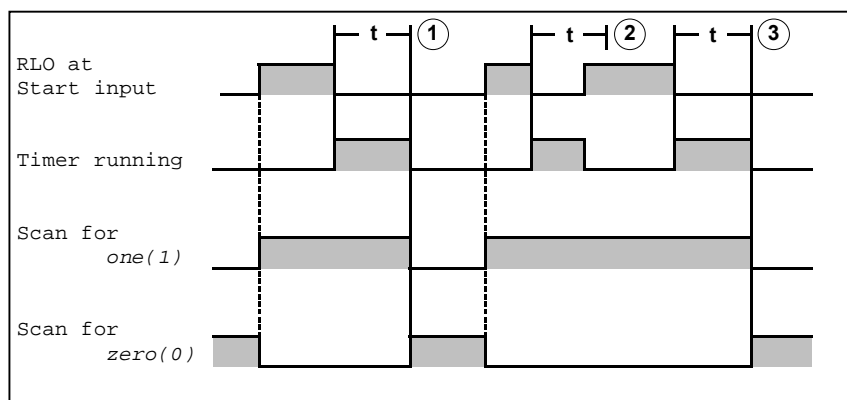


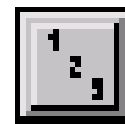
Figure 5-89 Off-Delay Timer characteristics

5.7.6.4 Counter (Insert a Counter Function Symbol)

The command Counter opens a dialog box where you can select the counter function. Two different counters are available, an up counter and a down counter.

Basically the both counters are the same. As a result of the arrangement of the function symbol the first input must be used. For the up counter this is the input that increments the counts. For the down counter this is the input that decrements the counts. Both counters provide a second input (this input doesn't have to be used) for the opposite count direction.

- ◆ Click the **Counter** icon in the tool bar or the **Counter** command in the insert menu.



- ◆ Press **Shift + F7**.

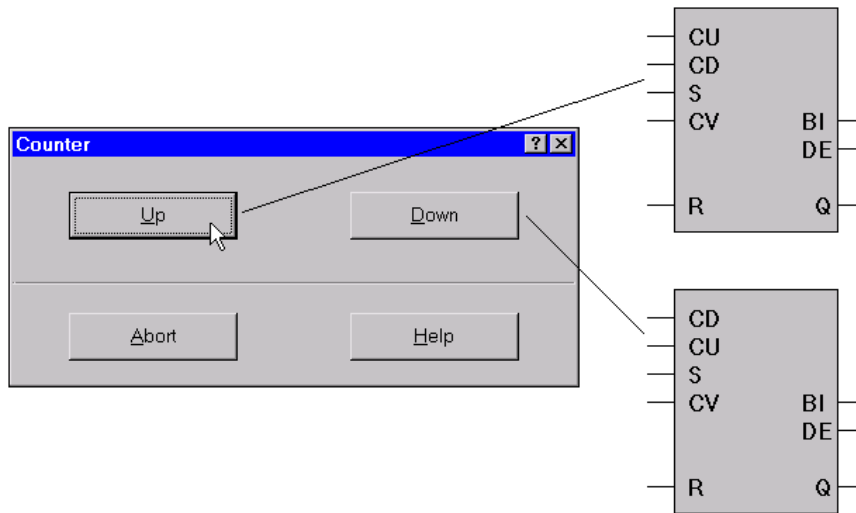


Figure 5-90 Counter dialog box

Counters signals overview	
CU	Count up (increment)
CD	Count down (decrement)
S	Set
CV	Load counter (value in BCD)
R	Reset
BI	Current counter value (Binary)
DE	Current counter value (BCD)
Q	Output

Table 5-19 Counter inputs and outputs

● **Insert an Up Counter**

◆ Click the **Up** button.

◆ Press **U**.

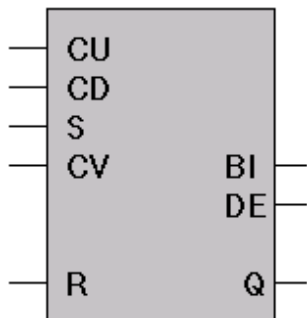
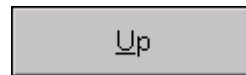


Figure 5-91 Up Counter function symbol

● Insert a Down Counter

◆ Click the **Down** button.

◆ Press **D**.

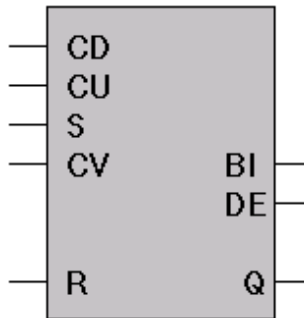
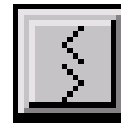


Figure 5-92 Down Counter function symbol

5.7.6.5 Comparator (Insert a Comparator Function Symbol)

The command **Comparator** opens a dialog box to select the compare functions. Six (6) different comparators are available.

◆ Click the **Comparator** icon in the tool bar or the **Comparator** command in the insert menu.



◆ Press **ALT + I, P**.

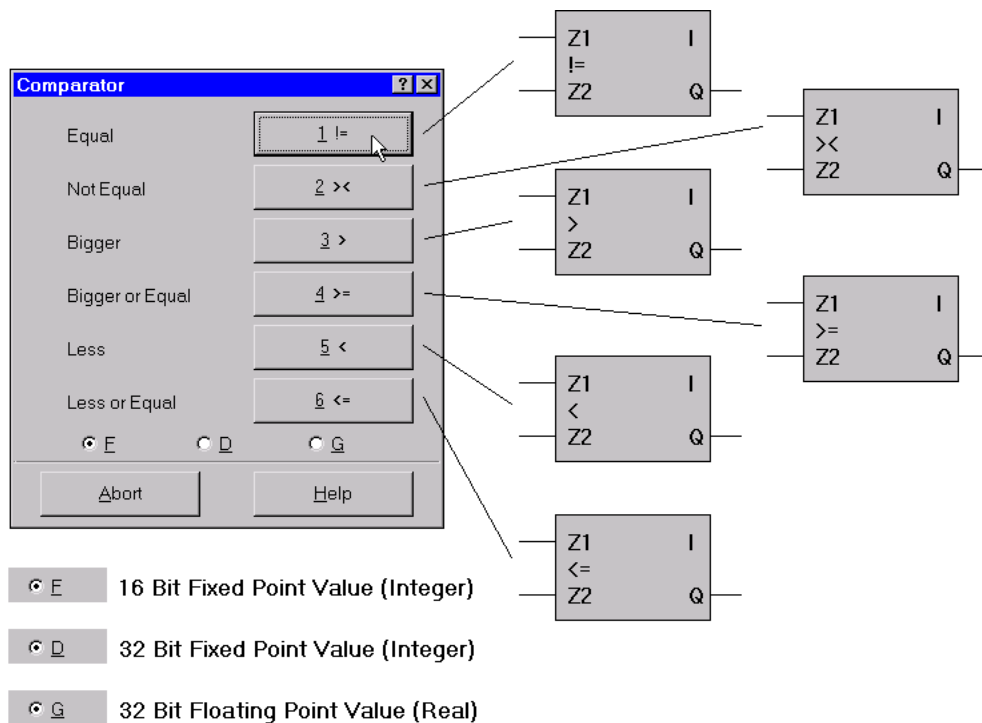


Figure 5-93 Comparator dialog box

Symbol	Function	Fixed point (Integer) F	Fixed point (Integer) D	Floating point (Real) G
! =	Compare for equal	16 Bit	32 Bit	32 Bit
> <	Compare for not equal	16 Bit	32 Bit	32 Bit
>	Compare for greater than	16 Bit	32 Bit	32 Bit
> =	Compare for greater than or equal	16 Bit	32 Bit	32 Bit
<	Compare for less than	16 Bit	32 Bit	32 Bit
< =	Compare for less than or equal	16 Bit	32 Bit	32 Bit

Table 5-20 Compare functions

Comparator signals overview	
Z 1	Input 1
Z 2	Input 2
Q	Output (one for equal, zero for not equal)
F, D, G	The letter (F, D, G) in the right upper corner of the comparator function symbol indicates the value representation of the inputs (16 bit integer, 32 bit integer or 32 bit real).

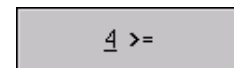
Table 5-21 Comparator Inputs and Outputs

● Insert a Comparator

- ◆ Click the appropriate button to select the value representation of the inputs (**F** - 16 bit integer, **D** - 32 bit integer or **G** - 32 bit floating point).



- ◆ Click the appropriate button to select the desired comparator (**1**, **2**, **3**, **4**, **5**, or **6**)



- ◆ Press **F**, **D**, or **G**.

- ◆ Press **1**, **2**, **3**, **4**, **5**, or **6**

A Comparator function symbol is inserted.

5.7.6.6 FB Call (Insert a Block Call Symbol)

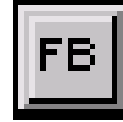
The command **FB Call** opens a dialog box displaying a list of all the blocks that are available to be called. These are not only the blocks displayed in the PC block list but also all **System Functions (SFC)** and the **System Function Blocks (SFB)**.

The CALL function symbol is used for an absolute block call. With a CALL function symbol, Functions (FC), Function Blocks (FB), System Functions (SFC), and System Function Blocks (SFB) can be opened for execution. The call is independent from any condition and is always executed. Organization blocks (OB) cannot be opened with the CALL instruction. Organization Blocks (OB) are only called for execution by the PLC

operating system. The CALL function symbol may also be used to open the Instance Data Block assigned to a Function Block.

The Call function symbol can only be placed in a separate network.

- ◆ Click the **FB Call** icon in the tool bar or the **FB Call** command in the insert menu.



- ◆ Press **SHIFT + F10**.

Note:

When using the Block Call function, *S7 for Windows* switches into Control System Flowchart Presentation for that single network. Therefore, the column width for the operands is changed with the CSF setting (see Chapter 3.2.11.2).

The Block Call function is identical in LAD and CSF presentation.

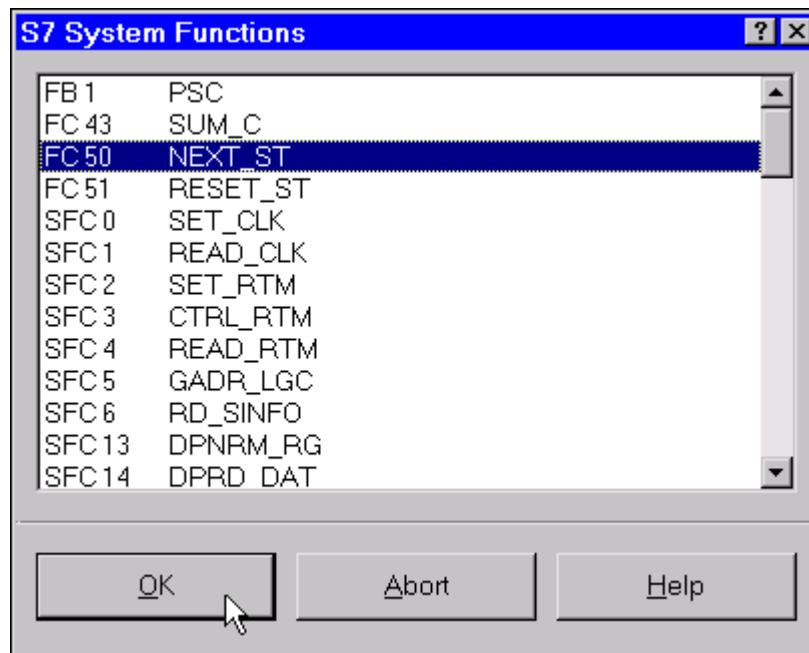


Figure 5-94 The command **FB Call** opens a **S7 System Functions** dialog box

- ◆ Mark the block (blue background) that you want to call with the **CALL** function symbol and confirm with the **OK** button.

If a Function Block (FB) is selected an additional dialog box is opened to select its Instance Data Block (DB).

When calling a Function Block (FB) an Instance Data Block must be assigned. Mark the Data Block you want to assign to the Function Block (FB) as its Instance Data Block and confirm with the **OK** button.

An example of the Select Instance Data Block (DB) is shown in figure 5-95. The figure 5-96 shows the function symbol of an FB Call.

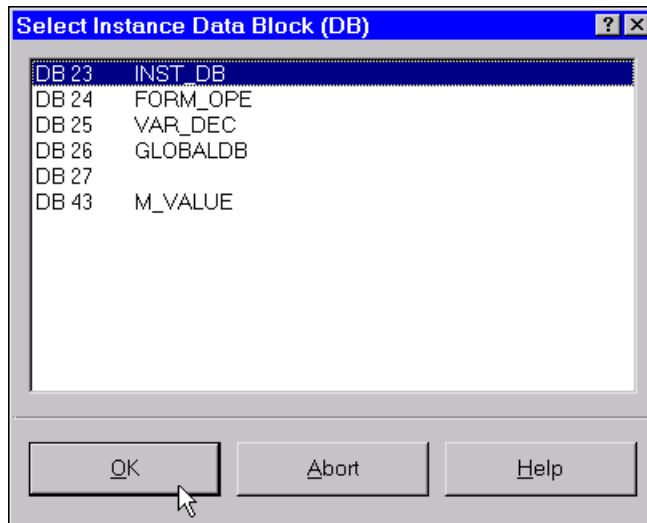


Figure 5-95 Select Instance Data Block (DB) dialog box

The CALL function symbol is inserted.

If a block, with assigned block parameters is called (e.g. Function (FC), etc.), the name of the block and the assigned parameter are displayed in the CALL function symbol. Input parameter are shown at the left side, output parameter are shown on the right side.

The names of the parameters (operands) may not be displayed in their full length. Truncated names are indicated with a colon after the truncated name.

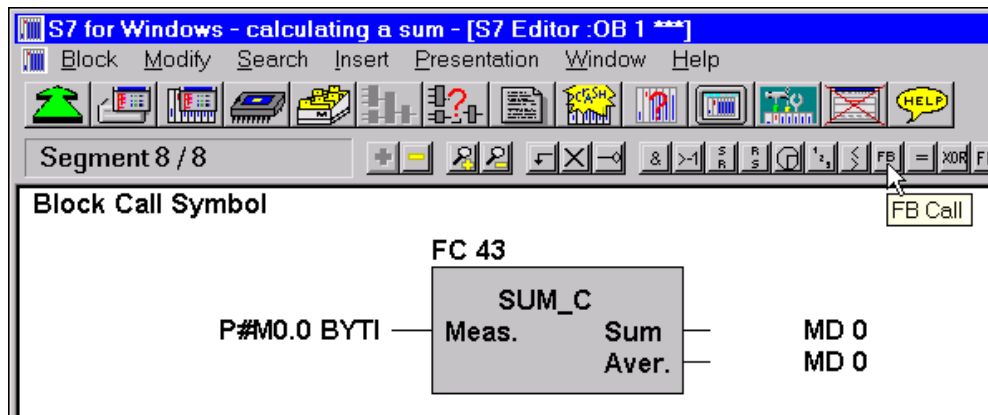


Figure 5-96 CALL function symbol

By editing the **Place Holders** (M 0.0, MD 0) you can enter the actual variables handling the assignment of the block parameters.

Figure 5-97 shows an example of the edited block CALL with the actual variables assigned to the block parameters. The parameters may be displayed or edited in there symbolic or absolute form.

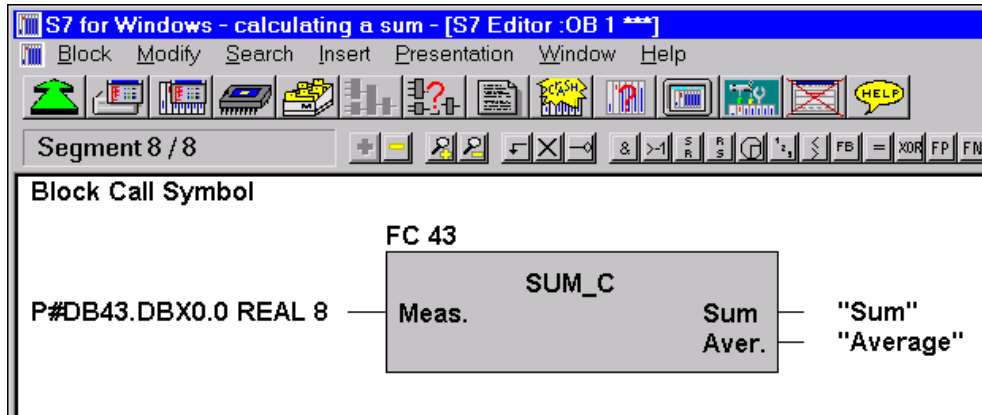


Figure 5-97 CALL function symbol with the assignment of the actual variables

CALL Function Symbol			
Name	Parameter	Parameter	Explanation
FC 43			Call function FC 43
Meas.	Measured_Value	P#DB43.DBX0,0 REAL 8	Measured_Value (formal parameter supplied with DB43.DBX0,0 REAL 8 (actual parameter) – Data Word 0 of Data Block 43, Data type REAL, 8 Byte
Sum	Sum	"Sum"	Sum (formal parameter supplied with "Sum" (actual parameter)
Aver.	Average_Value	"Average"	Average_Value (formal parameter supplied with "Average" (actual parameter)

Table 5-22 Function CALL with the assignment of the actual variables

● Calling a Function Block with its assigned Instance Data Block

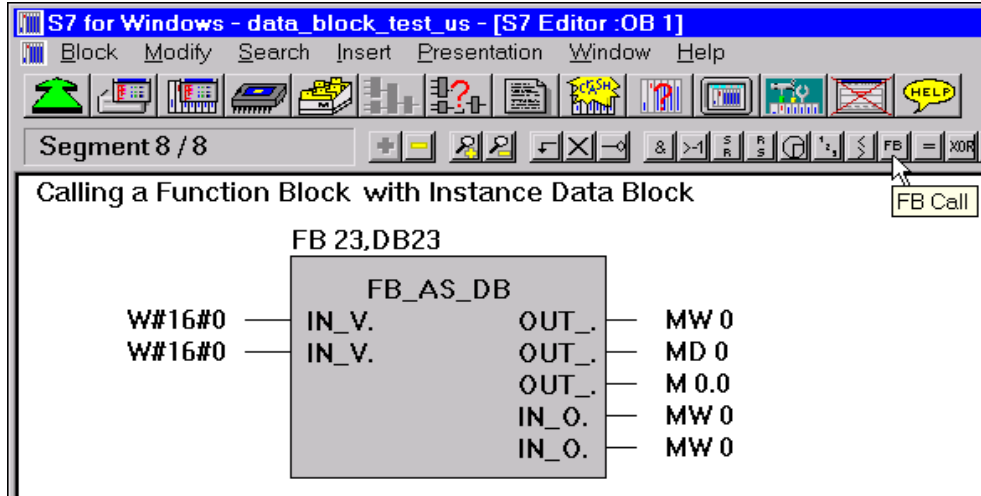


Figure 5-98 CALL of the Function Block (FB23) with instance Data Block (DB23)

By editing the **Place Holders** (W#16#0, MW0, MD0, M0.0) you can enter the actual variables handling the assignment of the block parameters.

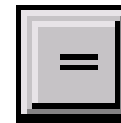
The actual parameters (W#16#0, MW0, MD0, M0.0) are supplying the data for the formal parameter (IN_V., OUT_., and IN_O.).

5.7.6.7 Assignment (Coil) (Insert an Assignment)

The command **Assignment (Coil)** inserts an assignment function symbol (result, intermediate result).

To add an assignment function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 5.1.1. To change the assignment, mark the assignment name (e.g. Q 1.1 etc.).

◆ Click the **Assignment** icon in the tool bar or the **Assignment (Coil)** command in the insert menu.



◆ Press **Shift + F9**.

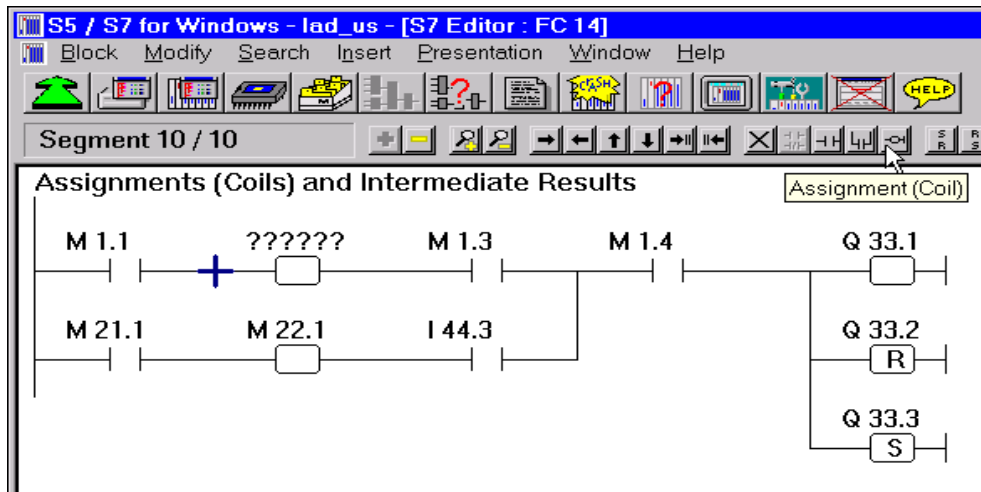


Figure 5-99 Assignment function symbols as results and intermediate results

Assignment function symbol as a result

The assignment, as a result, may have a **Normal**, a **Set (S)**, or a **Reset (R)** function. Changing the result function is done with the **Change Type (ALT + F9)** command from the modify menu (see chapter 5.7.3.4).

Assignment as an intermediate result

The assignment, as an intermediate result, may be **Normal** or **Negated (/)**. Changing the intermediate result function is done with the **Change Type (ALT+F9)** command from the modify menu (see chapter 5.7.3.4).

5.7.7 Presentation (Presentation Menu - S7 LAD Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. Not all commands are available in LAD presentation. For details on the commands from the presentation menu see chapter 4.2.7

◆ Click **Presentation** in the menu bar.

◆ Press **ALT + P**.

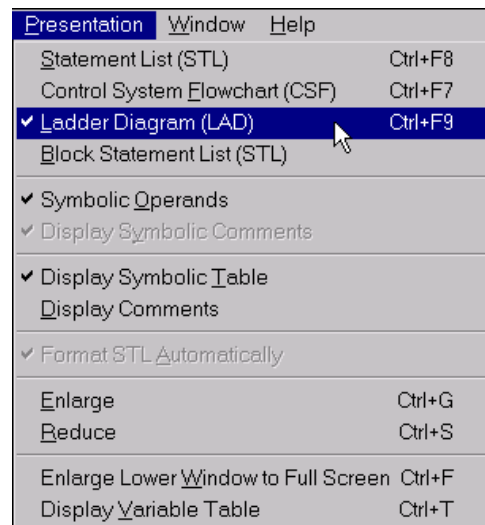


Figure 5-100 Presentation menu S7 LAD presentation

5.7.8 Window (Window Menu - Editor Window)

The **Window** menu from the editor window is identical with the window menu from the PC block list window. For more details see chapter 3.6.

5.7.9 Help (Help Menu - Editor Window)

The **Help** menu from the editor window is identical with the help menu from the PC block list window. For more details see chapter 3.7.

6 S5 Block Editor

In this chapter the methodology on how to create or modify a block, using the Step® 5 syntax, is described.

6.1 Editing an S5 Statement List (STL)

The **S5 Statement List Editor** is basically a text editor with some special functions. You can type without regard to the case, **TAB**, or **SPACE**. Typing in lower or upper case will have no effect on the results except when dealing with symbolic names. The symbolic names must be typed in the same way as is defined in the symbolic table. A symbolic operand is defined with a dash (-) in front of the name.

The command **Format** (key F9) performs a syntax check, converts the operation code, and changes the absolute operand into capital letters. The symbolic operand will remain the same. Each line of STL code is inserted into the appropriate column.

PLC logic programmed in STL presentation may be converted to CSF or LAD presentation if the program follows a defined syntax. Complex logic may be converted to CSF but not to LAD presentation. Certain parts of a PLC program may only be programmed in STL presentation.

6.2 S5 Statement List Instructions

A statement is the smallest independent command of a PLC Program. A Statement consists of an **Operation Code** (O for OR operation) and an **Operand** (F 1.2). An operand is constructed of an identifier (e.g. F for flag) and a parameter (e.g. 1.2 for Byte 1 Bit 2).

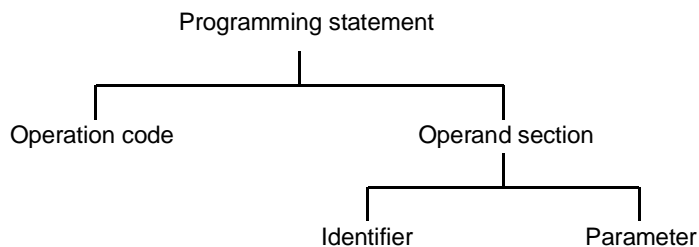


Figure 6-1 S5 STL Statement structure

- **Operation Code**

S5 for Windows supports all operation code used by the Siemens Simatic® 5 line. Certain CPUs are limited in the use of the operation code. Please refer to the manual that came with your PLC. In statement list you can enter the operation code in capital or small letters. The **Format** command converts the operation code to capital letters and inserts the desired spaces.

- **Operand Section**

Symbolic Operand

The symbolic operand must be entered in the same form as is defined in the symbolic table. A dash (-) must be entered in front of the name to identify the symbolic operand. The **Format** command does not alter the writing (lower / upper case) of the symbolic operand, it only inserts the desired spaces.

Absolute Operand

Identifier

S5 for Windows supports all identifiers used by the Siemens Simatic® 5 line. Certain CPUs are limited in the use of identifiers. Please refer to the manual that came with your PLC. The **Format** command converts the operation code to capital letters and inserts the desired spaces.

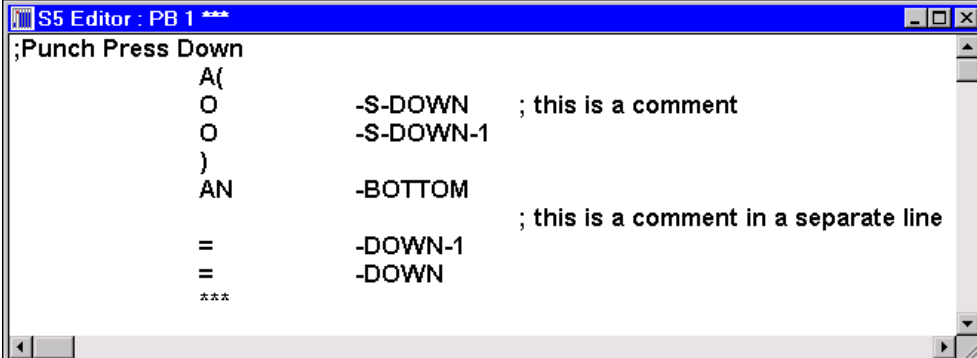
Parameter

The parameter specifies the address of an operand. These are numbers and are not affected by the **Format** command, **Format** only inserts the required spaces.

6.2.1 Block Structure

Comment

A comment may be entered as a separate line or after a PLC statement. A preceding semicolon must separate the comment. The **Format** command puts the comment at the end of a line.



```

S5 Editor : PB 1 ***
;Punch Press Down
  A(
  O      -S-DOWN   ; this is a comment
  O      -S-DOWN-1
  )
  AN     -BOTTOM   ; this is a comment in a separate line
  =      -DOWN-1
  =      -DOWN
  ***
  
```

Figure 6-2 Example of comments

Absolute Addresses

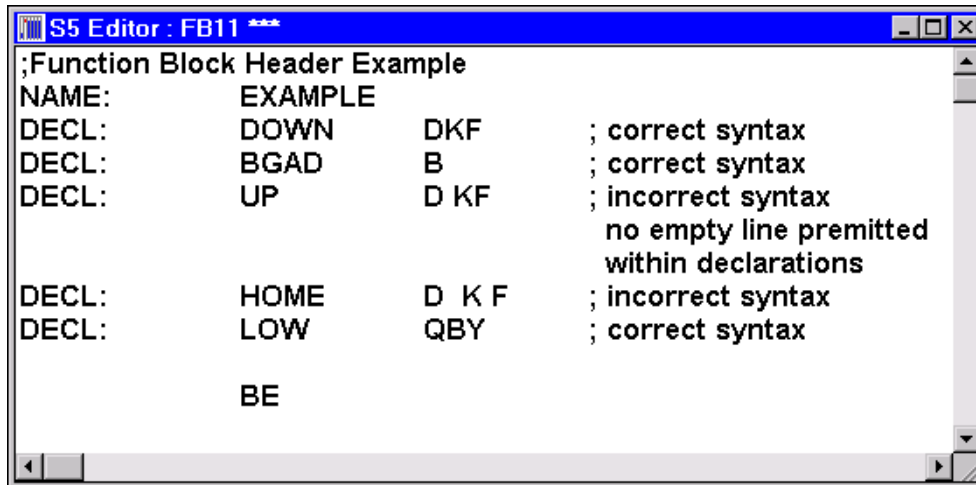
S5 for Windows accepts the following syntax when entering an absolute address.

?(hex address) Example: ?3AF8

Formal Operands (Declarations)

S5 for Windows uses a special syntax for entering declarations in a function block (formal operands). The data type must be entered without any blank spaces between. Empty lines within the declaration field are not permitted. The formal operand name may have up to four (4) characters.

S5 for Windows offers a dialog box to generate function block headers and to insert the formal operands (see chapter 6.2.7.1).



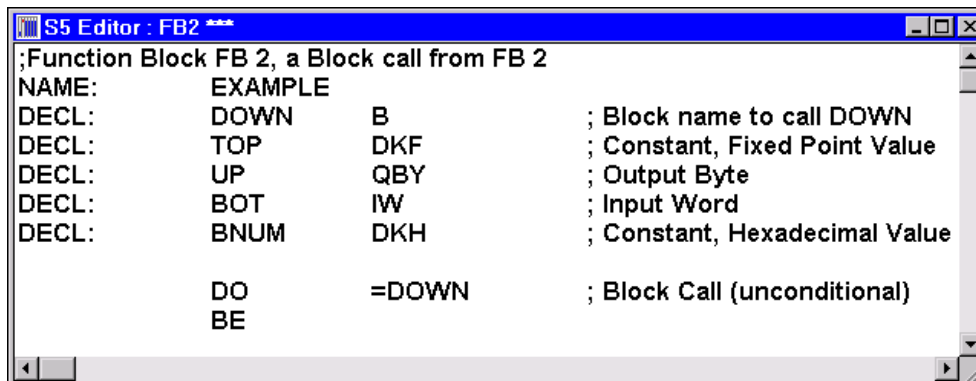
```

S5 Editor : FB11 ***
;Function Block Header Example
NAME:      EXAMPLE
DECL:      DOWN      DKF      ; correct syntax
DECL:      BGAD      B        ; correct syntax
DECL:      UP        D KF     ; incorrect syntax
                                no empty line premitted
                                within declarations
DECL:      HOME      D K F    ; incorrect syntax
DECL:      LOW      QBY      ; correct syntax

          BE
  
```

Figure 6-3 Example formal operands

Block call with Parameters



```

S5 Editor : FB2 ***
;Function Block FB 2, a Block call from FB 2
NAME:      EXAMPLE
DECL:      DOWN      B        ; Block name to call DOWN
DECL:      TOP      DKF      ; Constant, Fixed Point Value
DECL:      UP      QBY      ; Output Byte
DECL:      BOT      IW      ; Input Word
DECL:      BNUM     DKH      ; Constant, Hexadecimal Value

          DO      =DOWN     ; Block Call (unconditional)
          BE
  
```

Figure 6-4 Example - Block call with Parameters

To call a block (e.g. data block DB xx) from a function block (e.g. FB 2) as a parameter, the following procedure may be used.

- **Generating the Function Block.**

The figure 6-4 shows an example of a function block. The declaration was edited by using the dialog box, Insert Formal Operands (see chapter 6.2.7.1).

- **Generating the Organization Block.**

As shown in the figure below, the line with the jump instruction (JU FB2) must be entered manually. The following line, **Name:** and the lines, **DOWN:**, **TOP:**, **UP:**, **BOT:**, and **NUM:** are automatically inserted. They are the declarations from FB2.

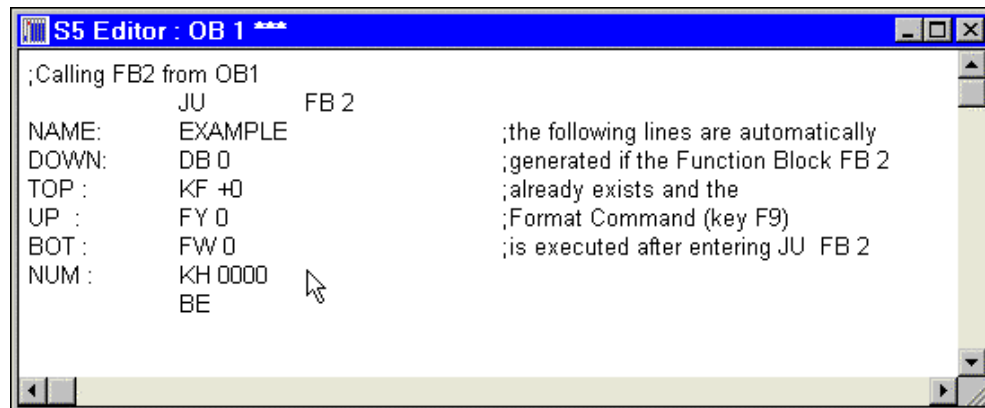


Figure 6-5 Organization Block example

The lines inserted automatically into your PLC program may have to be edited.

6.2.1.1 Data Block (DB, DX) call

Data blocks may only be called from segments in STL presentation.

- ◆ Create a new segment by activating the commands **Add New Segment** or **Insert Segment** (key **F2** or **CTRL+F2**) from the modify menu. You may also create a separate block.

Enter the text as shown in the figure 6-6 below.

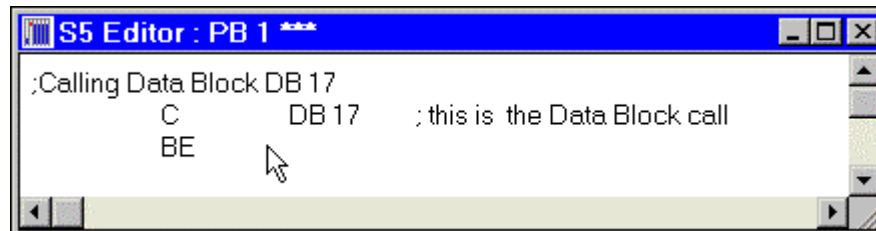


Figure 6-6 Data Block (DB, DX) call

- ◆ Format the segment (key **F9**) and save the block.

A data block call can also be done in **Block-STL** presentation.

6.2.1.2 Creating a Data Block (DB, DX)

To create a data block, perform the following steps.

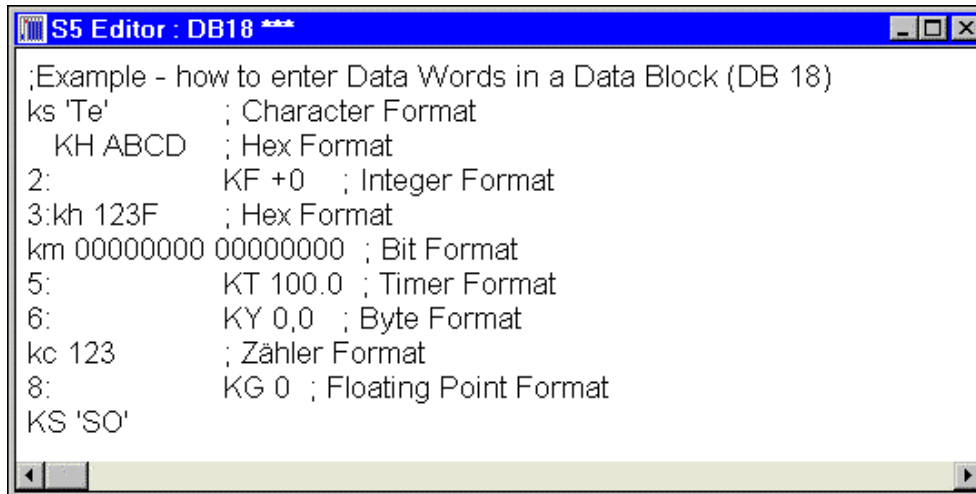
- ◆ Open a data block by activating the **New Block** command from the block menu (PC or PLC block list window).

When you open a new data block, STL presentation is automatically selected from the presentation menu (editor window).

A data block is not divided into segments. The icons to select the previous or next segment are not active and no block end mark (**BE**) is shown.

- ◆ You may enter a comment in the segment comment field (see chapter 6.2.1).

Enter the text as shown in the figure 6-7 below.



```

S5 Editor : DB18 ***
;Example - how to enter Data Words in a Data Block (DB 18)
ks 'Te'      ; Character Format
  KH ABCD    ; Hex Format
2:           KF +0   ; Integer Format
3:kh 123F    ; Hex Format
km 00000000 00000000 ; Bit Format
5:           KT 100.0 ; Timer Format
6:           KY 0,0   ; Byte Format
kc 123       ; Zähler Format
8:           KG 0     ; Floating Point Format
KS 'SO'

```

Figure 6-7 Data Block (DB, DX) prior formatting

To enter the data words you must follow a defined syntax.

Spaces within data type declaration (**K H** is not permitted) or within numbers (**123 456**) are not permitted.

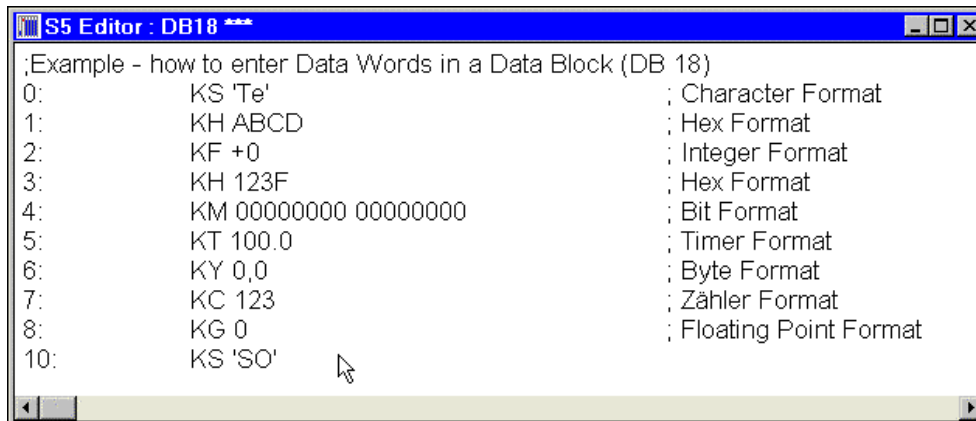
A comment after a data word that is separated by a semicolon (;) is permitted.

A separate line comment is not permitted.

The data words are automatically (using the format command) numbered starting with data word zero (0). If you enter numbers (e.g. **5:**) they are ignored.

- ◆ Format the data block (key F9) and save the block.

The formatted data will have the following form.



```

S5 Editor : DB18 ***
;Example - how to enter Data Words in a Data Block (DB 18)
0:      KS 'Te'      ; Character Format
1:      KH ABCD      ; Hex Format
2:      KF +0        ; Integer Format
3:      KH 123F      ; Hex Format
4:      KM 00000000 00000000 ; Bit Format
5:      KT 100.0     ; Timer Format
6:      KY 0,0       ; Byte Format
7:      KC 123       ; Zähler Format
8:      KG 0         ; Floating Point Format
10:     KS 'SO'

```

Figure 6-8 Data Block (DB, DX) formatted

6.2.1.3 Changing the Data Word Format

A dialog box is provided to modify the format of a data word.

- ◆ Mark a data word.

```

6:      KF +0                ; Integer-Format
7:      KH 0000             ; Hex-Format
8:      KM 00000000 00000000 ; Bit-Format
9:      KT 100.0            ; Timer-Format
10:     KY 0,0              ; Byte-Format

```

Figure 6-9 Data word format

- ◆ Click **Change Type** in the modify menu.

- ◆ Press **ALT + F9**.

Select the new data word format by activating the desired button and confirm the selection (**OK** button).

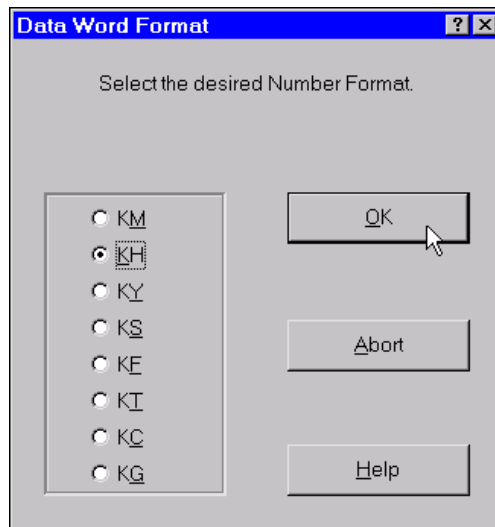


Figure 6-10 Data Word Format dialog box

The data word value is converted into its new form.

Possible Data Word Formats (constants).

Format	Limits		Explanation
	lower	upper	
KM	00000000.00000000	11111111.11111111	arbitrary bit pattern (16 bit)
KH	0000	FFFF	hexadecimal code
KY	000.000	255.255	two (2) byte (address)
KS	two ASCII characters, max. 24 chr. per line		text format
KF	- 32768	+ 32767	integer (fixed point number)
KT	000.0	999.3	time value with multiplier
KC	0	999	count
KG	- 1469368 - 38	+ 17014112 + 39	floating point value

Table 6-1 Data Word Formats

6.2.1.4 Creating a Data Block (DB, DX) automatically

The generate data block statement may also be used to create a data block. To do so you must write a segment as shown in the following picture.

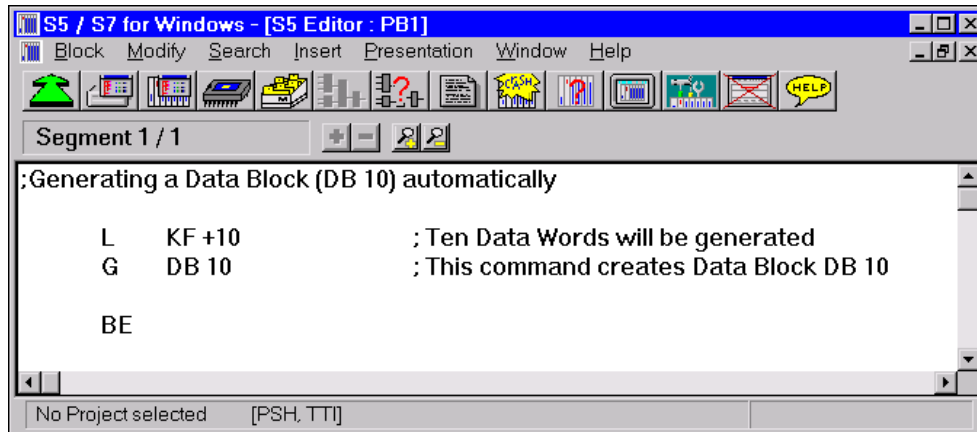


Figure 6-11 Automatic Data Block generation

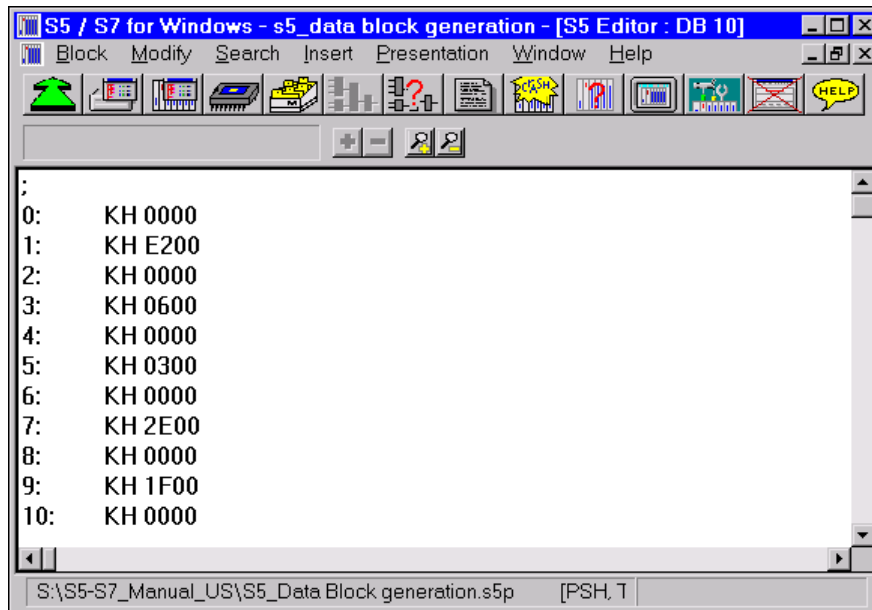


Figure 6-12 Automatically generated Data Block

The data block is generated in the internal data block area of the PLC CPU. Prior to the generate instruction (**G DBnn** or **G DXnn**) the number of data words must be defined (**L KF +xx**). The maximum number of data words that can be generated depends on the CPU type.

After executing the PLC program the data block is created (see figure 6-12). You may edit the value or change the data type format (see chapter 6.2.1.3)

6.2.2 Tool Bar II – Statement List (STL) Editor



Select the tools with a mouse or with the function keys (see S5 / S7 for Windows function - key template). The tool bar II displays the number of the open network (Segment) and the total number of networks.



Open the **Next Segment**.

 Key **F8**.



Open the **Previous Segment** or the local variable definition table.

 Key **F7**.



Enlarge the text in the editor window workplace.

 Key **Ctrl + G**.



Reduce the text in the editor window workplace.

 Key **Ctrl + S**.

6.2.3 Keyboard and Mouse Functions (S5 STL Editor)

Within the workplace you can enter text at any position by moving the insertion point to that position.

With the **INSERT** key you can switch in and out of the type-over mode. By default, *S5 for Windows* makes room for new characters that you type by moving existing characters to the right. You can change the insert mode and have *S5 for Windows* replace existing characters with new characters. This is called type-over and is indicated by the insertion point cursor.

- **Insert mode**

The cursor appears as a small, blinking, vertical line. The insertion cursor fits between two characters.

- **Type-Over mode**

The cursor appears as a blinking black rectangle. The type-over cursor covers one character.

The *S5 for Windows* STL editor differentiates between the comment position field (segment comment) and the function field.

The **Segment Comment field** starts in the upper left corner of the workplace. The field is a single line and may be up to sixty (60) characters wide. The width may be adjusted (see chapter 3.2.11.5). The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.









The **Function field** is located below the comment field.

 ◆ **Moving the insertion point using the mouse**

- ◆ Use the scroll bars until you reach the location you want is displayed in the workplace.
- ◆ Click (press and release the left mouse button) the location where you want to position the insertion point.

 ◆ **Moving the insertion point using the keyboard**

- ◆ **Do one of the following:**

To move	Press
One character to the left	
One character to the right	
One line up	
One line down	
Workplace one character to the left	CTRL + 
Workplace one character to the right	CTRL + 
Workplace one line up	CTRL + 
Workplace one line down	CTRL + 
To the end of a line	END
To the beginning of a line	HOME
Up one screen	PAGE UP
Down one screen	PAGE DOWN
To the end of the network	CTRL + END
To beginning of the network	CTRL + HOME











 ◆ **Selecting text using the mouse**

- ◆ **Do one of the following:**

To select	Do this
Any amount of text	Drag over the text you want to select.
A word	Double-click the word.

 ◆ **Selecting text using the keyboard**

- ◆ **Do one of the following:**

To select	Press
One character to the left	 Shift + 
One character to the right	 Shift + 
One line up	 Shift + 
One line down	 Shift + 
To the end of a line	 Shift + END
To the beginning of a line	 Shift + HOME

Note:

The **right mouse button** may be used within the S5 STL Editor. If the **right mouse button** is clicked, a menu with commands used in the S5 STL Editor is opened.

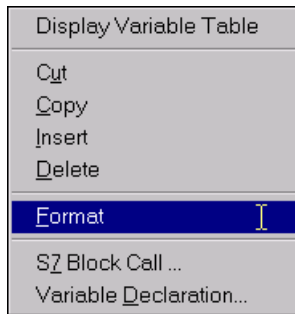


Figure 6-13 Menu opened with the click of the right mouse button

6.2.4 Block (Block Menu – S5 STL Presentation)

With the commands from the **Block** menu you can save a block and close the block editor. The block menu for the block editor S5 PC STL - presentation and S5 PLC block editor STL - presentation, are the same. Also the commands for the STL and the Block STL editors are the same. For more details see chapter 4.2.1.

6.2.5 Modify (Modify Menu – S5 STL Presentation)

The commands from the **Modify** menu in the editor window are used to work with an existing segment and/or create a new segment.

In STL and the Block STL, text may be displayed in bold black. The commands for the STL and the Block STL editors are the same.

For more details on the commands of the Modify menu see chapter 4.2.2.

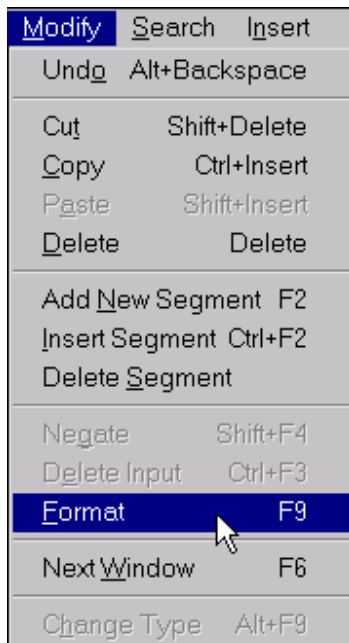


Figure 6-14 Modify Menu – S5 STL Presentation

The commands Negate, Delete Input, and Change Type are not available in S5 STL presentation.

6.2.6 Search (Search Menu – S5 STL Presentation)

The commands from the **Search** menu are used to search and replace text strings and operands in a segment or a block. Also another segment may be opened. The search menu for the block editor S5 PC STL - presentation and S5 PLC block editor STL - presentation, are the same. Also the commands for the STL and the Block STL editors are the same.

For more details on the commands of the Search menu see chapter 4.2.3.

6.2.7 Insert Menu (S5 STL - Presentation)

In STL presentation the insert menu provides FB /FX - Formal Operands command.

In STL presentation the commands displayed in bold black may be used. The commands displayed in light gray can be used in S7, CSF, LAD and /or Block-STL presentation.

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

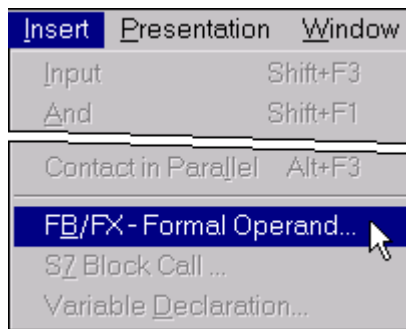


Figure 6-15 Insert menu S5 STL presentation

6.2.7.1 Insert FB / FX Formal Operands

The command **FB / FX Formal Operands**, from the insert menu, opens a dialog box. Using the dialog box you can easily insert a formal operand parameter by name (Declaration - **DECL:**), its type and its data configuration.

◆ Click **FB / FX Formal Operands** in the insert menu

◆ Press **ALT + I, B**.

The **Insert Formal Operand** dialog box opens.

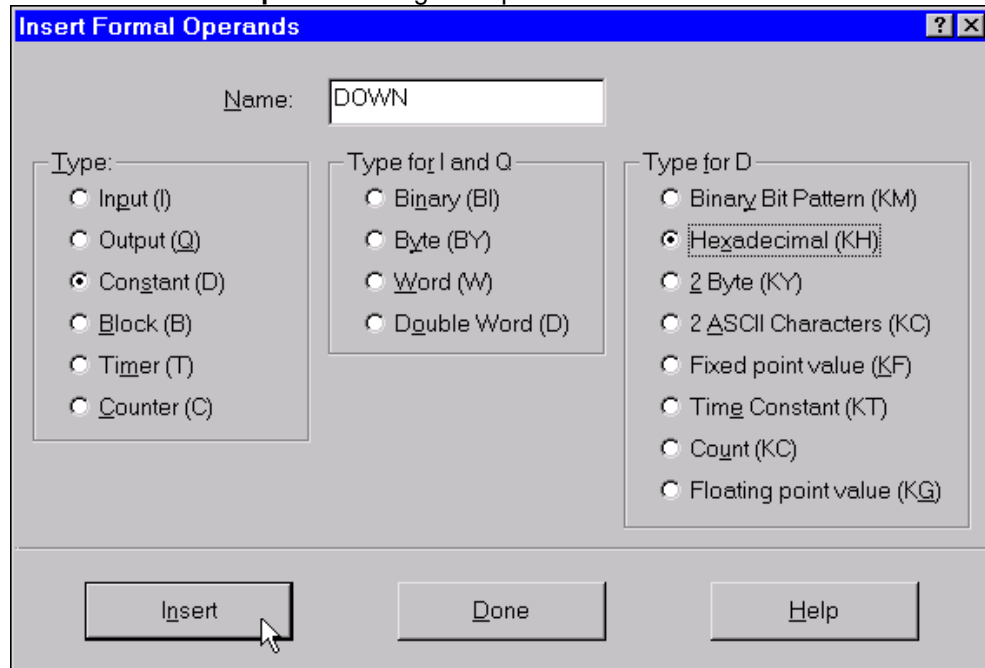


Figure 6-16 Insert Formal Operands dialog box

- **Name**

In the text field enter the name of the block parameter. The name may be up to four (4) characters long and must start with a letter. The name is automatically entered in capital letters. The block parameter name is identical to the formal operand specified in the program in place of the actual operand.

- **Type**

A marked button identifies the block parameter type. Input parameter, output parameter and parameters representing a constant, need further definitions.

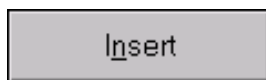
- **Type for I and Q**

Input and output parameters need a further definition. With the buttons you may define if an input or output parameter represents a bit (BI), a byte (BY), a word (W), or a double word (D).

- **Type for D**

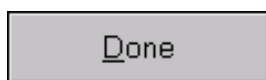
A parameter representing a constant needs further definition. The value may be presented in different forms. Mark the button to select the required form.

- **Insert button**



If you activate the **Insert** button the defined parameter will be entered into the function block. The dialog box stays open and is ready to define the next parameter. Up to forty block parameters may be defined per function block.

- **Done button**



If you activate the **Done** button the defined parameter will

be entered into the function block and the dialog box will be closed.

Note:

Prior to opening the dialog box **Insert Formal Operand** you must position the insertion mark in a separate line directly below the line defining the name.

6.2.8 Presentation (Presentation Menu - S5 STL Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. All commands are available in STL presentation. For details on the commands of the presentation menu see chapter 4.2.5

6.2.9 Window (Window Menu - Editor Window)

The **Window** menu of the editor window is identical with the window menu of the PC block list window. For more details see chapter 3.5.

6.2.10 Help (Help Menu - Editor Window)

The **Help** menu of the editor window is identical with the help menu of the PC block list window. For more details see chapter 3.6.

6.3 Editing an S5 Control System Flowchart (CSF)

The **Editor** in the **Control System Flowchart** (CSF) presentation is a special graphics editor. The workplace is divided into eleven (11) columns. The column borders are not shown. A function symbol (AND, OR, Timer, etc.) occupies one (1) column. Scroll bars are available to move parts of the segment into view when the entire segment doesn't fit in the allotted space.

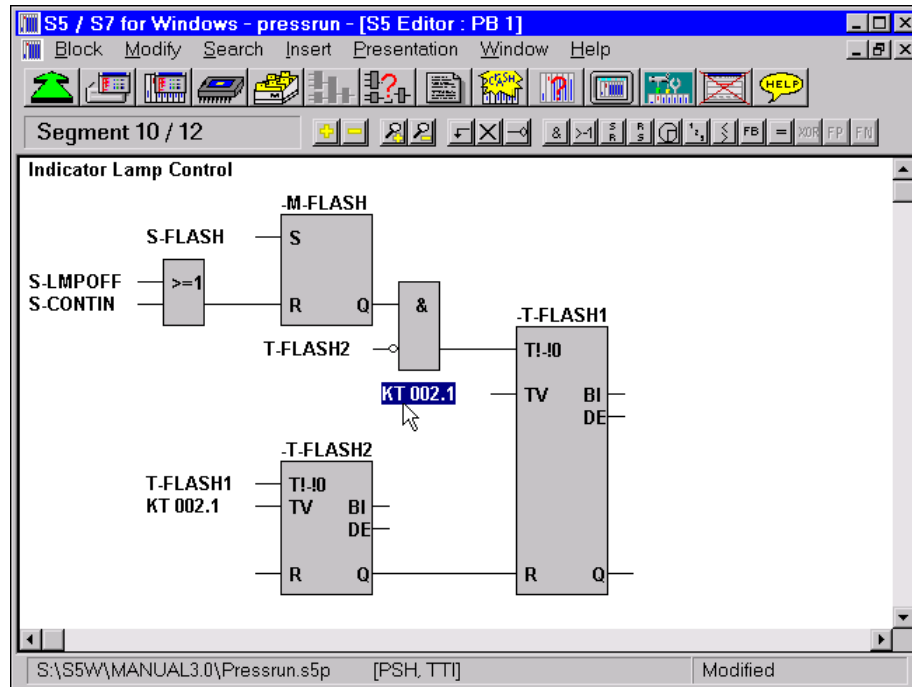


Figure 6-17 Example of an S5 editor window in CSF presentation.

PLC logic programmed in CSF presentation may be converted to LAD or STL presentation any time. Converting PLC logic programmed in LAD presentation into CSF presentation is always possible.

PLC logic programmed in STL presentation may be converted to CSF presentation if the program follows the appropriate syntax. A complex logic may not be converted into CSF presentation. Certain parts of PLC programs may only be programmed in STL presentation.

6.3.1 Keyboard and Mouse Functions (CSF Editor)

In the CSF editor you can build PLC logic by moving the insertion point to a given position and inserting function symbols.

The *S5 for Windows* CSF graphical editor works in the insertion mode only. The CSF editor differentiates between the comment position (network comment), the operand positions, and the function symbol positions.

The **Network** (Segment) **Comment** field starts in the upper left corner of the workplace. The field is a single line and may be up to sixty (60) characters wide. The width can be adjusted with the Maximum Command Comment (see chapter 3.2.11.5).

The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.

The **Operand** position fields are defined by the function symbols. The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.

The **Function Symbol** positions are defined as follows:

The first function symbol is positioned automatically. The position of the insertion mark is ignored.

To add a function symbol the insertion mark must be positioned at the desired input or output of the function symbol. To insert a function symbol in an existing segment the insertion mark must be positioned at the output of the function symbol that the inserted function should follow.



Moving the insertion point using the mouse

- ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want.
- ◆ Click (press and release the left mouse button) the location where you want to position the insertion point.

The possible locations to position the insertion mark are described above.



Moving the insertion point using the keyboard

- ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want. Use the keys **PAGE UP**, **PAGE DOWN**, **CTRL + ⬅**, **CTRL + ➡**, **CTRL + ⬆**, **CTRL + ⬇** to move the scroll bars.

Within the segment comment field or an operand field

To move	Press
One character to the left	⬅
One character to the right	➡

In a function symbol from one operand position to the next

To move	Press
One position up (or left)	⬆
One position down (or right)	⬇

Within the complete segment

To move	Press
From one operand to the next	TAB or ⤵
One position up (or left)	⬆
One position down (or right)	⬇
To the beginning of the segment comment	HOME

6.3.2 Tool Bar II – S5 Control System Flowchart (CSF) Editor



Select the tools with the mouse or with the function keys (see *S5 for Windows* Function - Key Template). The segment (network) number and the total number of segments (network) are displayed.



Open the **Next Segment**.

 Key **F8**.



Open the **Previous Segment**.

 Key **F7**.



Activating this function will **Enlarge** the PLC logic displayed in CSF presentation. The selected font must be scaleable.

 Key **CTRL + G**.




Activating this function will **Reduce** the PLC logic displayed in CSF presentation. The selected font must be scaleable.

 Key **CTRL + S**.



Insert an Additional Input at the selected function symbol (AND, OR).

 Key **(↑ Shift) + F3**.




Delete an Input at the selected function symbol (AND, OR).

 Key **CTRL + F3**.




Invert the selected **Input** at the function symbol (AND, OR). The input to be negated could be an output of another function (AND, OR). To negate an intermediate result the command **Change Type** (Modify menu, Key **ALT + F9**) must be used.

 Key **(↑ Shift) + F4**.




Insert an **AND** function.

 Key **(↑ Shift) + F1**.



Insert an **OR** function.

 Key **(↑ Shift) + F2**.



Insert a **SR Flip Flop** (latch) with a dominating reset input.

 Key  + F5.



Insert a **RS Flip Flop** (latch) with a dominating set input.

 Key **ALT** + F5.



This icon opens a dialog box to select **Timers**.

 Key  + F6.



This icon opens a dialog box to select **Counters**.

 Key  + F7.



This icon opens a dialog box to select **Comparators**.

 Key **CTRL** + F9.



Insert a **Function Block Call**.

 Key  + F10.



Insert an **Assignment** (result, intermediate result).

 Key  + F9.



This function is not available with the Step® 5 syntax.



This function is not available with the Step® 5 syntax.



This function is not available with the Step® 5 syntax.

Note:

The **right mouse button** may be used with the S5 Control System Flowchart (CSF) Editor. If the **right mouse button** is clicked, a menu of the commands available in the S5 CSF Editor is opened.

The commands available are all the commands from the **Insert menu** plus some commands from the Modify menu. These commands give you full control to generate or change the PLC logic displayed in the workspace of the S5 Control System Flowchart (CSF) Editor window.

6.3.3 Block (Block Menu – S5 CSF Presentation)

With the commands from the **Block** menu you can save a block and close the block editor. The block menu for the block editor, S5 PC CSF - presentation, and S5 PLC block editor CSF - presentation, are the same.

For more details on the commands of the Block menu see chapter 4.2.1.

6.3.4 Modify (Modify Menu – S5 CSF Presentation)

The commands from the **Modify** menu in the CSF presentation are used to work with an existing network and/or create a new network.

◆ Click **Modify** in the menu bar.

◆ Press **ALT + M**.

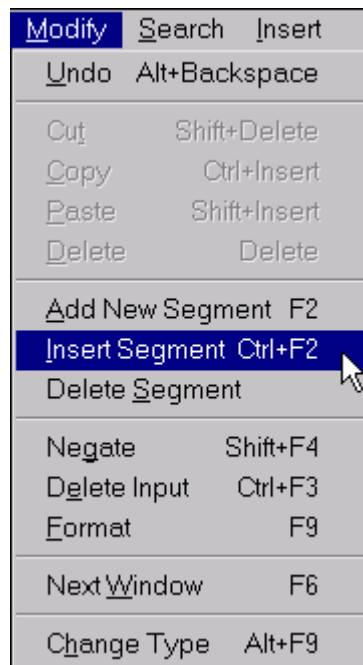


Figure 6-18 The **Modify** menu S5 CSF presentation

The commands **Cut**, **Copy**, **Paste**, and **Delete** are not available in CSF presentation. The commands **Undo**, **Add New Segment**, **Insert Segment**, **Delete Segment**, and **Next Window** are commands that can also be used with other presentations. For detailed information about these commands from the modify menu see chapter 4.2.2.

The commands **Negate / Invert**, **Delete Input**, **Format** and **Change Type** have special functions in the S5 Control System Flowchart presentation and are described below.

6.3.4.1 Negate (Modify Menu)

The **Negate** command, from the modify menu, changes the selected input from a normal input to an inverted input or vice versa (inverted input to normal input). Inputs being connected to another logical device may also be negated.

- ◆ Mark the input (the name of the input) or the logic connected to the input of another logical device. The selected logic connected to the input is displayed in dark blue (see figure 6-19).
- ◆ Click the **Negate** icon in the tool bar or the **Negate** command in the modify menu.
- ◆ Press **Shift + F4**.

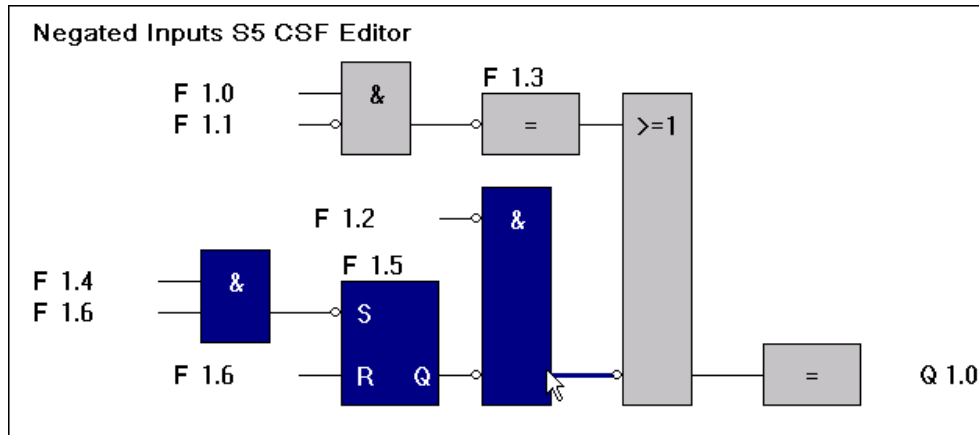
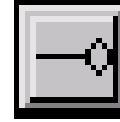
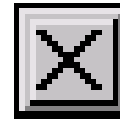


Figure 6-19 Negated Inputs S5 CSF Editor

6.3.4.2 Delete Input (Modify Menu)

The **Delete Input** command, from the modify menu, deletes the selected input or the selected logical connection. A selected input or logical connection (one or more function symbols) is displayed in dark blue. Only inputs from an **AND** function symbol or an **OR** function symbol may be deleted.

- ◆ Click the **Delete** icon in the tool bar or the **Delete Input** command in the modify menu.
- ◆ Press **CTRL + F3**.



Examples:

A marked input may be deleted with the **Delete Input** command.

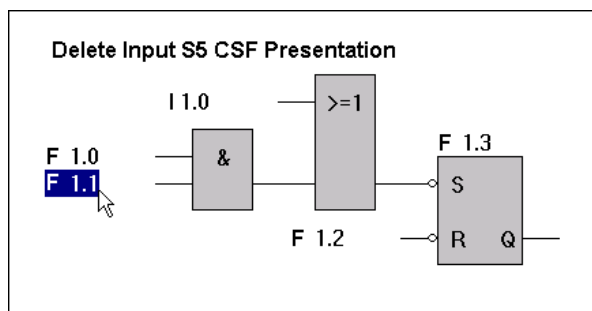


Figure 6-20 Delete Input S5 CSF Presentation (example 1)

A logical connection was marked (displayed in dark blue). The OR function symbol and the AND function symbol with all its inputs will be deleted.

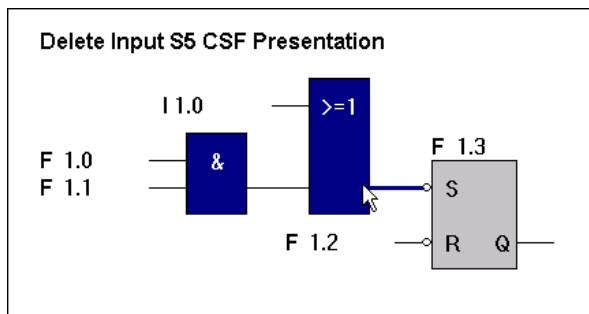


Figure 6-21 Delete Input S5 CSF Presentation (example 1)

6.3.4.3 Format (Modify Menu)

The **Format** command, from the modify menu, in the S5 CSF Editor does not have any function.

6.3.4.4 Change Type (Modify Menu)

The **Change Type** command, from the modify menu, allows you to modify the type of a logical function. This command also changes the type of an assignment to an **S** (set) or **R** (reset) type. You may activate the change type command several times to change, for example, a pulse timer into a latched on-delay timer.

◆ Click **Change Type** in the modify menu.

◆ Press **ALT + F9**.

Example: The following logical functions may change their type:

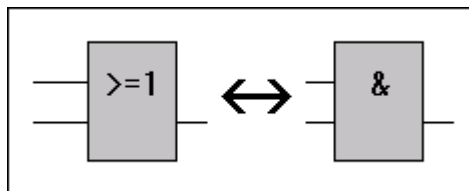


Figure 6-22 Change Type AND, OR

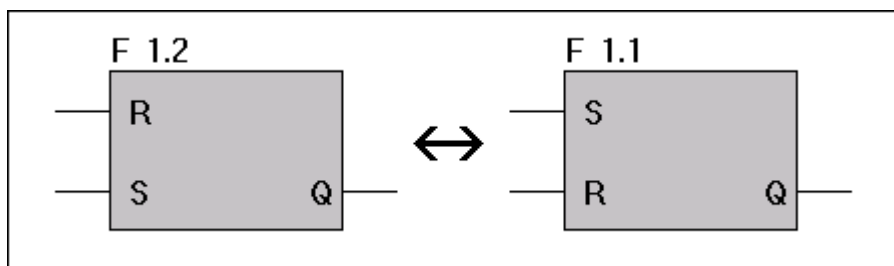


Figure 6-23 Change Type, RS Flip Flop, SR Flip Flop

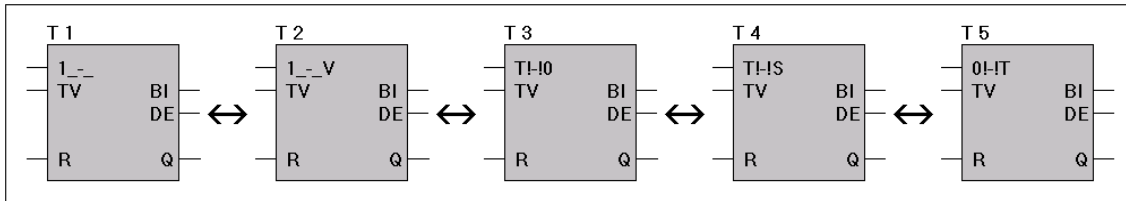


Figure 6-24 Change Type, Pulse Timer, Extended Pulse Timer, ON-Delay Timer, Latching ON-Delay Timer, OFF-Delay Timer

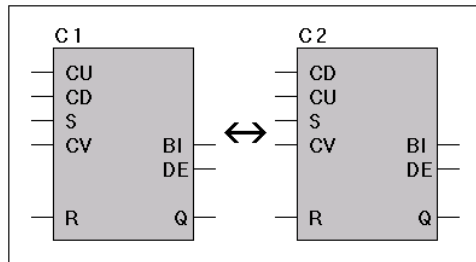


Figure 6-25 Change Type, Upward Counter, Downward Counter

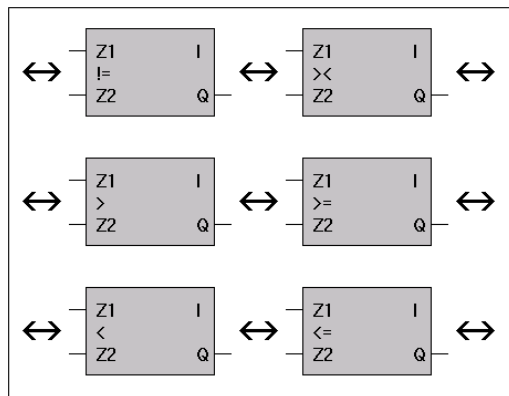


Figure 6-26 Change Type, Equal, Not Equal, Bigger, Bigger or Equal, Less, Less or Equal

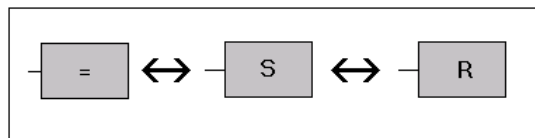


Figure 6-27 Change Type, Assignment, Set Assignment, Reset Assignment

6.3.5 Search (Search Menu – S5 CSF Presentation)

The commands from the **Search** menu in the CSF presentation are used to review or change text in the displayed segment and to move to another segment.

In CSF presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, LAD, and /or Block-STL (Source Text) presentation.

◆ Click **Search** in the menu bar.

◆ Press **ALT + S**.

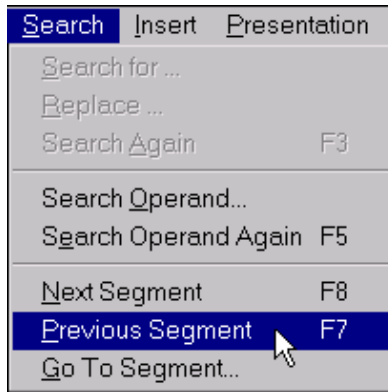


Figure 6-28 Search menu S5 - CSF presentation

The commands Search for, Replace, and Search again are not available in CSF presentation. For detailed information on the commands from the Search menu see chapter 4.2.3.

6.3.6 Insert (Insert Menu – S5 CSF Presentation)

The commands from the **Insert** menu in the CSF Editor are used to insert logical functions into the workplace to build a segment. The commands are identical with the corresponding icons from the S5 - CSF Editor Toolbar (see chapter 6.3.2). The commands Timer, Counter, Comparator, and FB Call, open dialog boxes. In CSF presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, LAD and /or Block-STL presentation.

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

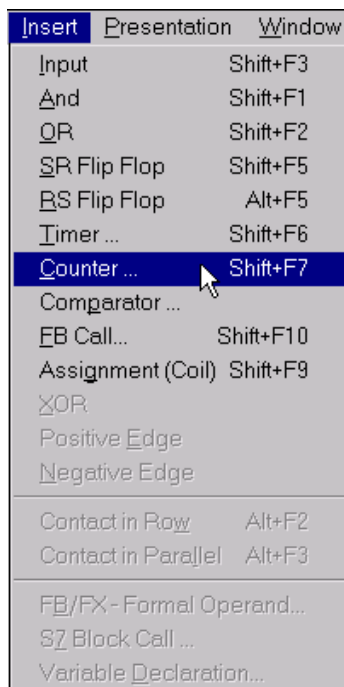


Figure 6-29 Insert menu S5 - CSF presentation

The commands XOR, Positive Edge, Negative Edge, Contact in Row, Contact in Parallel, FB / FX - Formal Operands, S7 Block Call, and Variable Declaration are not available in S5 CSF presentation.

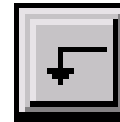
6.3.6.1 Input (Insert an additional Input)

The command **Input** adds an additional input to an existing AND function symbol or an OR function symbol.

To add an input, mark one of the inputs of the function symbol. The operand (placeholder) at this input is displayed with a blue background. If an input connected to an output of a previous function symbol was marked, the entire function symbols beyond the input are displayed in blue.

- ◆ Click the **Input** icon in the tool bar or the **Input** command in the insert menu.

- ◆ Press **(Shift) + F3**



Example:

An AND function symbol with an additional input. One input is marked to add an additional input.

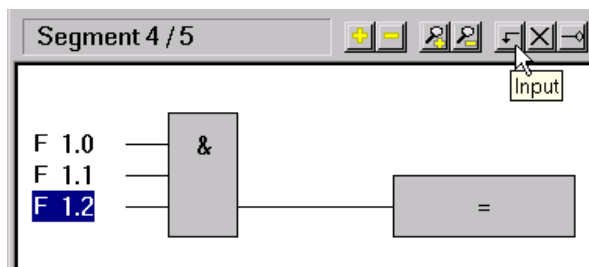


Figure 6-30 Insert additional input

6.3.6.2 AND (Insert an AND Function Symbol)

The command **And** inserts an AND function symbol.

To add an AND function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.3.1.

- ◆ Click the **And** icon in the tool bar or the **And** command in the insert menu.

- ◆ Press **(Shift) + F1**.

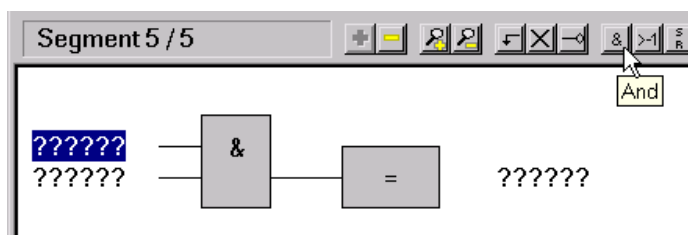
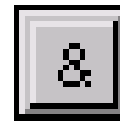


Figure 6-31 Insert AND Function

6.3.6.3 OR..(Insert an OR Function Symbol)

The command **OR** inserts an OR function symbol.

To add an OR function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.3.1.

- ◆ Click the **OR** icon in the tool bar or the **OR** command in the insert menu.
- ◆ Press **Shift + F2**.

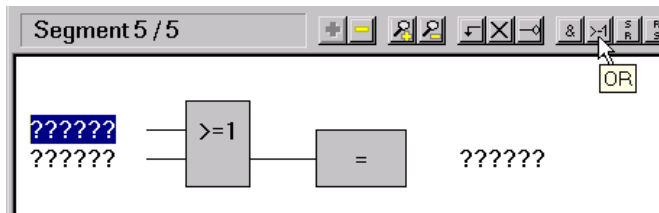
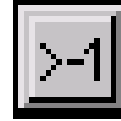


Figure 6-32 Inserts an OR Function

6.3.6.4 SR Flip Flop (Insert a SR Flip Flop (Latch) Function Symbol)

The command **SR Flip Flop** inserts a SR Flip Flop with a dominating reset input.

To add a SR Flip Flop function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.3.1.

- ◆ Click the **SR Flip Flop** icon in the tool bar or the **SR Flip Flop** command in the insert menu.
- ◆ Press **Shift + F5**.

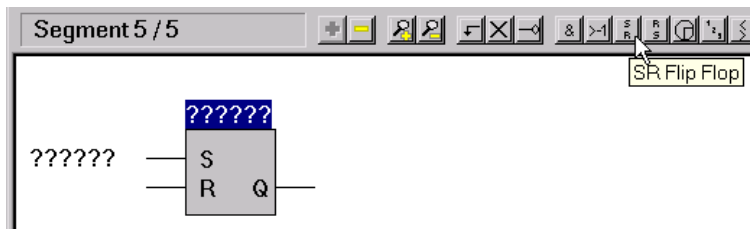
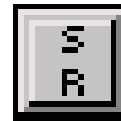


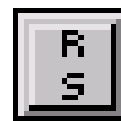
Figure 6-33 Insert SR Flip Flop (Latch)

6.3.6.5 RS Flip Flop (Insert a RS Flip Flop (Latch) Function Symbol)

The command **RS Flip Flop** inserts a RS Flip Flop with a dominating set input.

To add a RS Flip Flop function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.3.1.

- ◆ Click the **RS Flip Flop** icon in the tool bar or the **RS Flip Flop** command in the insert menu.
- ◆ Press **ALT + F5**.



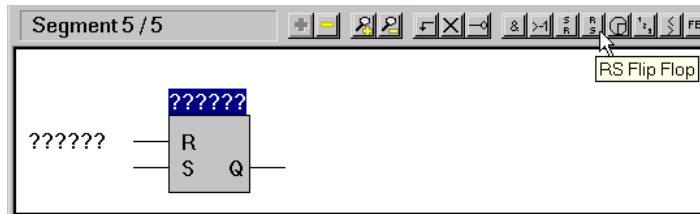


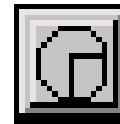
Figure 6-34 Insert RS Flip Flop (Latch)

6.3.6.6 Timer (Insert a Timer Function Symbol)

The command **Timer** opens a dialog box to select the timer function. Five different timers are available.

To add a timer function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.3.1.

◆ Click the **Timer** icon in the tool bar or the **Timer** command in the insert menu.



◆ Press **Shift + F6**.

- The **Pulse** timer outputs a pulse with the defined width but no longer than the input pulse.
- The **Extended Pulse** timer outputs the input pulse plus the defined pulse width.
- The **On-Delay** timer outputs a pulse after the time has elapsed (the start pulse must still be present).
- The **Latched On-Delay** timer outputs a pulse after the time has elapsed.
- The **Off-Delay** timer outputs a pulse with a fixed length after the starting pulse goes to zero.

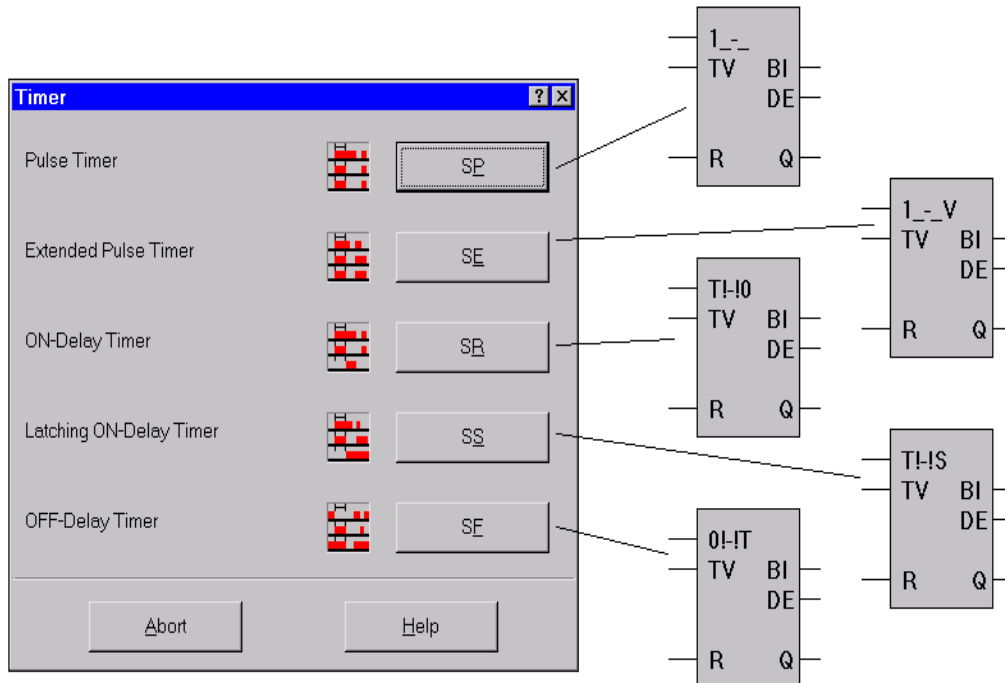


Figure 6-35 Timer selection dialog box

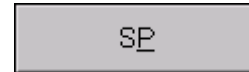
Timer signals overview

SP, SE, SR, SS, SF	Start timer																				
TV	The Time Value is entered as a time constant (KT). The KT value consists of a number (in front of the decimal point) and a multiplier, the Time Base (after the decimal point).																				
The following Time Bases are available:																					
	<table border="1"> <thead> <tr> <th>Time Bases</th> <th>Accuracy</th> <th>Example</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>0 = 0.01 sec.</td> <td>10ms</td> <td>KT 500.0</td> <td>5 seconds</td> </tr> <tr> <td>1 = 0.1 sec</td> <td>100ms</td> <td>KT 50.0</td> <td>5 seconds</td> </tr> <tr> <td>2 = 1 sec</td> <td>1s</td> <td>KT 5.0</td> <td>5 seconds</td> </tr> <tr> <td>3 = 10 sec</td> <td>10s</td> <td>KT 100.0</td> <td>1000 seconds</td> </tr> </tbody> </table>	Time Bases	Accuracy	Example	Time	0 = 0.01 sec.	10ms	KT 500.0	5 seconds	1 = 0.1 sec	100ms	KT 50.0	5 seconds	2 = 1 sec	1s	KT 5.0	5 seconds	3 = 10 sec	10s	KT 100.0	1000 seconds
Time Bases	Accuracy	Example	Time																		
0 = 0.01 sec.	10ms	KT 500.0	5 seconds																		
1 = 0.1 sec	100ms	KT 50.0	5 seconds																		
2 = 1 sec	1s	KT 5.0	5 seconds																		
3 = 10 sec	10s	KT 100.0	1000 seconds																		
R	Reset																				
BI	Current counter value (Binary)																				
DE	Current counter value (BCD)																				
Q	Output																				

Table 6-2 Time Value

● Insert a Pulse Timer

◆ Click the **SP** button.



◆ Press **P**.

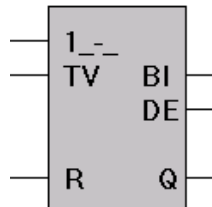


Figure 6-36 Pulse timer function symbol

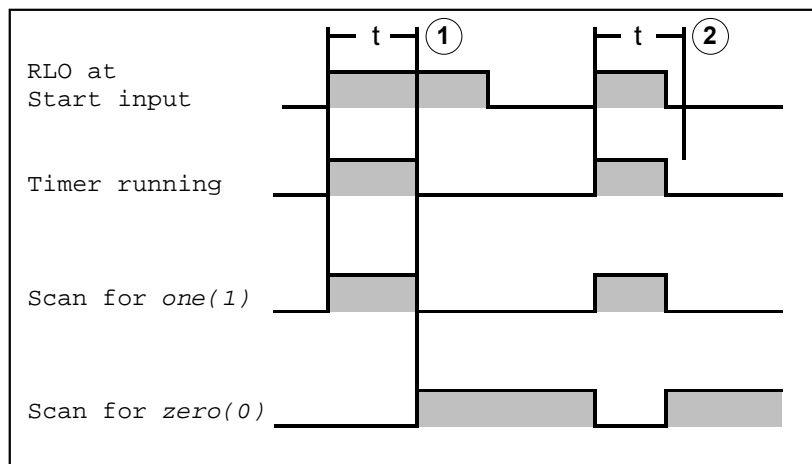
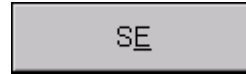


Figure 6-37 Pulse Timer characteristics

● **Insert an Extended Pulse Timer.**

◆ Click the **SE** button.



◆ Press **E**.

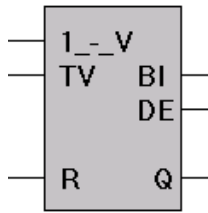
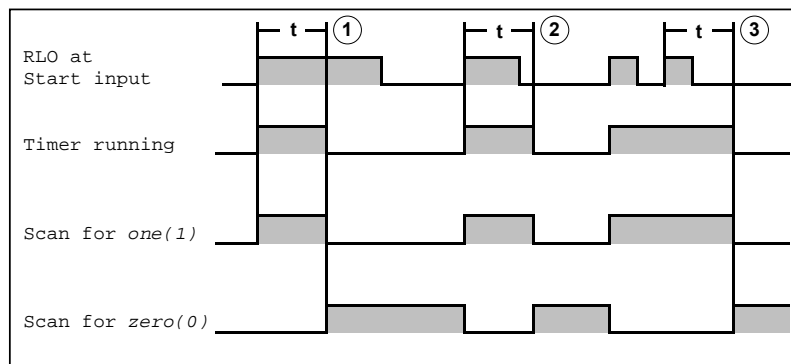


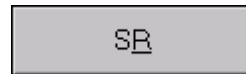
Figure 6-38 Extended Pulse timer function symbol

Figure 6-39 Extended Pulse Timer characteristics



● **Insert an On-Delay Timer**

◆ Click the **SR** button.



◆ Press **R**.

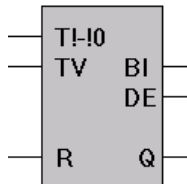


Figure 6-40 On-Delay timer function symbol

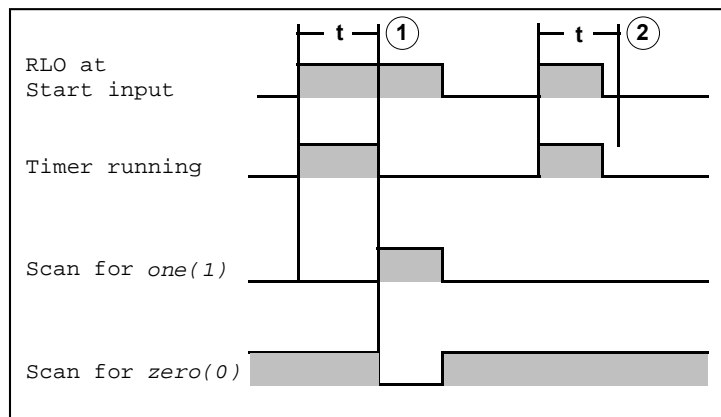
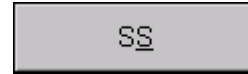


Figure 6-41 **On-Delay Timer** characteristics

● **Insert a Latching On-Delay Timer**

◆ Click the **SS** button.



◆ Press **S**.

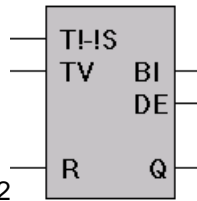


Figure 6-42 Latching On-Delay timer function symbol

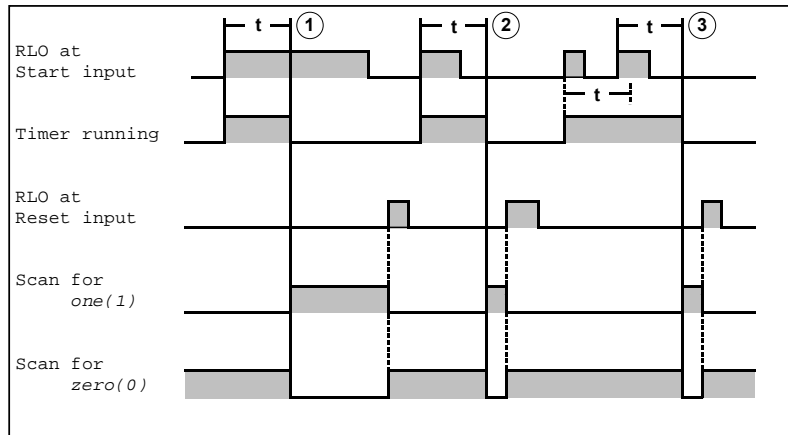
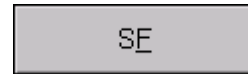


Figure 6-43 Latching On-Delay Timer characteristics

● **Insert an Off-Delay Timer**

◆ Click the **SF** button.



◆ Press **F**.

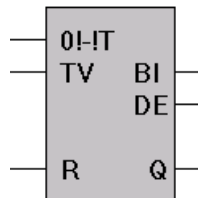


Figure 6-44 Off-Delay timer function symbol

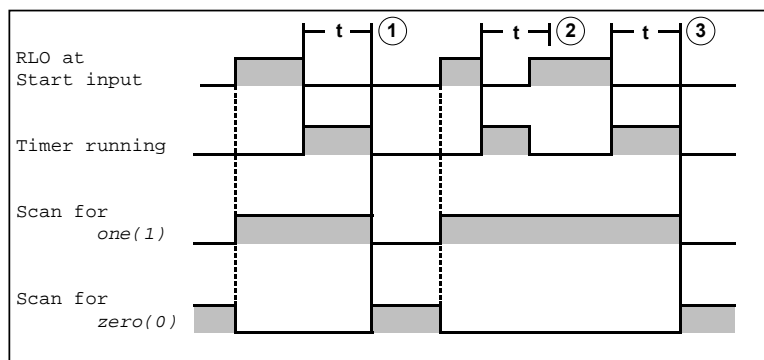


Figure 6-45 Off-Delay Timer characteristics

6.3.6.7 Counter (Insert a Counter Function Symbol)

The command Counter opens a dialog box where you can select the counter function. Two different counters are available, an up counter and a down counter.

Basically the both counters are the same. As a result of the arrangement of the function symbol the first input must be used. For the up counter this is the input that increments the counts. For the down counter this is the input that decrements the counts. Both counters provide a second input (this input doesn't have to be used) for the opposite count direction.

◆ Click the **Counter** icon in the tool bar or the **Counter** command in the insert menu.

◆ Press **Shift + F7**.

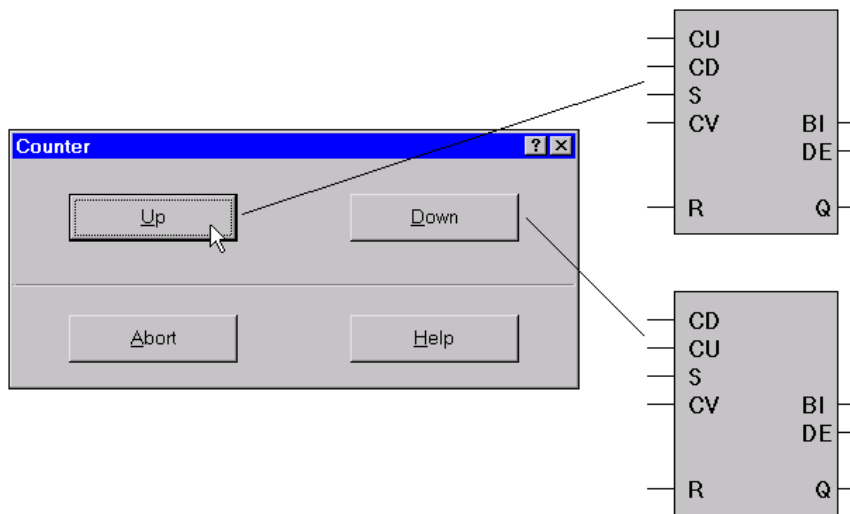
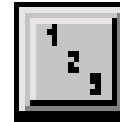



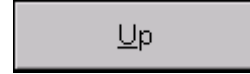
Figure 6-46 Counter dialog box

Counters signals overview	
CU	Count up (increment)
CD	Count down (decrement)
S	Set
CV	Load counter (value in BCD)
R	Reset
BI	Current counter value (Binary)
DE	Current counter value (BCD)
Q	Output

Table 6-3 Counter inputs and outputs

- **Insert an Up Counter**

 ◆ Click the **Up** button.



 ◆ Press **U**.

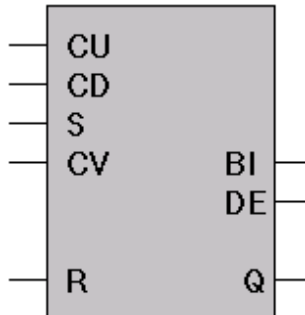



Figure 6-47 Up Counter function symbol

- **Insert a Down Counter**

 ◆ Click the **Down** button.

 ◆ Press **D**.

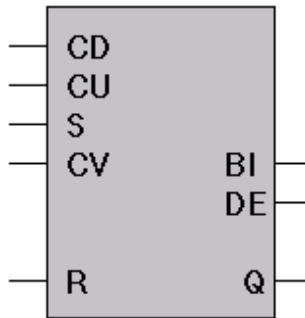
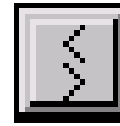


Figure 6-48 Down Counter function symbol

6.3.6.8 Comparator (Insert a Comparator Function Symbol)

The command **Comparator** opens a dialog box to select the compare functions. Six (6) different comparators are available.

◆ Click the **Comparator** icon in the tool bar or the **Comparator** command in the insert menu.



◆ Press **ALT + I, P**.

Figure 6-49 Comparator dialog box

Symbol	Function	Fixed point (Integer) F	Fixed point (Integer) D	Floating point (Real) G
!=	Compare for equal	16 Bit	32 Bit	32 Bit
><	Compare for not equal	16 Bit	32 Bit	32 Bit
>	Compare for greater than	16 Bit	32 Bit	32 Bit
>=	Compare for greater than or equal	16 Bit	32 Bit	32 Bit
<	Compare for less than	16 Bit	32 Bit	32 Bit
<=	Compare for less than or equal	16 Bit	32 Bit	32 Bit

Table 6-4 Compare functions

Comparator signals overview	
Z 1	Input 1
Z 2	Input 2
Q	Output (one for equal, zero for not equal)
F, D, G	The letter (F, D, G) in the right upper corner of the comparator function symbol indicates the value representation of the inputs (16 bit integer, 32 bit integer or 32 bit real).

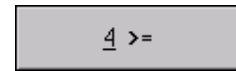
Table 6-5 Comparator Inputs and Outputs

● Insert a Comparator

- ◆ Click the appropriate button to select the value representation of the inputs (**F** - 16 bit integer, **D** - 32 bit integer or **G** - 32 bit floating point).



- ◆ Click the appropriate button to select the desired comparator (**1**, **2**, **3**, **4**, **5**, or **6**)



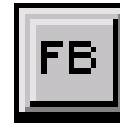
- ◆ Press **F**, **D**, or **G**.
- ◆ Press **1**, **2**, **3**, **4**, **5**, or **6**

A Comparator function symbol is inserted.

6.3.6.9 FB Call (Insert a Function Block Call Symbol)

The command **FB Call** opens a dialog box to select an absolute or a conditional function block call.

- ◆ Click the **FB Call** icon in the tool bar or the **FB Call** command in the insert menu.



- ◆ Press **SHIFT + F10**.

The FB - Call dialog box opens.

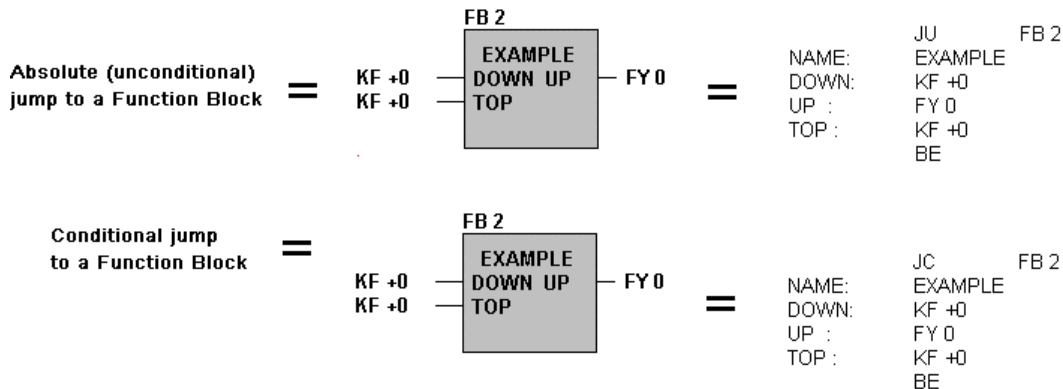
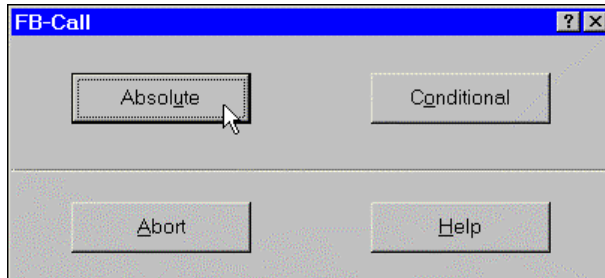
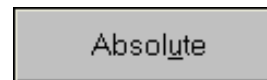


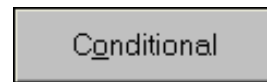
Figure 6-50 Insert a Function Block Call

In CSF presentation a FB call may only be performed from a separate segment.

- ◆ Click the appropriate button to select an absolute or a conditional function block call.



If you select a conditional function block call the last ROL of the previous segment is used as the condition. ROL = 1, the FB is called, ROL = 0, the FB is not called.



- ◆ Press **U**, or **O** to select an absolute or a conditional function block call.



Figure 6-51 Function Block Call symbol

- ◆ Edit **FB 0** to call the desired function block and confirm with the **↵** or the **TAB** key.

If the function block already exists, the parameters of the function block are displayed as inputs and outputs.

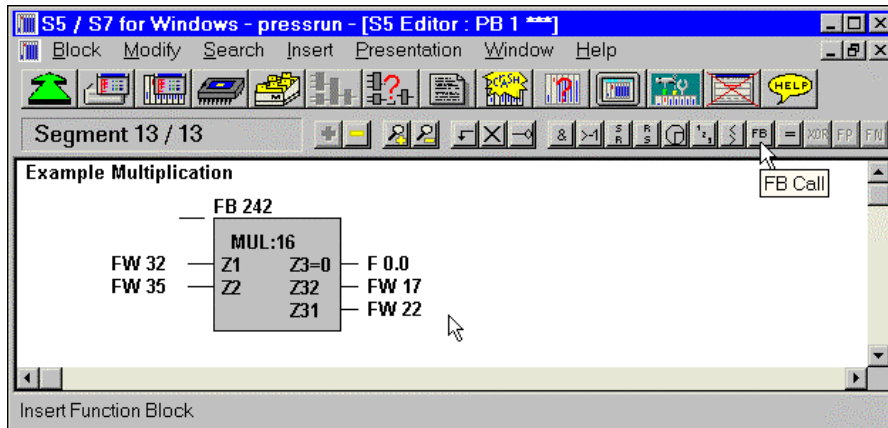


Figure 6-52 FB CALL function symbol with the assignment of the actual variables

- ◆ You may have to edit the parameters (operands) to meet the requirements of the PLC program.

Note:

Data block (DB, DX) calls may only be programmed in STL presentation. For details on data block calls see chapter 6.2.1.1.

6.3.6.10 Assignment (Coil) (Insert an Assignment)

The command **Assignment (Coil)** inserts an assignment function symbol (result, intermediate result).

To add an assignment function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.3.1. To change the assignment, mark the assignment name (e.g. Q 1.1 etc.).

- ◆ Click the **Assignment** icon in the tool bar or the **Assignment (Coil)** command in the insert menu.

- ◆ Press **Shift + F9**.

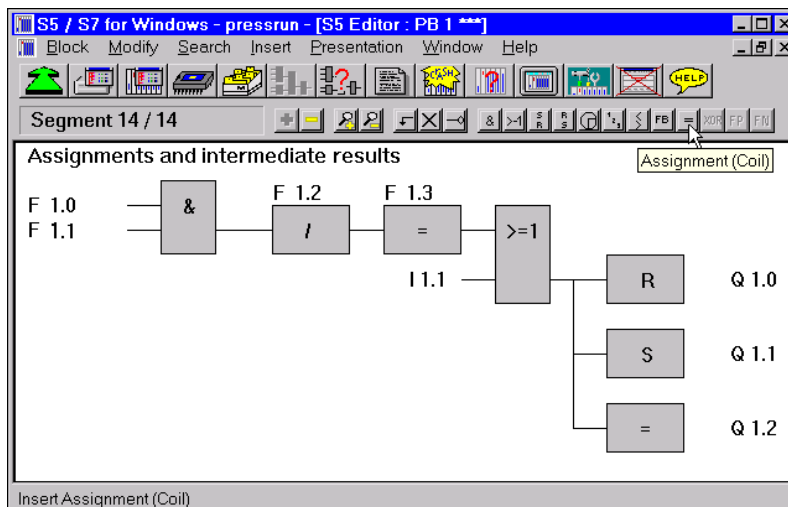
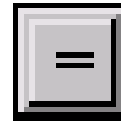


Figure 6-53 Assignment function symbols as results and intermediate results

Assignment function symbol as a result

The assignment, as a result, may have a **Normal**, a **Set (S)**, or a **Reset (R)** function. Changing the result function is done with the **Change Type (ALT + F9)** command from the modify menu (see chapter 6.3.4.4).

Assignment as an intermediate result

The assignment, as an intermediate result, may be **Normal** or **Negated (/)**. Changing the intermediate result function is done with the **Change Type (ALT+F9)** command from the modify menu (see chapter 6.3.4.4).

6.3.7 Presentation (Presentation Menu - S5 CSF Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. Not all commands are available in CSF presentation. For details on the commands from the presentation menu see chapter 4.2.5.

 ◆ Click **Presentation** in the menu bar.

 ◆ Press **ALT + P**.

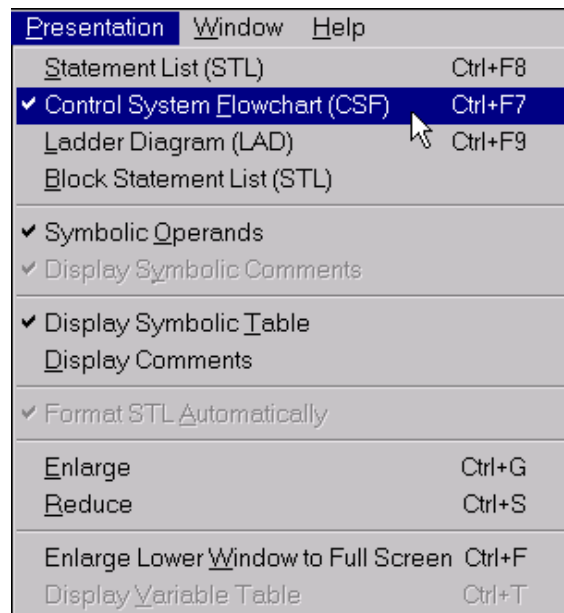


Figure 6-54 Presentation menu S5 CSF presentation

6.3.8 Window (Window Menu - Editor Window)

The **Window** menu from the editor window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

6.3.9 Help (Help Menu - Editor Window)

The **Help** menu from the editor window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

6.4 Editing an S5 Ladder Diagram (LAD)

S5 for Windows offers, as an option, **Ladder Diagram (LAD)** presentation. If the LAD option is installed, it is an integral part of the *S5 for Windows* software package.

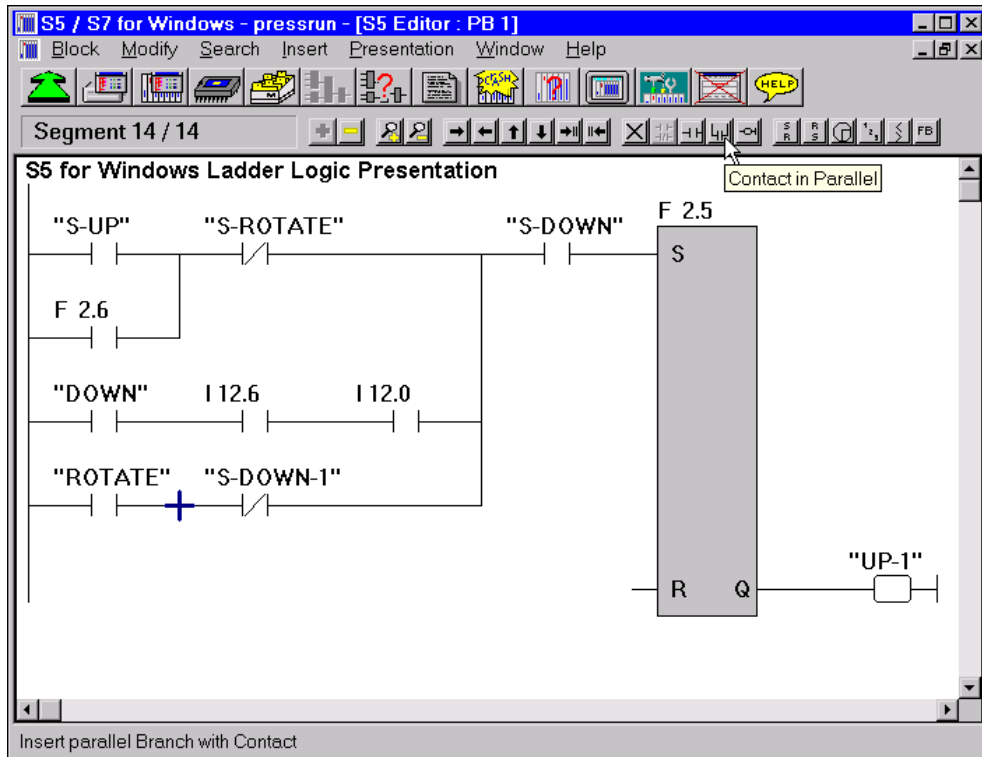


Figure 6-55 **Ladder Diagram (LAD)** presentation example

PLC logic programmed in LAD presentation may be converted into CSF or STL presentation any time. PLC logic programmed in STL presentation may be converted into LAD presentation if the program follows a defined syntax. Complex logic may not be converted into LAD presentation. PLC logic programmed in CSF presentation cannot always be converted into LAD presentation. Certain parts of PLC programs may only be programmed in STL presentation.

The **Editor** in the **Ladder Diagram (LAD)** presentation is a special graphics editor. The workplace of the LAD editor is organized as a matrix. Up to 20 elements (lines, contacts, Flip Flops, etc.) may be displayed horizontally. Vertically up to 30 elements (lines, Flip Flops, etc. but no contacts) may be displayed.

The tool bar is divided into five blocks. With icons from the first block you can move to other segments. The second block provides the icons to enlarge or reduce the displayed logic.

The third block allows you to draw lines and contacts. Each icon has multiple functions. Clicking an arrow icon will draw a line (in the direction of the arrow). Drawing over an existing line deletes the line (in the direction of the arrow). Drawing over a contact replaces the contact with a line.

The arrow icons with the contact symbol operate the same way. Clicking the icon will draw a contact (in the direction of the arrow). Drawing over an existing contact will delete the contact. Drawing over a line will replace the line with a contact.

The icons from block four and five are used to delete and to insert function symbols

During the ladder diagram generation the segment may be in one of two different stages. In one stage the segment is in a logically operational mode. The other stage of the segment is a logically non-operational mode.

The edit functions that are available depend on the functional stage of the segment. Edit functions that are not operational in the current mode are indicated by light gray icons.

The **Graphical Elements** from the third group in the toolbar may always be used to insert, add, or overwrite contacts and lines. It is irrelevant if the segment is in a logical operational mode or not.

Inserting function symbols from the fifth group is only possible in a logical operational mode.

- **Adding** function symbols are always possible.
- **Overwriting** contacts is always possible. It is not possible to overwrite function symbols.
- **Deleting** function symbols is not possible. You may change the type of the function symbol using the **Change Type** command (**ALT + F9**) from the modify menu (see chapter 6.4.4.4).

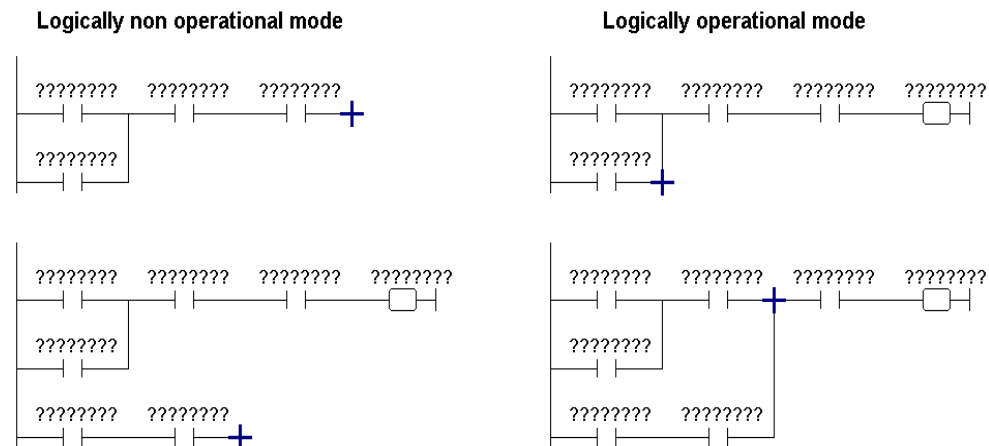


Figure 6-56 Example, logically operational mode and logically non operational mode

6.4.1 Keyboard and Mouse Functions (LAD Editor)

In the LAD editor you can build PLC logic by moving the insertion point to given positions and inserting contacts, connecting lines, and function symbols.




The *S5 for Windows* LAD graphical editor differentiates between the comment position (segment [network] comment), the operand positions, and the function symbol positions (contacts, timers, etc.).

The **Network** (Segment) **Comment** field starts in the upper left corner of the workplace. The field is a single line and may be up to sixty (60) characters wide. The width may be adjusted with the *S5 for Windows* Maximum Command Comment (see chapter 3.2.11.5).

The insertion mark may be moved freely within the comment field. In an empty command field the insertion mark is always positioned at its beginning.







The **Function Symbol** (contact) positions are defined as follows:

To insert the first contact (function symbol) you must position the insertion mark (blue cross) on the vertical line in the upper left corner of the workplace (below the segment comment field).



-  ◆ Click the vertical line below the network (segment) comment field.
-  ◆ Press **HOME**, the insertion mark moves to the beginning of the segment field.
- ◆ Press  the insertion mark moves on the vertical line below the comment field.

● Moving the insertion point





To add a contact (function symbol) the insertion mark must be positioned at the desired position.

-  ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want.
- ◆ Click (press and release the left mouse button) the location where you want to position the insertion point. The blue cross indicates the position of the insertion mark.
-  ◆ Use the scroll bars (horizontal, vertical), until you reach the location you want. Use the keys **PAGE UP**, **PAGE DOWN**, **CTRL + **, **CTRL + **, **CTRL + **, **CTRL + ** to move the scroll bars.

Within a network (segment), comment field, or an operand field

To move	Press
One character to the left	
One character to the right	

In the logic area (outside the comment field or an operands field)

To move	Press
One position up	
One position down	
One position left	
One position right	
From one operand to the next	TAB or ↵
To the beginning of the segment comment	HOME

6.4.2 Tool Bar II – S5 Ladder Diagram (LAD) Editor



Select the tools with the mouse or with the function keys (see *S5 for Windows* Function - Key Template). The segment number and the total number of segment are displayed.



Open the **Next Network**.

 Key **F8**.



Open the **Previous Network**.

 Key **F7**.



Activating this function will **Enlarge** the PLC logic displayed in LAD presentation. The selected font must be scaleable.

 Key **CTRL + G**.



Activating this function will **Reduce** the PLC logic displayed in LAD presentation. The selected font must be scaleable.

 Key **CTRL + S**.



Draw a Line to the Right. Erase a line to the right of the marked position. Overwrite a contact with a line to the right of the marked position.

 Key **(↑ Shift) + (→)**.



Draw a Line to the Left. Erase a line to the left of the marked position. Overwrite a contact with a line to the left of the marked position.

 Key **(↑ Shift) + (←)**.



Draw a Line Upward. Erase a line upward of the marked position.

 Key **(↑ Shift) + (↑)**.



Draw a Line Downward. Erase a line downward of the marked position.

 Key **(↑ Shift) + (↓)**.



Add a Contact (NO) to the Right. Erase a contact (NO) to the right of the marked position. Overwrite a line with a contact to the right of the marked position.

 Key **ALT + (→)**.



Add a Contact (NO) to the Left. Erase a contact (NO) to the left of the marked position. Overwrite a line with a contact to the left of the marked position.

 Key **(↑ Shift) + (←)**.



Delete a Contact to the right of the marked position.

 Key **CTRL + F3**.



Negate (Change) the selected **Contact** from normally open (NO) to normally closed (NC) or vice versa (NC to NO).

 Key **(↑ Shift) + F4**.



Insert a **Contact** to the right of the marked position.



Key **ALT + F2**.



Insert a **Contact Parallel** to the contact to the right of the marked position.



Key **ALT + F3**.



Insert a **Coil** or an intermediate resolute to the right of the marked position.



Key **(Shift) + F3**.



Insert a **RS Flip Flop** (latch) with a dominating reset input.



Key **(Shift) + F5**.



Insert a **SR Flip Flop** (latch) with a dominating set input.



Key **ALT + F5**.



This icon opens a dialog box to select **Timers**.



Key **(Shift) + F6**.



This icon opens a dialog box to select **Counters**.



Key **(Shift) + F7**.



This icon opens a dialog box to select **Comparators**.



Key **CTRL + F9**.



Insert a **Block Call**.



Key **(Shift) + F10**.

Note:

The **right mouse button** may be used within the S5 Ladder Diagram (LAD) Editor. If the **right mouse button** is clicked, a menu with commands available for the S5 LAD Editor is opened.

The commands available are all the commands from the **Insert menu** plus some of the commands from the Modify menu. These commands give you full control to generate or change the PLC logic displayed in the workspace of the S5 Ladder Diagram (LAD) Editor window.

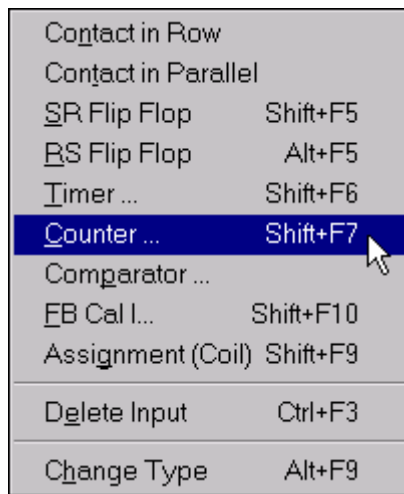


Figure 6-57 The right mouse menu (S7 Ladder Diagram (LAD) Editor)


6.4.3 Block (Block Menu – S5 LAD Presentation)

With the commands from the **Block** menu you can save a block and close the block editor. The block menu for the block editor, S5 PC LAD - presentation, and S5 PLC block editor LAD - presentation, are the same (see chapter 4.2.1).

6.4.4 Modify (Modify Menu – S5 LAD Presentation)

The commands from the **Modify** menu in the LAD presentation are used to work with an existing segment and/or create a new segment.

 ◆ Click **Modify** in the menu bar.

 ◆ Press **ALT + M**.

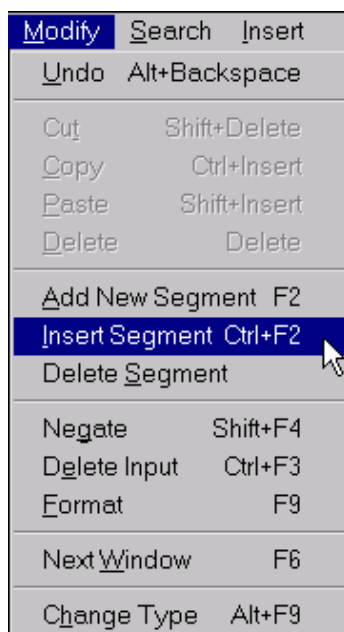


Figure 6-58 The **Modify** menu S5 LAD presentation

The commands **Cut**, **Copy**, **Paste**, and **Delete** are not available in LAD presentation.

The commands **Undo**, **Add New Segment**, **Insert Segment**, **Delete Segment**, and **Next Window** are commands that can also be used with other presentations. For detailed information on these commands from the modify menu see chapter 4.2.2.

The commands **Negate / Invert**, **Delete Input**, **Format** and **Change Type** have special functions in the S7 Ladder Diagram (LAD) presentation and are described below.

6.4.4.1 Negate (Modify Menu)

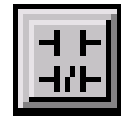
The **Negate** command, from the modify menu, changes the selected contact from a NO to a NC contact (normally open to a normally closed) or vice versa (normally closed to a normally open).

Note:

Only contacts having an operand assigned, symbolic or absolute, may be changed from a NO to a NC contact (normally open to a normally closed) or vice versa (normally closed to a normally open).

- ◆ Mark the contact (the name of the contact) or position the insertion mark (blue cross to the left of the contact).

- ◆ Click the **Negate (Change)** icon in the tool bar or the **Negate** command in the modify menu.



- ◆ Press **Shift + F4**.

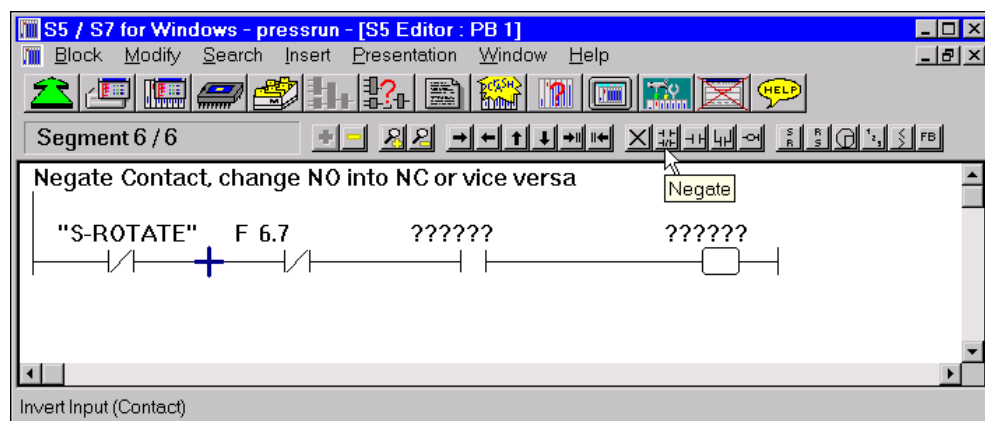


Figure 6-59 Change the NO to a NC contact or vice versa

6.4.4.2 Delete Contact (Input) (Modify Menu)

The **Delete Input (Contact)** command, from the modify menu, deletes the selected contact to the right of the insertion point (blue cross). Only contacts may be deleted.

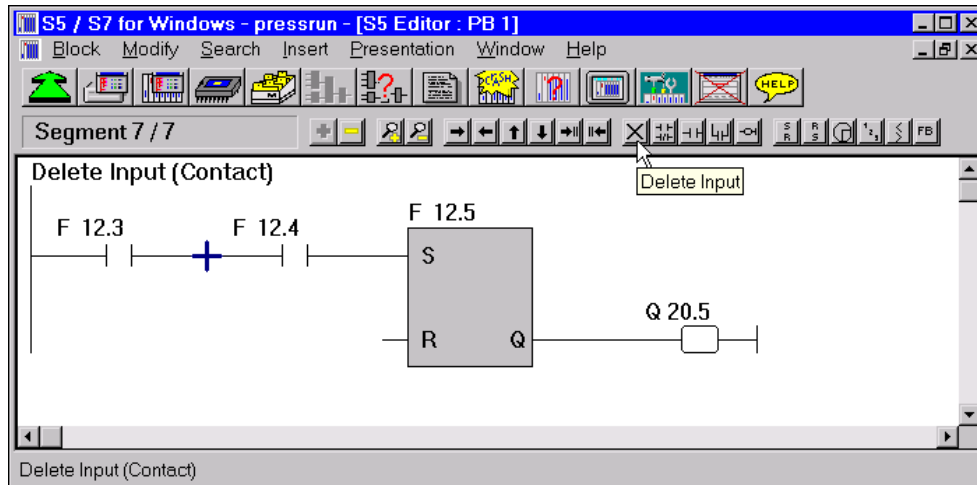


Figure 6-60 Delete contact (example)

- ◆ Click the **Delete** icon in the tool bar or the **Delete Input (Contact)** command in the modify menu.
- ◆ Press **CTRL + F3**.

6.4.4.3 Format (Modify Menu)

The **Format** command is used to format the PLC logic created in LAD presentation. The segment is redrawn and formatted. A syntax check of the construction of the segment is performed. If *S5 for Windows* detects an error, an error message will be displayed.

- ◆ Click **Format** in the modify menu.
- ◆ Press **F9**.

6.4.4.4 Change Type (Modify Menu)

- ◆ The **Change Type** command, from the modify menu, allows you to modify the type of logical functions. This could be a result (Coil), a Flip Flop (RS / SR latch), a timer, a counter, or a comparator. You may have to activate the change type command several times to change, for example, a pulse timer into a latched on-delay timer.

Note:

Only logical functions having an operand assigned, symbolic or absolute, may be changed by using the **Change Type** command.

◆ Click **Change Type** in the modify menu.

◆ Press **ALT + F9**.

Example: The following logical functions may change their type:

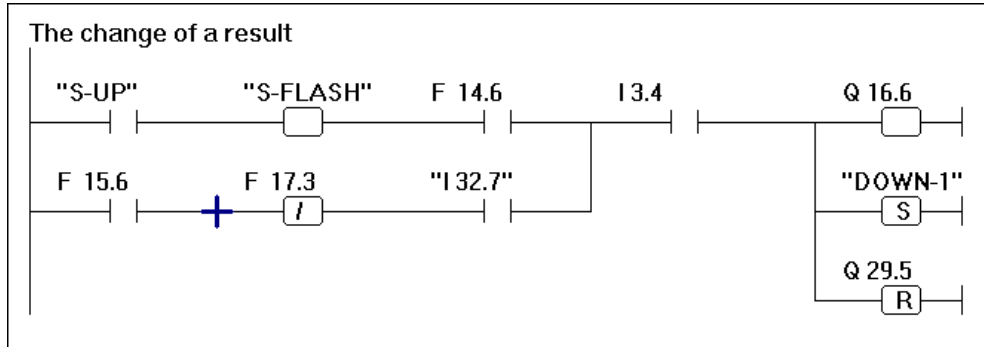


Figure 6-61 Change type of a result (coil) and an intermediate result

The result (coil) may be changed from **Normal** to an **S** (set) or **R** (reset) type. The intermediate result may be changed from **Normal** to **Negated**.

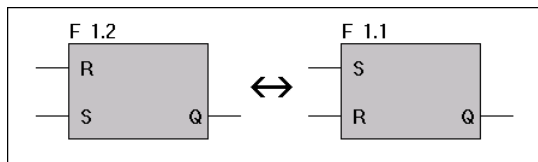


Figure 6-62 Change Type, RS Flip Flop, SR Flip Flop

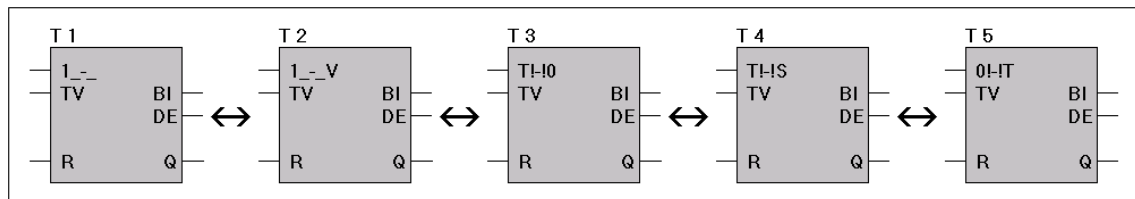


Figure 6-63 Change Type, Pulse Timer, Extended Pulse Timer, ON-Delay Timer, Latching ON-Delay Timer, OFF-Delay Timer

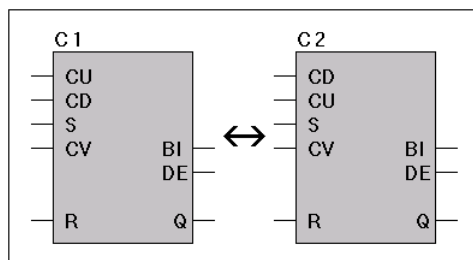


Figure 6-64 Change Type, Upward Counter, Downward Counter

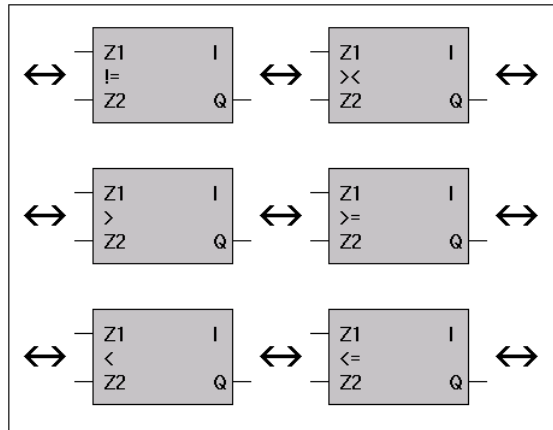


Figure 6-65 Change Type, Equal, Not Equal, Bigger, Bigger or Equal, Less, Less or Equal

6.4.5 Search (Search Menu – S5 LAD Presentation)

The commands, from the **Search** menu, in the LAD presentation, are used to review or change text in the displayed segment and to move to another segment.

In LAD presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, CSF, and /or Block-STL presentation.

The commands Search for, Replace, and Search again are not available in LAD presentation. For detailed information on the commands from the Search menu see chapter 4.2.3.

 ◆ Click **Search** in the menu bar.

 ◆ Press **ALT + S**.

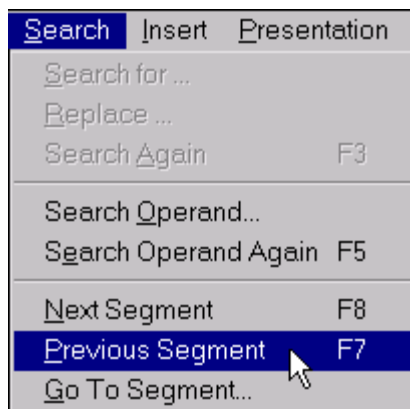


Figure 6-66 Search menu S5 - LAD presentation

6.4.6 Insert (Insert Menu – S5 LAD Presentation)

The commands from the **Insert** menu in the LAD Editor are used to insert logical functions in the workplace to build a segment. The commands are identical with the corresponding icons from the S5 - LAD Editor Toolbar (see chapter 6.4.2).

The commands Timer, Counter, Comparator, and FB Call, open dialog boxes. Those functions and the functions of the R-S and S-R Flip Flops are identical to the functions in CSF presentation (see chapter 6.3.6.4 – 6.3.6.9).

In LAD presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in STL, CSF and /or Block-STL presentation.

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

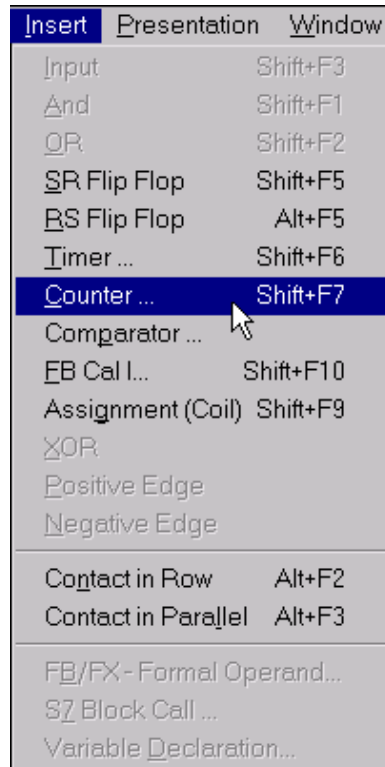


Figure 6-67 Insert menu S5 - LAD presentation

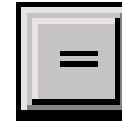
The commands Input, And, Or, XOR, Positive Edge, Negative Edge, FB / FX - Formal Operands, S7 Block Call, and Variable Declaration are not available in the S5 LAD presentation.

6.4.6.1 Assignment (Coil) (Insert an Assignment)

The command **Assignment (Coil)** inserts an assignment function symbol (result, intermediate result).

To add an assignment function symbol, position the insertion mark at the required position. For information on how to position the insertion mark see chapter 6.4.1. To change the assignment, mark the assignment name (e.g. Q 1.1 etc.).

- ◆ Click the **Assignment** icon in the tool bar or the **Assignment (Coil)** command in the insert menu.



- ◆ Press **Shift + F9**.

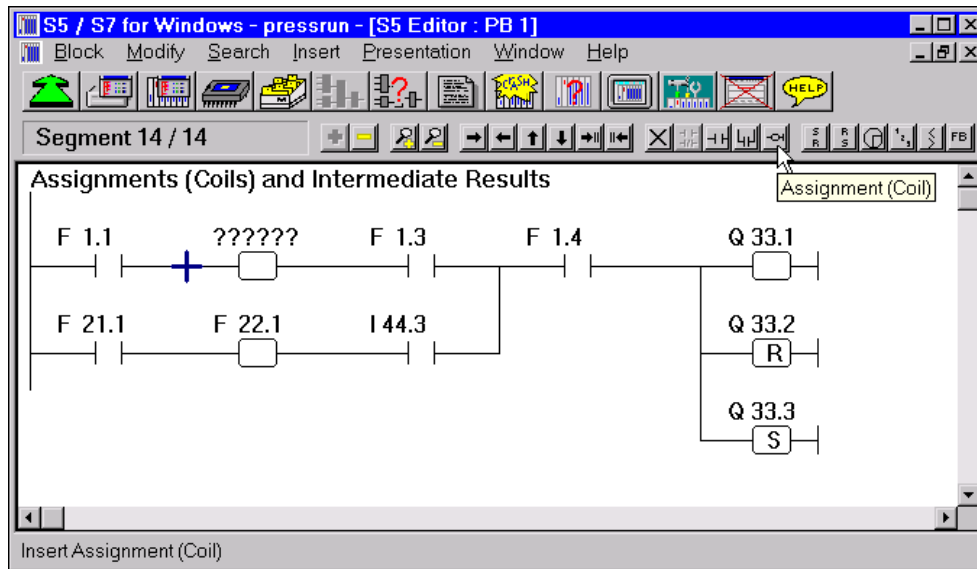


Figure 6-68 Assignment function symbols as results and intermediate results

Assignment function symbol as a result

The assignment, as a result, may have a **Normal**, a **Set (S)**, or a **Reset (R)** function. Changing the result function is done with the **Change Type (ALT + F9)** command from the modify menu (see chapter 6.4.4.4).

Assignment as an intermediate result

The assignment, as an intermediate result, may be **Normal** or **Negated (/)**. Changing the intermediate result function is done with the **Change Type (ALT+F9)** command from the modify menu (see chapter 6.4.4.4).

6.4.7 Presentation (Presentation Menu - S5 LAD Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. Not all commands are available in LAD presentation. For details on the commands from the presentation menu see chapter 4.2.5.

- ◆ Click **Presentation** in the menu bar.

- ◆ Press **ALT + P**.

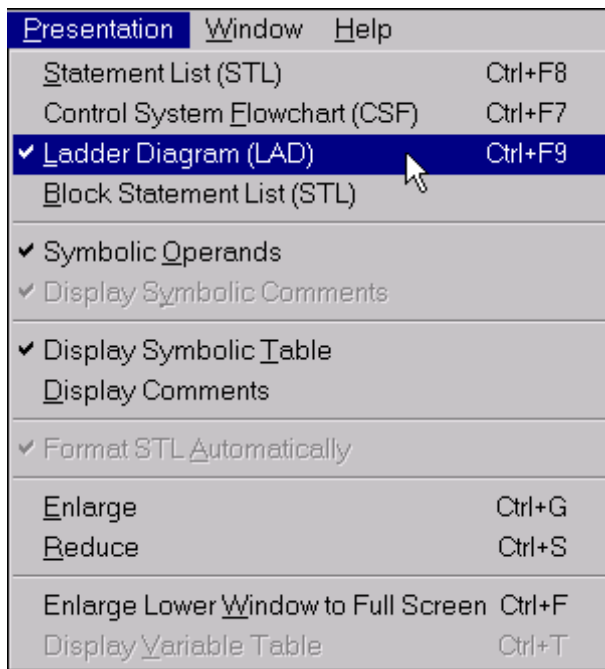


Figure 6-69 Presentation menu S5 LAD presentation

6.5 Editing a S5 Block Statement List (Block-STL)

The **Editor** in the **S5 Block - STL** is for the most part identical with the **S5 STL Editor**. The Block - STL editor has the ability to display a complete block for editing. By using the scroll bars you can move parts of the block into view when the entire block doesn't fit in the workplace.

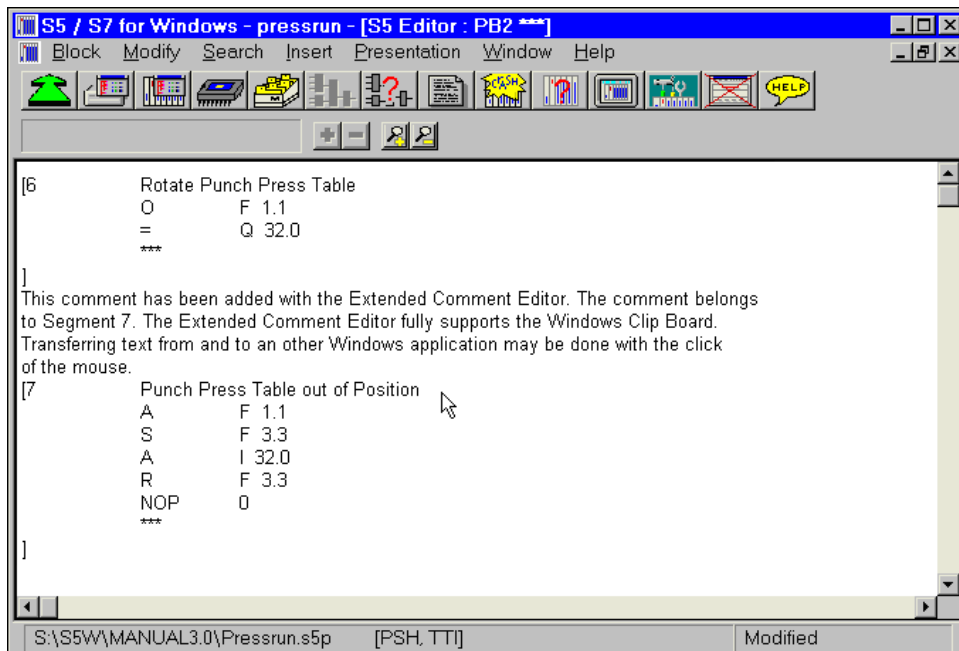


Figure 6-70 Example of an S5 Block - STL window

Each segment is displayed with the segment number and the segment comment (if present). The segment start is indicated with a bracket [followed by the segment number and the segment comment. The end of a segment is indicated with a closing bracket] .

An extended segment comment is displayed between the closing bracket of the previous segment and the opening bracket of the next segment, the comment is assigned to.

In the Block-STL the search and replace functions (chapter 4.2.3) may be used to search an entire block.

6.5.1 Modify Menu (S5 Block-STL - Presentation)

The commands from the **Modify** menu in the Block-STL presentation are used to work with an existing Block.

All the segment handling commands (add new-, insert-, delete segment) and the commands Negate, Delete Input, and Change Type are not available in Block-STL presentation. For detailed information on the commands from the modify menu see chapter 4.2.2.

◆ Click **Modify** in the menu bar.

◆ Press **ALT + M**.

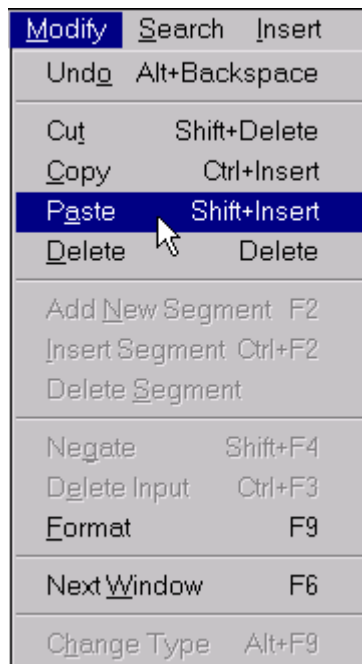


Figure 6-71 Modify menu S5 Block-STL presentation

In Block-STL presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in CSF, LAD and /or STL presentation.

6.5.2 Search Menu (S5 Block-STL - Presentation)

The commands from the **Search** menu in the Block-STL presentation are used to review or change text in the displayed segment and to move to another segment.

All commands except the segment handling commands (next-, previous-, go to segment) from the search menu are available in the Block-STL presentation.

◆ Click **Search** in the menu bar.

◆ Press **ALT + S**.

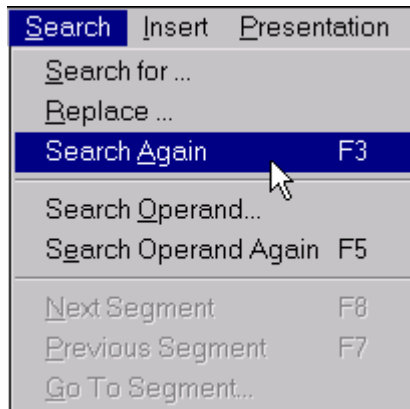


Figure 6-72 Search menu S5 Block-STL presentation

For detailed information on the commands from the search menu see chapter 4.2.3.

6.5.3 Insert Menu (S5 Block-STL - Presentation)

In Block-STL presentation the insert menu provides **FB /FX - Formal Operands** command.

◆ Click **Insert** in the menu bar.

◆ Press **ALT + I**.

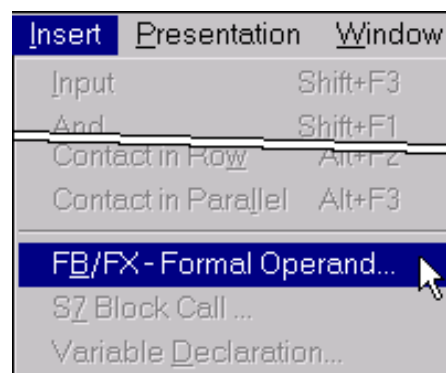


Figure 6-73 Insert menu S5 Block-STL presentation

In S5 Block-STL presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in CSF, LAD and /or STL presentation.

The FB /FX - Formal Operands command is described in the S5 STL editor (see chapter 6.2.7.1).

6.5.4 Presentation Menu (S5 Block-STL - Presentation)

The commands from the **Presentation** menu are used to select the logic presentation. Additional commands are available to configure the appearance of the presentations. Not all commands may be always available.

◆ Click **Presentation** in the menu bar.

◆ Press **ALT + P**.

In Block-STL presentation the commands displayed in bold black may be used. The commands displayed in light gray may be used in CSF, LAD and /or STL presentation.

The commands Display Comments, Enlarge, and Reduce are not available in S5 Block STL presentation. For detailed information on the commands from the presentation menu see chapter 4.2.5.

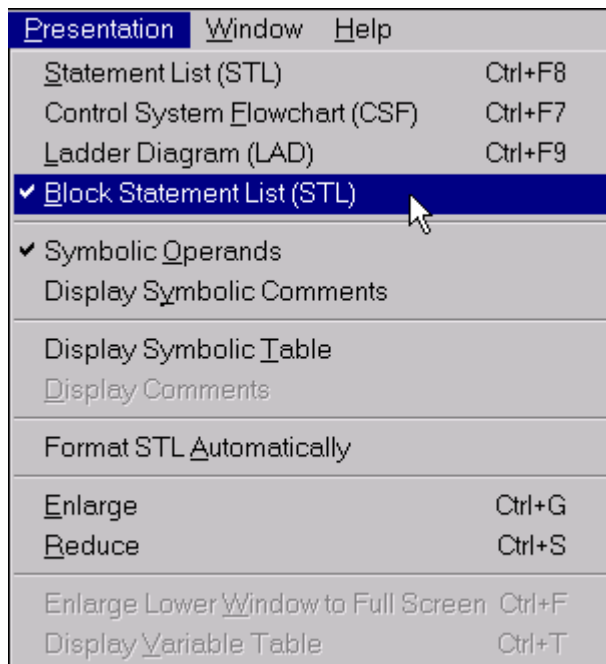


Figure 6-74 Presentation menu S5 Block-STL presentation

7 Cross Reference

S5 / S7 for Windows provides a tool to list the operands, their use, and origin. The Internal cross-reference list is constantly updated. Whenever you search for the use of an operand, the displayed (or printed) list provides the current state of the operand in use.

7.1 Cross Reference Window

With the commands from the **Cross Reference** window you can search for the location (networks) of operands used in the PLC program. You can also close the Cross Reference window.

There are several ways to open the cross-reference window.

- **Open the cross-reference window**

- **From the S5 / S7 editor or S5 / S7 status window**

- ◆ Mark the operand that you want cross-reference information about. A marked operand is shown with a blue background. In STL or Block-STL presentation, position the insertion mark within the operand. If an operand is marked in the status window the whole line is displayed in white on a black background.



- ◆ Click the **Cross Reference** icon in the tool bar.



- ◆ Press **F4**.

The cross-reference window is opened and displays the list of locations where the marked operand is used in the PLC program.

If you did not mark an operand, the cross-reference window will be opened and is ready for a search operation.

- **From all the other windows**



- ◆ Click the **Cross Reference** icon in the tool bar.



- ◆ Press **F4**.

The cross-reference window will be opened. Commands are provided to start the search operation.

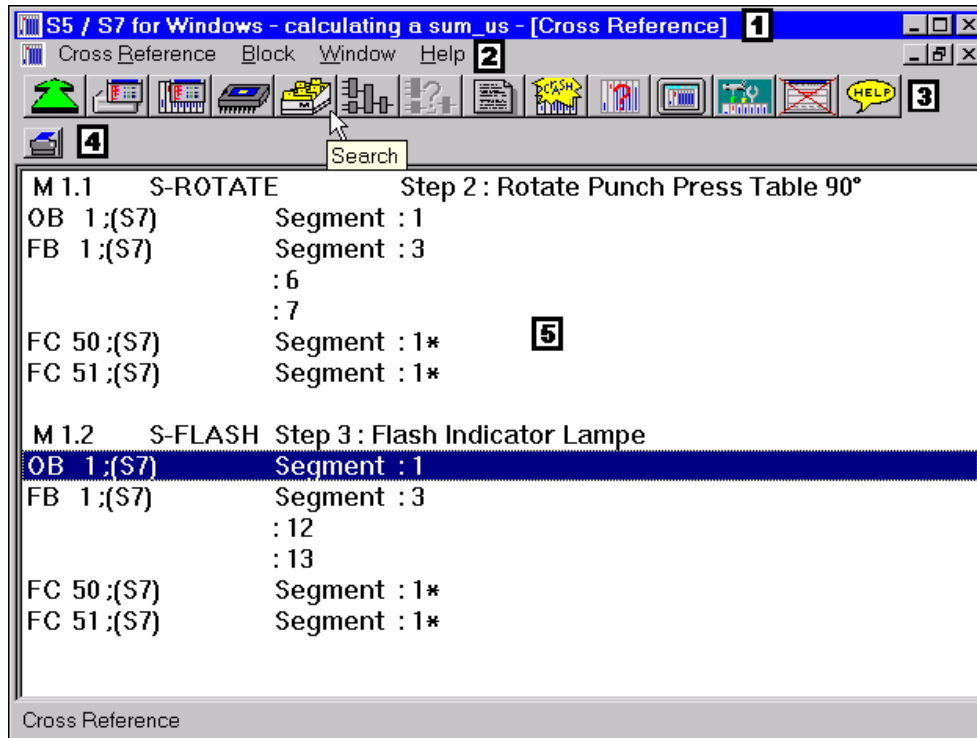
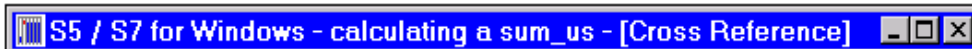


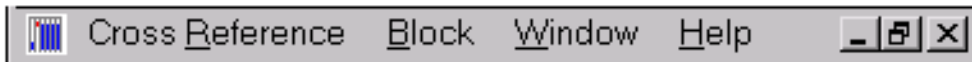
Figure 7-1 Cross Reference Window

1 S5 / S7 Cross Reference Title Bar



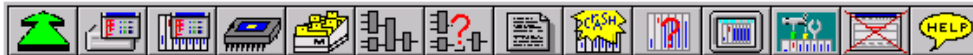
The Title bar displays *S5 / S7 for Windows*, the name of the open project (Calculating a Sum_US), and the name of the window (Cross Reference).

2 Menu Bar



The menu bar displays a list of menus. You may open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character of the menu name. All the commands from these menus are described in this chapter.

3 Tool Bar



The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. You can reach these functions with the keyboard via the window menu and/or the function keys. For more details see chapter 3.1.

4 Tool Bar II



The tool bar II provides an icon to print the contents of the cross-reference window.

5 Workplace - Cross-Reference -

The cross-reference list displays the operand in the absolute and also, if available, in the symbolic form with a comment (as defined in the symbolic table). The block and the segment where the operand is used is also displayed. A star (*) after the segment number indicates the source of the operand.

Note:

You can jump between the network (block) and the cross-reference list by using the icon *Open next Window* and double clicking the network line that contains the operand you are searching for.

7.2 Cross Reference Menu (S7 Cross Reference Window)

Commands from the cross-reference menu control the search for, and printing of, an operand, as well as closing of the cross-reference window.

◆ Click **Cross Reference** in the menu bar.

◆ Press **ALT + R**.

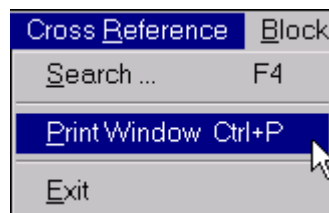


Figure 7-2 Cross-Reference Menu

7.2.1 Search (Cross-Reference Menu)

The **Search** command opens the **Cross-Reference** dialog box. You have to enter the name of the operand that you want to search for in the text field. The operand may be in absolute or symbolic form.

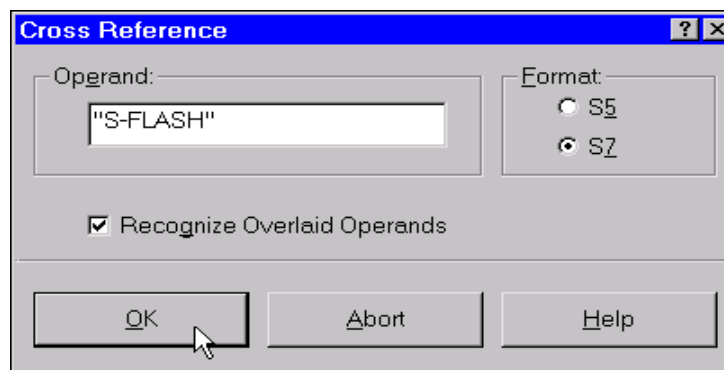




Figure 7-3 Cross Reference dialog box

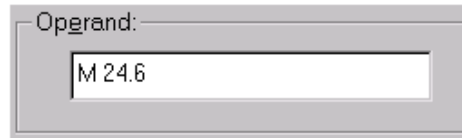
 ◆ Click **Search** in the cross-reference menu.

 ◆ Press **F4**.

● **Operand:**



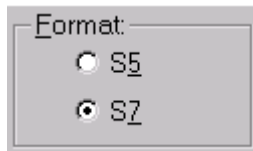
Operand: _____
"S-FLASH"



Operand: _____
M 24.6

The name of the operand listed in the cross reference can be entered in the text field in its symbolic or absolute form.

● **Format:**



Format:
 S5
 S7

If you have *S5 / S7 for Windows* installed on your PC you have to select the format of the operand that you want to display in the cross-reference list. If only *S7 for Windows* is installed, the S7 button is marked by default.

● **Recognize Overlaid Operands**

Recognize Overlaid Operands

When the **Recognize Overlaid Operands** button is marked, the specified bit displayed in the cross-reference is listed as a bit and if the bit is present in a byte, word, or double word that will also listed. A byte will be found in a word or double word and a word will be found in a double word.

If the button is not marked the specified operand will only be found in its specified format.

- ◆ Enter the name of the operand that you want displayed in the cross-reference list in the text field, **Enter Operand**. Mark the desired buttons and confirm by activating the **OK** button.

S7 for Windows displays the list of locations where the operand is used. A star (*) indicates the source of the operand. You can open the block segment with a double click on that particular line. You can view or edit this segment.

S7 for Windows can display a cross-reference list for the following operands (the **Range** may be restricted by the CPU and / or the working memory size). Absolute operand names can be entered in lower or uppercase letters. Spaces are ignored.

Operand	Range	The cross reference list displays	Example
*		the complete cross reference list	*
B		all Blocks	B
C		all Counters	C
Cn	0 to 255	the specified Counter	C12
D		all Data Words	D

Operands that can be displayed in the S7 cross-reference list (continued)

Operand	Range	The cross reference list displays	Example
DBBn	0 to 65533	the specified Data Byte in a Data Block	DBB12
DBDn	0 to 65530	the specified Data Double Word in a DB	DBD6
DBn	1 to 4095	the specified Data Block (DB)	DB5
DBWn	0 to 65532	the specified Data Word in a DB	DBW23
DBXn.n	0.0 to 65533.7	the specified Bit in a Data Block	DBX12.7
DIBn	0 to 65533	the specified Data Byte in a Instance DB	DIBn
DIDn	0 to 65530	the specified Data Double Word in a Instance DB	DIDn
DIWn	0 to 65532	the specified Data Word in a Instance DB	DIWn
DIXn.n	0.0 to 65533.7	the specified Bit in a Instance DB	DIXn.n
FBn	0 to 2047	the specified Function Block (FB)	FB567
FCn	0 to 2047	the specified Function (FC)	FC890
I		all Inputs	I
IBn	0 to 511	the specified Input Byte	IB44
IDn	0 to 508	the specified Input Double Word	ID24
In.n	0.0 to 511.7	the specified Input Bit, also from a Input Byte or Input Word	I34.5
IWn	0 to 510	the specified Input Word	IW15
LBn	0 to 16383	the specified Local Data Byte	LB23
LDn	0 to 16380	the specified Local Data Double Word	LD16
Ln.n	0.0 to 16383.7	the specified Local Data Bit, also from a Local Data Byte or Local Data Word	L26.7
LWn	0 to 16382	the specified Local Data Word	LW35
M		all Memory Bits	M
MBn	0 to 2047	the specified Memory Byte	MB34
MDn	0 to 2044	the specified Memory Double Word	MD54
Mn.n	0.0 to 2047.7	the specified Memory Bit, also from a Memory Byte or Memory Word	M56.4
MWn	0 to 2046	the specified Memory Word	MW23
PIBn	0 to 16383	the specified Peripheral Input Byte (direct I/O access)	PIB123
PIDn	0 to 16380	the specified Peripheral Input Double Word (direct I/O access)	PID456

Operands possible to be displayed in the S7 cross reference list (continued)

Operand	Range	The cross reference list displays	Example
PIWn	0 to 16382	the specified Peripheral Input Word (direct I/O access)	PIW246
PQBn	0 to 16383	the specified Peripheral Output Byte (direct I/O access)	PQB76
PQDn	0 to 16380	the specified Peripheral Output Double Word (direct I/O access)	PQD452
PQWn	0 to 16382	the specified Peripheral Output Word (direct I/O access)	PQW346
Q		all Outputs	Q
QBn	0 to 511	the specified Output Byte	QB487
QDn	0 to 508	the specified Output Double Word	QD345
Qn.n	0.0 to 511.7	the specified Output Bit, also from a Output Byte or Output Word	Q411.7
QWn	0 to 510	the specified Output Word	QW24
T	T	all Timers	T
Tn	0 to 511	the specified Timer	T126

Table 7-1 Operands possible to be displayed in the S7 cross reference list

7.3 Cross Reference Menu (S5 Cross Reference Window)

Commands from the cross-reference menu control the search for, and printing of, an operand as well as closing the cross-reference window.

 ◆ Click **Cross Reference** in the menu bar.

 ◆ Press **ALT + R**.

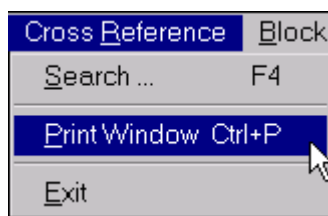


Figure 7-4 Cross-Reference Menu

7.3.1 Search (Cross-Reference Menu)

The **Search** command opens the **Cross-Reference** dialog box. You have to enter the name of the operand that you want to search for in the text field. The operand may be in absolute or symbolic form.

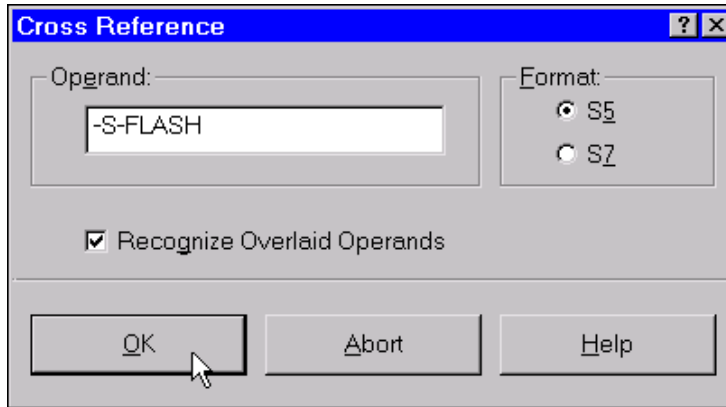
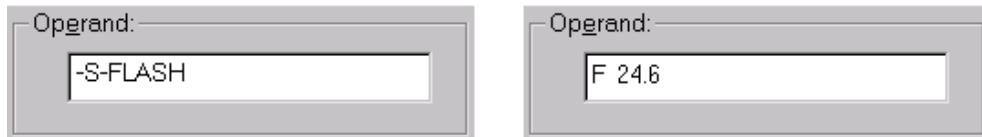


Figure 7-5 Cross Reference dialog box

◆ Click **Search** in the cross-reference menu.

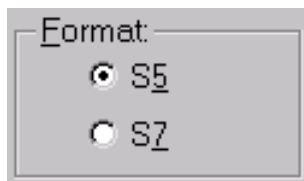
◆ Press **F4**.

- **Operand:**



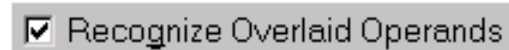
The name of the operand can be entered in the text field in its symbolic or absolute form.

- **Format:**



If you have *S5 / S7 for Windows* installed on your PC you have to select the format of the operand that you want to display in the cross-reference list. If only *S5 for Windows* is installed, the S5 button is marked by default.

- **Recognize Overlaid Operands**



When the **Recognize Overlaid Operands** button is marked, the specified bit will be displayed in the cross reference is listed as a bit and if the bit is present in a byte, word, or double word that will also listed. A byte will be found in a word or double word and a word will be found in a double word.

If the button is not marked the specified operand will only be found in its specified format.

- ◆ Enter the name of the operand that you want displayed in the cross-reference list in the text field, **Enter Operand**. Mark the desired buttons and confirm by activating the **OK** button.

S5 for Windows displays the list of locations where the operand is used. A star (*) indicates the source of the operand. You can open the block segment with a double click on that particular line. You can view or edit this segment.

S5 for Windows can display a cross-reference list for the following operands (the **Range** may vary by the CPU type).

Absolute operand names can be entered in lower or uppercase letters. Spaces are ignored.

The following search criteria may be used.

Input	A list of
*	the complete cross reference list
B	all Blocks
BBn	the specified Picture Block
C	all Counters
Cn	the specified Counter
D	all Data Words
DBn	the specified Data Block
DDn	the specified Data Double Word
DLn	the specified Data Word, left Byte
Dn.n	the specified Bit in a Data Word
DRn	the specified Data Word, right Byte
DWn	the specified Data Word
DXn	the specified Extended Data Block
F	all Flags
FBn	the specified Function Block
FDn	the specified Flag Double Word
Fn.n	the specified Flag (Bit), also from a Byte and Word
FWn	the specified Flag Word
FXn	the specified Extended Function Block
FYn	the specified Flag Byte
I	all Inputs
IBn	the specified Input Byte
IDn	the specified Input Double Word
In.n	the specified Input (Bit), also from a Byte and Word
IWn	the specified Input Word

The following search criteria may be used. (continued)

OB	the specified Organization Block
OWn	the specified Extended Peripheral Word
OYn	the specified Extended Peripheral Byte
P	all Peripheral Bytes and Words
PB	the specified Program Block
PWn	the specified Peripheral Word
PYn	the specified Peripheral Byte

Table 7-2 Operands possible to be displayed in the S7 cross reference list

7.3.2 Print Window (Cross Reference Menu)

Executing the print command starts the printing of the cross-reference list displayed in the workplace of the cross-reference window.

- ◆ Click the **Print** icon in the tool bar or click **Print Window** in the block menu.



- ◆ Press **CTRL + P**

7.3.3 Exit (Cross Reference Menu)

With the **Exit** command from the Cross Reference menu, you can close the cross-reference window.

- ◆ Click **Exit** in the cross-reference menu.

- ◆ Press **ALT + R, E**.

7.4 Block Menu (Cross Reference Window)

Commands from the **Block** menu in the cross-reference window are used to print marked blocks and to modify blocks with the editor.

- ◆ Click **Block** in the menu bar.

- ◆ Press **ALT + B**.

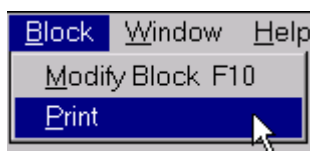


Figure 7-6 The Block menu

7.4.1 Modify Block (Block Menu)


This command opens the editor for the block network selected (marked in the cross-reference window workplace). If you did not select a block network (marked) in the cross-reference window workplace, the command is not active.


 ◆ Click **Modify Block** in the cross-reference menu.

 ◆ Press **F10**.

7.4.2 Print (Block Menu)

Executing the print command starts the printing of the selected block. One or more blocks may be marked in the cross-reference window workplace for printing.

 ◆ Click **Print** in the block menu.

 ◆ Press **ALT + B, P**

The marked blocks will be printed using the presets from the documentation layout dialog box (see chapter 3.2.13.1).

7.5 Window (Window Menu - Cross Reference Window)

The **Window** menu from the cross-reference window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

7.6 Help (Help Menu - Cross Reference Window)

The **Help** menu from the cross-reference window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

8 Symbolic Table

S5 / S7 for Windows provides a symbolic table editor to create and edit a **Symbolic Table** (Assignment List). This list must be generated before symbolic operands can be used within the PLC program. The symbolic names of global variables are assigned in the symbolic table (*S7 for Windows* only).

8.1 Symbolic Table Editor Window

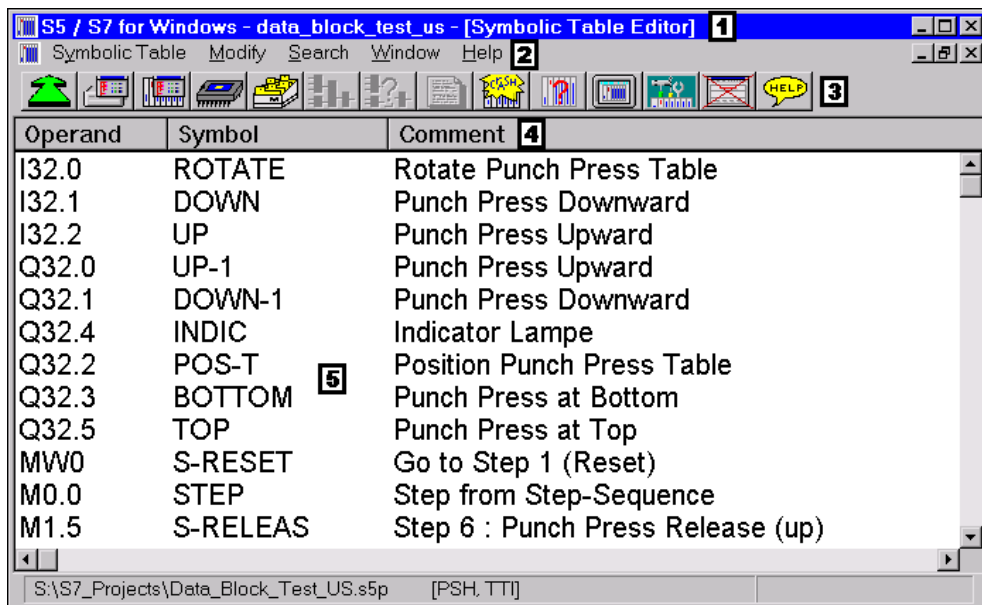


Figure 8-1 Symbolic Table Editor Window

The symbolic table editor is basically a text editor. Special functions have been added to sort and test the symbolic table.

◆ Click the **Symbolic Table** icon in the tool bar.

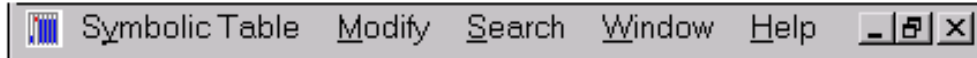


◆ Press **ALT + W, Y**.

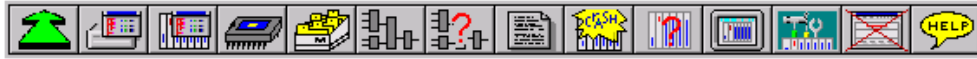
1 S5 /S7 Symbolic Table Title Bar



The Title bar displays *S5 / S7 for Windows*, the name of the open project (*Data_Block_Test_US*), and the name of the window (*Symbolic Table Editor*).

2 Menu Bar

The menu bar displays a list of menus. You may open a menu by clicking on the name of the menu or by pressing the **ALT** key and then the underlined character from the menu name. All the commands from these menus are described in this chapter.

3 Tool Bar

The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. You can reach these functions with the keyboard via the window menu and/or the function keys. For more details see chapter 3.1.

4 Workplace Column Title Bar

By holding the left mouse button and dragging the column limit, you can adjust the width of the columns in the symbolic table workplace. The width of the columns can be adjusted to accommodate the font selected (see chapter 3.2.11.4).

5 Workplace - Symbolic Table Editor -

The workplace provides columns for absolute addresses (global variables & operands), symbolic addresses (global variables & operands), and the comment.

8.2 The S7 Symbolic Table Format

To be compatible with the SIEMENS STEP® 7 programming system, *S7 for Windows* follows the same syntax.

The maximum column width is set as **follows**:

Operand	Symbol	Comment
The number of characters is given by the absolute address	max. 24 alpha numerical characters	max. 80 alpha numerical characters

Table 8-1 S7 Symbolic Table column width

- Permitted absolute addresses

Address	Range	Explanation	Example
Cn	0 to 255	the specified Counter	C12
DBn	1 to 4095	the specified Data Block (DB)	DB5
FBn	0 to 2047	the specified Function Block (FB)	FB567
FCn	0 to 2047	the specified Function (FC)	FC890
IBn	0 to 511	the specified Input Byte	IB44
IDn	0 to 508	the specified Input Double Word	ID24
In.n	0.0 to 511.7	the specified Input Bit, also from a Input Byte or Input Word	I34.5
IWn	0 to 510	the specified Input Word	IW15
MBn	0 to 2047	the specified Memory Byte	MB34
MDn	0 to 2044	the specified Memory Double Word	MD54
Mn.n	0.0 to 2047.7	the specified Memory Bit, also from a Memory Byte or Memory Word	M56.4
MWn	0 to 2046	the specified Memory Word	MW23
OBn	specific numbers	the specified Organization Block (OB)	OB1
PIBn	0 to 16383	the specified Peripheral Input Byte (direct I/O access)	PIB123
PIDn	0 to 16380	the specified Peripheral Input Double Word (direct I/O access)	PID456
PIWn	0 to 16382	the specified Peripheral Input Word (direct I/O access)	PIW246
PQBn	0 to 16383	the specified Peripheral Output Byte (direct I/O access)	PQB76
PQDn	0 to 16380	the specified Peripheral Output Double Word (direct I/O access)	PQD452
PQWn	0 to 16382	the specified Peripheral Output Word (direct I/O access)	PQW346
QBn	0 to 511	the specified Output Byte	QB487
QDn	0 to 508	the specified Output Double Word	QD345
Qn.n	0.0 to 511.7	the specified Output Bit, also from a Output Byte or Output Word	Q411.7
QWn	0 to 510	the specified Output Word	QW24
SDBn	specific numbers	the specified system data block	SDB1

Permitted absolute addresses (continued)

Address	Range	Explanation	Example
SFBn	specific numbers	the specified system function block	SFB14
SFCn	specific numbers	the specified system function	SFC51
Tn	0 to 511	the specified Timer	T126
UDTn	0 to 255	the specified User Data Type	UDT65

Table 8-2 Absolute addresses (global variables; operands)

- **Absolute Addresses**

The left column (Column 1) of the symbolic table is reserved for the absolute address. Any address identifier (alpha character) entered in a lower case letter will be changed into a upper case letter during format, save, or sort operations.

The alphabetic sorting of the symbolic table is using the ASCII value. Alpha characters follow numbers.

- **Symbolic Addresses**

The second column (column 2) is reserved for symbolic addresses. The symbol may be up to 24 characters (alpha and numeric characters). The actual number of characters displayed on the screen in the LAD and CSF presentation is dependent on the selection from the preferences dialog box (see chapter 3.2.11.2). In STL and Block-STL (source text) presentation, the symbolic address is always displayed with up to 24 characters.

Note:

For compatibility considerations we strongly recommend that you use only letters and numbers. Do not use any "special characters".

In networks (blocks), symbols are displayed in quotation marks ("**Symbol**"). These quotation marks are only needed when you enter a symbol in a network (block). When assigning a symbol to an absolute address in the symbolic table, do not use the quotation marks.

- **Comment Field**

The third column (column 3) in the symbolic table is used for the comment. The comment may be up to 80 characters (alpha and numeric characters). Upper and lower case are permitted.

You may enter separate comment lines in the symbolic table. A comment line must start with a semicolon (;) character. These comment lines are only displayed in the symbolic table and are not assigned to an absolute address.

- **Special Characters within the Symbolic Table**

Page Break

The characters **.PA** at the beginning of a line will force a page break at this point. These characters are saved with the symbolic table.

Additional comment

The semicolon character (**;**) at the beginning of a line defines that line as a comment line. Comment lines are not assigned to any absolute address.

8.3 The S5 Symbolic Table Format

To be compatible with the SIEMENS STEP® 5 programming system, *S5 for Windows* follows the same syntax.

The maximum column width is set as **follows**:

Operand	Symbol	Comment
The number of characters is given by the absolute address	max. 24 alpha numerical characters	max. 80 alpha numerical characters

Table 8-3 S5 Symbolic Table column width

- **Absolute Operands**

The left column (Column 1) of the symbolic table is reserved for the absolute operands. Any operand identifier (alpha character) entered with a small letter will be changed to a capital letter during the format, save, or sort operation.

The alphabetic sorting of the symbolic table is using the ASCII value. Alpha characters follow numbers.

The following operands may have a symbolic assignment. The list is sorted following the ASCII value.

- **Permitted absolute Operands**

Operand	Definition	Operand	Definition
BB	Picture Block	OB	Organization Block
C	Counter	OW	Extended Peripheral Word
D	Bit in a Data Word	OY	Extended Peripheral Byte
DB	Data Block	PB	Program Block
DD	Data Double Word	PW	Peripheral Word
DL	Data Word, left Byte	PY	Peripheral Byte
DR	Data Word, right Byte	Q	Output (Bit)
DW	Data Word	QB	Output Byte

Permitted absolute Operands (continued)

Operand	Definition	Operand	Definition
DX	Extended Data Block	QD	Output Double Word
F	Flag (Bit)	QW	Output Word
FB	Function Block	S	Extended Flag Area
FD	Flag Double Word	SB	Sequence Block
FW	Flag Word	SD	Extended Flag Double Word
FX	Extended Function Block	SW	Extended Flag Word
FY	Flag Byte	SY	Extended Flag Byte
I	Input (Bit)	T	Timer
IW	Input Word		

Table 8-4 Absolute operands

- **Symbolic Addresses**

The second column (column 2) is reserved for symbolic addresses. The symbol may be up to 24 characters (alpha and numeric characters). The actual number of characters displayed on the screen in the LAD and CSF presentation, is dependent on the selection from the preferences dialog box (see chapter 3.2.11.2). In STL and Block-STL (source text) presentation, the symbolic address is always displayed with up to 24 characters.

Note:

For compatibility considerations we strongly recommend that you use only letters and numbers. Do not use any "special characters".

In networks (blocks), symbols are displayed in quotation marks ("**Symbol**"). These quotation marks are only needed when you enter a symbol in a network (block). When assigning a symbol to an absolute address in the symbolic table, do not enter the quotation marks.

- **Comment Field**

The third column (column 3) in the symbolic table is used for the comment. The comment may be up to 80 characters (alpha and numeric characters). Upper and lower case are permitted.

You may enter separate comment lines in the symbolic table. A comment line must start with a semicolon (;) character. These comment lines are only displayed in the symbolic table and are not assigned to an absolute address.

- **Special Characters within the Symbolic Table**

Page Break

The characters **.PA** at the beginning of a line will force a page break at that point. These characters are saved with the symbolic table.

Additional comment

The semicolon character (;) at the beginning of a line defines that line as a comment line. Comment lines are not assigned to any absolute address.

8.4 Keyboard and Mouse Functions (Symbolic Table Editor)

Within the workplace you can enter text at a given position by moving the insertion point to that position.

With the **INSERT** key you can switch in and out the type-over mode. By default, *S5 / S7 for Windows* makes room for any new characters you type in by moving existing characters to the right.

You can change the insert mode and have *S5 / S7 for Windows* replace existing characters with new characters. This is called type-over. This momentary mode is indicated by the insertion point cursor.

- **Insert mode.** The cursor appears as a small, blinking, vertical line.
- **Type-over mode.** The cursor appears as a blinking black rectangle.

● Moving the insertion point using the mouse

- ◆ Use the scroll bars until you reach the location to enter text.
- ◆ Click (press and release the left mouse button) the location where you want to position the insertion point.

Positioning of the insertion point within the columns depends on the column.





Absolute and Symbols Address Column

In an empty line the insertion point always goes to the beginning of the column. In a column with an existing operand or symbol you can place the insertion point within the text. Positioning the insertion point in the space between columns puts the insertion point at the end of the text.

Comment Column

The insertion point may be placed at any position in the comment column.

● Moving the insertion point using the keyboard

To move	Press
One character to the left (within text and within the comment column)	
One character to the right (within text and within the comment column)	
One line up	
One line down	

Moving the insertion point using the keyboard (continued)







To move	Press
One word to the left (within the comment column)	CTRL + 
One word to the right (within the comment column)	CTRL + 
To the end of a line	END
To the beginning of a line	HOME
Up one screen	PAGE UP
Down one screen	PAGE DOWN
To the end of the symbolic table	CTRL + END
To beginning of the symbolic table	CTRL + HOME
To the previous column (if the insertion point is currently in the space between columns)	
To the next column (if the insertion point is currently in the space between columns)	
To the next column (next Tab position within the comment column)	TAB
To the beginning of a line (a new line is added)	


Table 8-5 Moving the insertion point using the keyboard (symbolic table)

Note:

Always use the **TAB** key to move to the next column when you enter a new **Absolute Address**, a new **Symbolic Address**, or a **Comment** in an empty line.

Use  only after entering the comment to move to the next line to enter the next absolute address.


- **Selecting text using the mouse**

 ◆ Do one of the following

To select	Do this
Any amount of text	Drag over the text you want to select
A word (within column)	Double-click the word

Table 8-6 Selecting text using the mouse (symbolic table)

- **Selecting text using the keyboard**

 ◆ Do one of the following











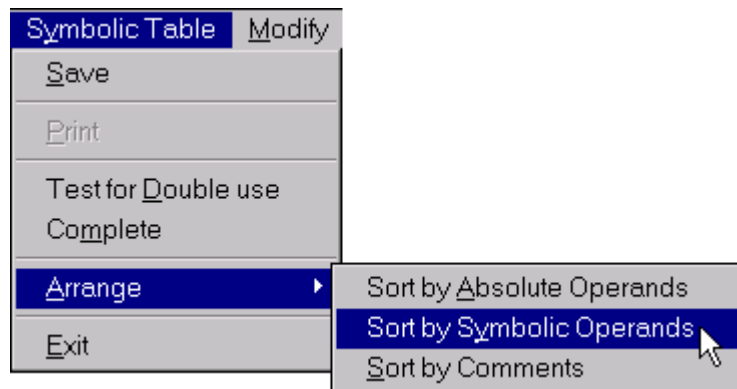
To select	Press
One character to the left	 + 
One character to the right	 + 
One line up	 + 
One line down	 + 
The line	 + END
The line	 + HOME

Table 8-7 Selecting text using the keyboard (symbolic table)

8.5 Symbolic Table Menu (Symbolic Table Window)

The commands from the **Symbolic Table** menu are used to save, test, sort, complete, and close the symbolic table.

 ◆ Click **Symbolic Table** in the menu bar.





 ◆ Press **ALT + Y**.

Figure 8-2 Symbolic table menu

8.5.1 Save (Symbolic Table Menu)

The symbolic table file in your system's RAM is saved under the current file name (symbolic table file name specified in the project file, see chapter 3.2.5).

 ◆ Click **Save** in the symbolic table menu.

 ◆ Press **ALT + Y, S**.

Note:

S5 / S7 for Windows provides different possibilities to save a new or modified symbolic table. Editing takes place in the RAM of your PC. See chapter 3.2.11.2, Save Blocks.


Immediately on Disk


The modified **symbolic table** is saved on disk whenever you select the **Save** command from the editor window or by closing the editor window.

If the button is not marked, the modified data is stored in an intermediate buffer whenever you execute a **Save** command from one of the editor windows. To store the data on disk you have to execute the **Save** command from the Block menu in the PC block list windows.

8.5.2 Print (Symbolic Table Menu)

Executing the print command starts the printing of the symbolic table window.

 ◆ Click **Print** in the symbolic table menu.

 ◆ Press **ALT + Y, P**

The symbolic table will be printed using the presets from the documentation layout dialog box (see chapter 3.2.13.1).

8.5.3 Test for Double use (Symbolic Table Menu)

In the symbolic table you cannot assign an absolute address or a symbol twice. The command **Test for Double use** checks the symbolic table for any match of absolute addresses and symbols. If *S5 / S7 for Windows* finds a double use, an error message will be displayed and the faulty line will be marked. After correcting the fault, run **Test for Double use** again.

Absolute addresses entered with lower case characters are modified into upper case characters.

 ◆ Click **Test for Double use** in the symbolic table menu.

 ◆ Press **ALT + Y, D**.

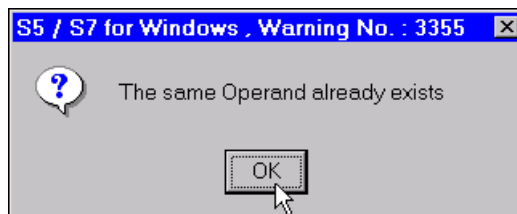




Figure 8-3 Double use error message

8.5.4 Complete (Symbolic Table Menu)

The **Complete** command, from the symbolic table menu, searches the PLC program for addresses not defined in the symbolic table. These addresses will be listed at the end of the symbolic table. The absolute address is used as the symbolic name. This is an easy way to create a symbolic table.

-  ◆ Click **Complete** in the symbolic table menu.
-  ◆ Press **ALT + Y, M**.

8.5.5 Arrange (Symbolic Table Menu)

S5 /S7 for Windows provides tools to arrange (sort) the symbolic table.

Note:

Sorting may be done even if the **Test for Double use** has found absolute addresses and symbols have been used more than once. Absolute addresses entered without a symbol will get the same absolute address assigned as a symbolic name.

8.5.5.1 Sort by Absolute Operands

Use the **Sort by Absolute Operands** command to sort the symbolic table in the alphabetically ascending order of the absolute addresses. This sort is done using ASCII values (numbers are listed prior to alpha characters).

-  ◆ Click **Arrange, Sort by Absolute Operands** in the symbolic table menu.
-  ◆ Press **ALT + Y, A, A**.

8.5.5.2 Sort by Symbolic Operands

Use the **Sort by Symbolic Operands** command to sort the symbolic table by symbolic names in alphabetically ascending order. This sort is done using ASCII values (numbers are listed prior to alpha characters).

-  ◆ Click **Arrange, Sort by Symbolic Operands** in the symbolic table menu.
-  ◆ Press **ALT + Y, A, Y**.


8.5.5.3 Sort by Comments


Use the **Sort by Comments** command to sort the symbolic table by the comments in alphabetically ascending order. This sort is done using ASCII values (numbers are listed prior to alpha characters).

-  ◆ Click **Arrange, Sort by Comments** in the symbolic table menu.
-  ◆ Press **ALT + Y, A, S**.

8.5.6 Exit (Symbolic Table Menu)

With the **Exit** command, from the symbolic table menu, you can close the symbolic table editor window.

 ◆ Click **Exit** in the symbolic table menu.

 ◆ Press **ALT + Y, E**.

8.6 Modify Menu (Symbolic Table Window)

The commands from the **Modify** menu in the symbolic table editor window are used to work with an existing symbolic table and/or create a new symbolic table. Commands displayed in light gray are not currently available.

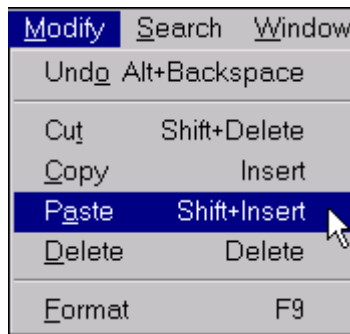


Figure 8-4 Modify Menu (Symbolic Table Window)

 ◆ Click **Modify** in the menu bar.

 ◆ Press **ALT + M**.

8.6.1 Undo (Modify Menu)

S5 / S7 for Windows keeps track of the edits you make. If you change your mind or make a mistake, you can usually reverse the last action you took.

 ◆ Click **Undo** in the modify menu.

 ◆ Press **SHIFT + BACKSPACE**.

8.6.2 Cut, Copy, Paste (Modify Menu)

The *S5 / S7 for Windows* symbolic table editor fully supports the windows clipboard. You may copy or move any marked text within the symbolic table or to another application, using the windows clipboard.


- **Moving**

Moving means to remove (**Cut**) the selected text from one location and insert it in another location. This can be within the same symbolic table, another symbolic table from a different PLC program, or another windows application (e.g. Word Processor).

- **Copying**

Copying means to make a copy of the selected text and insert it in another location. This could be within the same symbolic table, another symbolic table from a different PLC program, or another windows application (e.g. Word Processor).

- **To move or copy text using the mouse**

 ◆ Select the text with mouse.

To **move** text, click **Cut** from the modify menu. The text is transferred into the windows clipboard and is removed from the current location.

To **copy** text, click **Copy** from the modify menu. The text is transferred into the windows clipboard. The text maintains in the current location.


◆ Position the insertion point in a new location.

If the new location is another symbolic table in a different PLC program or another *Windows* application (e.g. Word Processor), open the desired location.

If you want to paste the text, click the **Paste** command from the modify menu. All windows applications that support the clipboard provide for the paste command.

The selected text is at the new location.

- **To move or copy text using the keyboard**

 ◆ Select the text by using key combinations.



To:	Press:
Copy selected text to the clipboard	CTRL + INSERT, or CTRL + C, or ALT + M, C
Move (Cut) selected text to the clipboard	 + DELETE or CTRL + X, or ALT + M, T
Paste Clipboard contents into a new location	 + INSERT, or CTRL +V, or ALT + M, A


Table 8-8 Move or copy text using the keyboard (Symbolic Table)

8.6.3 Delete (Modify Menu)

The **Delete** command from the modify menu is used to delete marked (selected) text. The *Windows* clipboard contents are not modified by this command.

Deleted text may only be returned to its original location by executing the **Undo** command directly after deleting the text.

 ◆ Click **Delete** in the modify menu.

 ◆ Press the **DELETE** key.

The marked text is deleted.

8.6.4 Format (Modify Menu)

The **Format** command, from the modify menu, formats the symbolic table and performs a syntax check. If *S5 / S7 for Windows* detects an error, an error message is displayed indicating the incorrect syntax. Addresses defined in an absolute form that have no symbol assigned will get the same name assigned as a symbol.

- ◆ Click **Format** in the modify menu.
- ◆ Press **F9**.

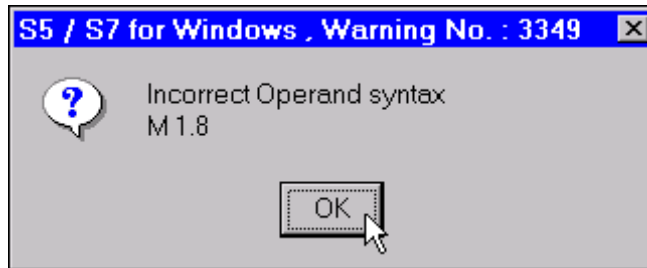


Figure 8-5 Incorrect syntax error message (symbolic table)

The error message will highlight the line with the incorrect syntax as a prompt.

8.7 Search Menu (Symbolic Table Window)

Commands from the **Search** menu in the symbolic table editor window are used to review or change text in the symbolic table.

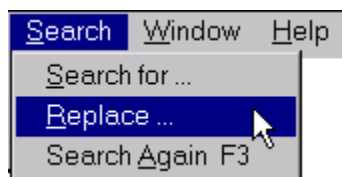


Figure 8-6 Search menu (symbolic table)

- ◆ Click **Search** in the menu bar.
- ◆ Press **ALT, S**.

8.7.1 Search for (Search Menu)

The **Search for** command opens a dialog box where you can enter a text string that you want to search for. The search function looks for identical ASCII strings and can only be used in the STL presentations.

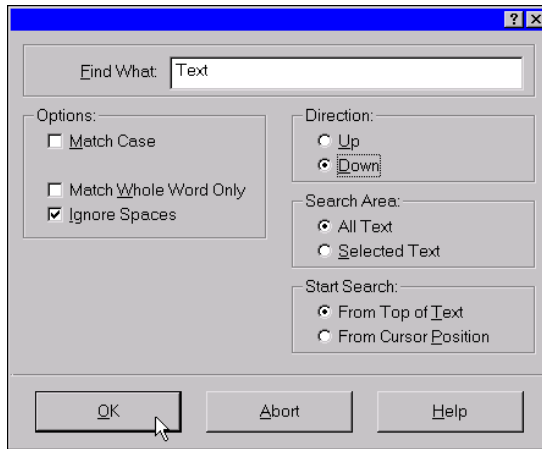



Figure 8-7 Find dialog box

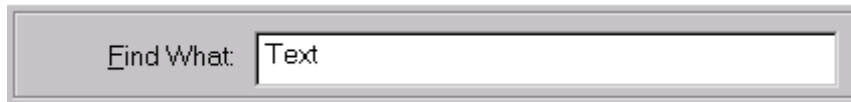
 ◆ Click **Search for** in the search menu.

 ◆ Press **ALT + S, S**.

If an identical string is found the search is canceled and the identified string is marked (blue background). If no match is found the search is canceled and a corresponding message will be displayed.

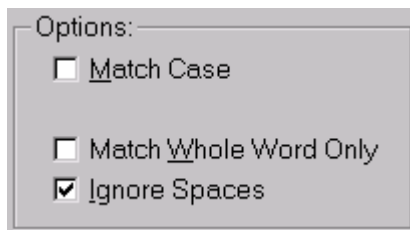
You may restart the search after a text string has been found by pressing the **F3** key. You can repeat this process until you reach the end of the text.

- **Find What:**



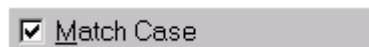
In the text field **Find What** enter the text string you want to search for. The text field is supported by the Clipboard copy function. It is wise to copy the string you want to search for into the text field to avoid spelling mistakes.

- **Options**



The search function allows you to select options on how you want to handle the search string.

- **Match Case**



If the **Match Case** button is marked the search function will only find text strings that have the same pattern of upper and lower case letters as the search string.

Match Whole Word Only

Match Whole Word Only

If the **Match Whole Word Only** button is marked the search function will only find words having the same length as the search words.

Ignore Spaces

Ignore Spaces

Text strings may have space characters included. To ensure that differences in the number of spaces will not influence the search function you can mark the **Ignore Spaces** button.

● Direction

Direction:

Up

Down

The search may be performed in the up or down direction.

● Search Area

Search Area:

All Text

Selected Text

The search may be performed in the text opened with the editor or only in the marked portion of the text

● Start Search

Start Search:

From Top of Text

From Cursor Position

The search may start at the beginning of the symbolic table or it may start from the position of the insertion mark (Cursor).

8.7.2 Replace (Search Menu)

The **Replace** command opens a dialog box where you can enter a text string that you want to search for and another text string you want to replace it with.

 ◆ Click **Replace** in the search menu.

 ◆ Press **ALT + S, R**.

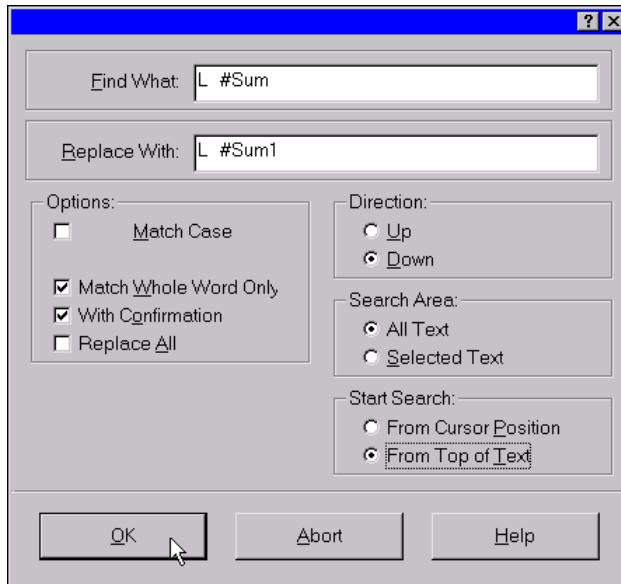


Figure 8-8 Search and Replace dialog box

- **Find What:**



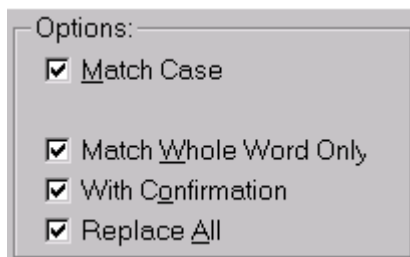
In the text field **Find What** enter the text string you want to search for. The text field is supported by the Clipboard copy function. Make sure that all the required spaces are included in the search string. Spaces are handled as characters during the search operation. It is wise to copy the string to search for into the text field to avoid spelling mistakes.

- **Replace With:**



In the text field **Replace With** enter the replacement text string. The text field is supported by the Clipboard copy function.

- **Options**



The search and replace function allows you to select options on how to handle the search string.

Match Case
 Match Case

If the **Match Case** button is marked the search function will find only text strings that have the same pattern of upper and lower case letters as the search string.

Match Whole Word Only
 Match Whole Word Only

If the **Match Whole Word Only** button is marked the search function will only find words having the same length as the search words.

With Confirmation
 With Confirmation

If you mark **With Confirmation** and *S5 / S7 for Windows* finds a match of the text string, a dialog box will open.

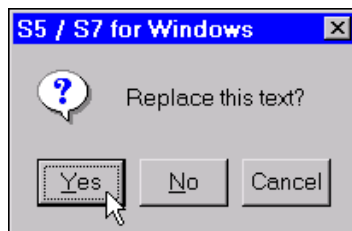


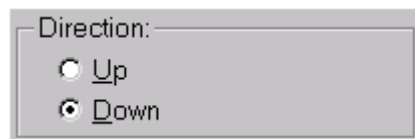
Figure 8-9 Replace Text prompt

The identified string is marked (blue background).

- ◆ Activate the **Yes** button to replace the string.
- ◆ Activate the **No** button to search for the next matching string.
- ◆ Activate the **Cancel** button to abort the replace action.
- ◆ Press **F3** to repeat the search after you activated the **Yes** or **No** button. *S5 / S7 for Windows* tries to find the next match.

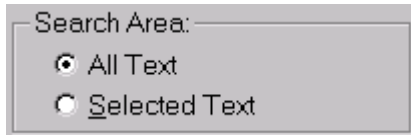
Replace All
 Replace All

Mark the **Replace All** button if you want automatically replace all the matching text strings.

● **Direction**

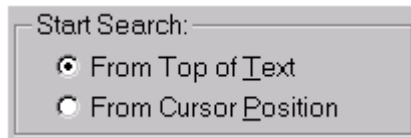
The search and replace may be performed in the up or down direction.

- **Search Area**



The search and replace may be performed in the text (Segment/ Network or Block) opened with the editor or only in the marked portion of the text.

- **Start Search**



The search and replace may start at the beginning of the Segment/ Network or Block or it may start from the position of the insertion mark (Cursor).

8.7.3 Search Again (Search Menu)

Use the **Search Again** command to restart a search after a matching text string was found (see chapter 8.7.1, 8.7.2). *S5 / S7 for Windows* starts the searches for the next matching text string.

 ◆ Click **Search Again** in the search menu.

 ◆ Press **F3**.

8.8 Window Menu (Symbolic Table Window)

The **Window** menu from the symbolic table window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

8.9 Help Menu (Symbolic Table Window)

The **Help** menu from the symbolic table window is identical with the help menu in the PC block list window. For more details see chapter 3.6

9 PLC Block List

The PLC window can be opened whenever an external PLC is connected on-line with a PC running *S5 / S7 for Windows*. The external PLC must be connected via a special cable. For additional details on how to connect to an external PLC see chapter 3.2.11.1.

9.1 PLC Block List Window

The commands from the **PLC Block List** menus are used to perform online functions.

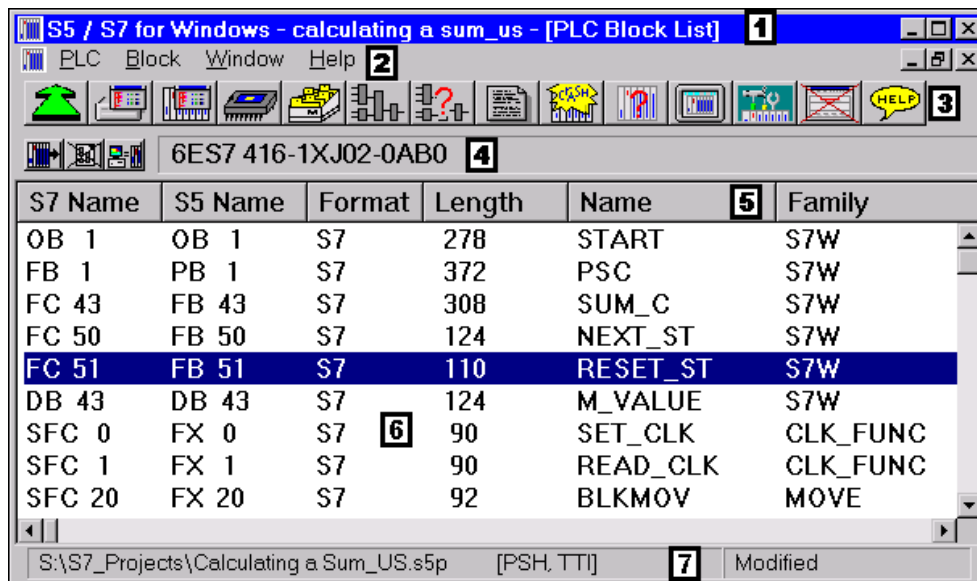
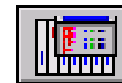


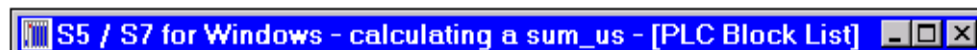
Figure 9-1 S7 PLC Block List Window

- **Opening the PLC Block List Window.**

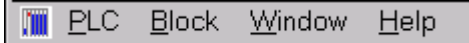
- ◆ Click the **PLC Block List** icon in the tool bar.
- ◆ Press **ALT + W, L**.



1 S5 / S7 PLC Block List Title Bar



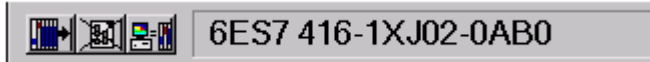
The Title bar displays *S5 / S7 for Windows*, the name of the open project (Calculating a Sum_US), and the name of the window (PLC Block List).

2 Menu Bar

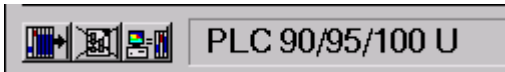
The menu bar contains a list of menus. You can open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character of the menu name. All the commands from the PLC Block List menus are described in this chapter.

3 Tool Bar

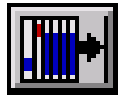
The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. You can reach these functions with the keyboard via the window menu and/or the function keys.

4 Tool Bar II (S7 PLC Block List)

Tool Bar II (S5 PLC Block List)

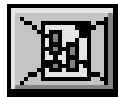


The tool bar II provides icons to manipulate marked blocks in the PLC block list window. The type of external PLC (S7 - CPU part number; S5 – CPU type) to be connected online is displayed.




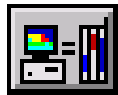
Transfer to PC. The blocks marked in the PLC block list are transferred from the PLC to the PC.

 Press **CTRL + F5**.




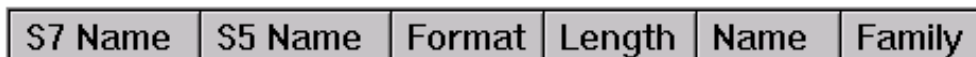
Delete. The blocks marked in the PLC block list are deleted in the PLC.

 Press **Shift + DELETE**.



Compare Blocks. The block marked in the PLC block list (PLC block contents) is compared with the same block stored in the PC RAM.

 Press **Shift + DELETE**.

5 Workplace Column Title Bar

You can customize the Workplace Column Title Bar by selecting the items you want to display from the *Preferences* dialog box. For additional information see chapter 3.2.11.3. By holding the left mouse button and dragging the column limit, you can

adjust the width of the columns in the symbolic table workplace. The width of the columns can be adjusted to accommodate the font selected (see chapter 3.2.11.4).

Note:

Double Clicking the title of a column will sort the PLC Block List information in an ascending order. Double Clicking the title a second time will sort the information in a descending order.

6

S5 / S7 Workplace

In the PLC block List displays all the blocks that are stored in the PLC memory. These are the blocks that belong to the PLC program and its system blocks (S7 - SFC, SFB; SDB; S5 – special FB's). The way the information is listed depends on the settings in the **Preferences** dialog box.

Workplace S5

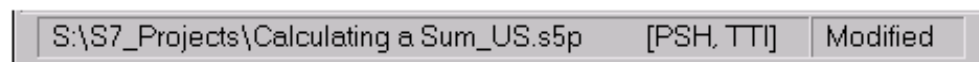
S7 Name	S5 Name	Format	Length	Address	Library #	Function Name
	BB 1	S5	0	0		
OB 1	OB 1	S5	14	D388		
FB 1	PB 1	S5	24	D370		
FC 50	FB 50	S5	42	D198		NEXT_ST
FC 51	FB 51	S5	28	D1C2		RESET_ST
FC 55	FB 55	S5	42	D326	12345	FN_NAME
DB 1	DB 1	S5	134	E00A		
DB 10	DB 10	S5	32	D350		

Figure 9-2 S5 PLC Block List window

Picture blocks (BB) that are displayed are not stored in the PLC (no starting address is displayed). You can open the status display of a picture block to see the status information of the defined operands. The picture blocks are only saved with the PLC program in the PC. For more details see chapter 3.3.1 and 10.6.

7

Status Bar



The status bar can display one or more of the following information :

- The name and the path of the active PLC program or the open PLC project.
- Information about the active command.
- Name and organization of the registered user.
- Status of the project (modified).
- Information about the command the mouse is pointing to.

Note:

The **right mouse button** may be used within the **PLC Block List Workplace**. If the **right mouse button** is clicked, a menu with the commands to manipulate the selected (marked) Block is opened.

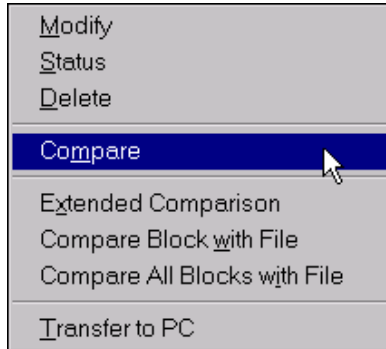


Figure 9-3 Menu that is opened with the right mouse button with the commands for manipulation of the selected (marked) Block

9.2 PLC Menu (PLC Block List Window)

The commands from the PLC menu are used to reread the PLC block list, compress the PLC memory, start and stop the PLC and close the PLC block list window. If there is a connection to the **PLC in a PC** (S5 / S7 for Windows software PLC), a command to save the PLC configuration and programs is provided.

 ◆ Click **PLC** in the menu bar.

 ◆ Press **ALT + P**.

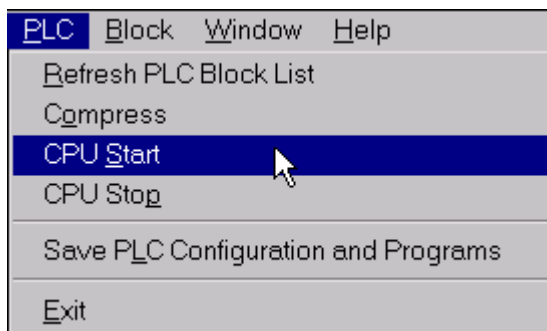



Figure 9-4 PLC Menu, PLC Block List Window

9.2.1 Refresh PLC Block List (PLC Menu)

With the command **Refresh PLC Block List** from the PLC menu, the contents of the PLC are read again. An updated list of all the PLC blocks stored in the PLC is displayed in the PLC block list workplace.


 ◆ Click **Refresh PLC Block List** in the PLC menu.

 ◆ Press **ALT + P, R**.

9.2.2 Compress (PLC Menu)

Deleting blocks in the PLC does not remove these blocks from the PLC memory. The deleted blocks still occupy space in the memory. If blocks with the same name are transferred to the PLC, the old block remains in the PLC and occupies space in the PLC memory. The command **Compress**, from the PLC menu, reorganizes the PLC memory. All the unused blocks are deleted. After executing this command, only usable blocks remain in the PLC memory.


 ◆ Click **Compress** in the PLC menu.

 ◆ Press **ALT + P, O**.

9.2.3 CPU Start (PLC Menu)

With the command **CPU Start**, from the PLC menu, the PLC starts to execute the program. This command can only be executed if the CPU RUN switch is in the RUN position and the program execution has previously been halted.

 ◆ Click **CPU Start** in the PLC menu.

 ◆ Press **ALT + P, S**.

9.2.4 CPU Stop (PLC Menu)

With the command **CPU Stop**, from the PLC menu, the PLC is put in the halt condition. This command can only be executed if the CPU has been previously put in the RUN condition.

 ◆ Click **CPU Stop** in the PLC menu.

 ◆ Press **ALT + P, P**.

9.2.5 Save PLC Configuration and Programs (PLC Menu)

This command is used in conjunction with the *S5 / S7 for Windows PLC in a PC* (software PLC). A PLC program in the *PLC in a PC* and its configuration data is saved on the hard disk. Whenever you reboot the PC, the PLC program you have saved, with the configuration data, will be executed. For more details see the *S5 / S7 for Windows PLC in a PC* manual.

- ◆ Click **Save PLC Configuration and Programs** in the PLC menu.
- ◆ Press **ALT + P, L**.

9.2.6 Exit (PLC Menu)

With the **Exit** command, from the PLC menu, you may close the PLC block list window.

- ◆ Click **Exit** in the PLC menu.
- ◆ Press **ALT + P, E**.
The PLC block list window is closed.

9.3 Block Menu (PLC Block List Window)

The commands from the **Block** menu in the PLC block list window are used to manage a single block, several blocks, a new block, or existing blocks in the PLC (online). Blocks can be deleted and compared. Also the transfer of blocks to the PC is controlled with the commands from this menu.

- ◆ Click **Block** in the menu bar.
- ◆ Press **ALT + B**.

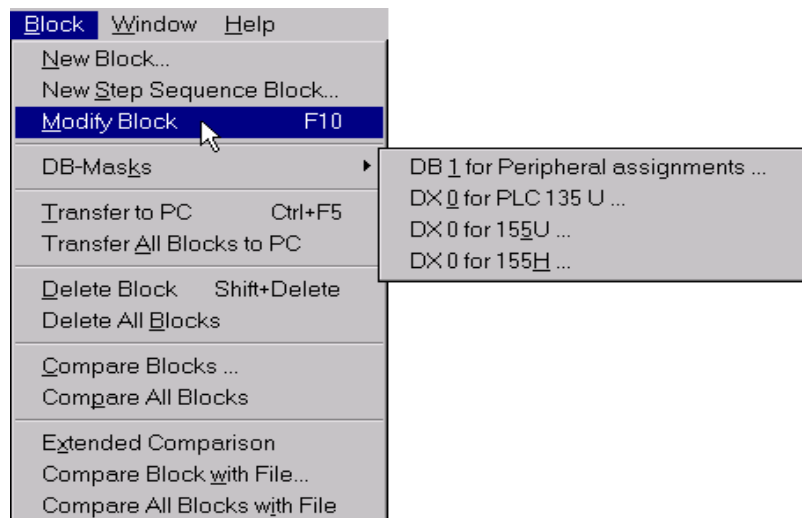


Figure 9-5 Block Menu, PLC Block List Window

Note:

Commands and icons displayed in light gray are currently not available. These functions may belong to an option or another mode must be selected to execute these commands.

9.3.1 New Block (Block Menu, PLC Block List Window)

With the **New Block** command the **PLC Block Editor Window** is opened. The PLC block editor and the PC block editor have basically the same functions. The PC block editor is explained in detail in chapter 4. The PLC block editor allows you to work with blocks stored in the PLC.

There are some differences in saving the modified Blocks in the PLC. We recommend that you use the PC block editor to create new blocks and to modify existing blocks.

Note:

The **PLC Block Editor** allows you to add and modify blocks, segments (networks), comments and labels. This data will only be saved in the PC if:


- the button **On PC and PLC** in the **Preferences dialog box** is marked (see chapter 3.2.11.2) and
- the block in the PC RAM and the PLC memory are identical when the PLC block editor is opened.

If the PLC block and the PC block are not identical (or new), no comment and no labels (jump) will be displayed. Instead of labels, substitute labels (M001 etc.) will be displayed.

We recommend, that you use the PLC block editor only for small modifications and direct tests of a PLC program. In all other cases you should use the PC block editor to modify and/or create a block and then transfer the block to the PLC.

The **New Block** command opens a dialog box. A text field is provided for the new block name. The drop down list shows you the existing blocks. Modifying the segment number is irrelevant. A new block always starts with the segment number one (1).

 ◆ Click **New Block** in the block menu.

 ◆ Press **ALT + B, N**.

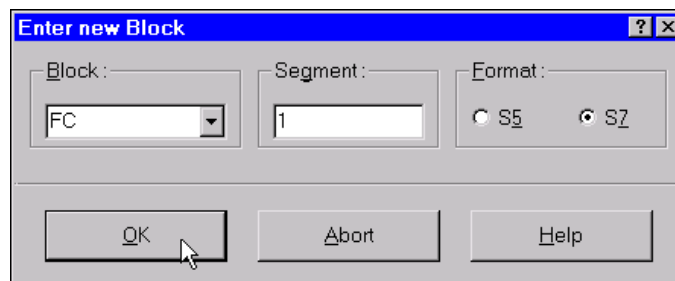


Figure 9-6 Enter new Block dialog box

- **Block**

Enter the block name in the text field. A block name is made up of two character identifiers and a counting number. A drop down list is provided to display the existing blocks. S5 and S7 use different Block types and different Block names (see tables below).

- **Segment (Network)**

In S5 terminology a PLC Block is divided into **Segments**. The S7 literature uses the term **Network** to describe a portion of a Block. Because this manual describes both S5 and S7 subjects, you will find both terms have the same meaning.

A new block always starts with the segment (network) number one (1). Entering the segment number is not required.

- **Format**

A new Block can be created in the Step® 5 (S5) or the Step® 7 (S7) syntax. The default Block format is set in the **Miscellaneous** tab (Preferred Syntax) of the Preference dialog box (see chapter 3.2.11.5). If only *S5 for Windows* or *S7 for Windows* is installed only the corresponding button is active.

After entering the new Block name and selecting the Block format confirm with **OK**. The Block Editor window is opened and ready to create a new Block.

- **Blocks available with S7**

Identifier	Block Name	Parameter Limits Indent Numbers
OB	Organization Block	The number of possible Blocks depends on the S7-300/400 CPU used
FC	Function	
FB	Function Block	
SFC	System Function	
SFB	System Function Block	
DB	Data Block	
SDB	System Data Block	

Table 9-1 Step® 7 Block names

- **Blocks available with S5**

Identifier	Block	Limits
	Name	Indent Numbers
OB	Organization block	1 - 39
PB	Program block	0 - 255
SB	Step sequence Block (non graphical)	0 - 255
FB	Function blocks	0 - 255
FX	Extended function blocks	0 - 255
DB	Data block	0 - 255
DX	Extended data block	0 - 255
BB	Picture block	0 - 255

Table 9-2 Step® 5 Block names

9.3.2 New Step Sequence Block (Block Menu)

The **New Step Sequence Block** command opens a dialog box to name the new block name. The drop down list shows you the existing blocks. Modifying the segment number is not necessary. A new block always starts with the network (segment) number one (1). This command is only available with the *G5 for Windows* option. Detailed information on how to use the graphical step sequence programming can be found in the *S5 for Windows User's Guide*. Currently you can only select a Block in the S5 format.

◆ Click **New Block** in the block menu.

◆ Press **ALT + B, S**.

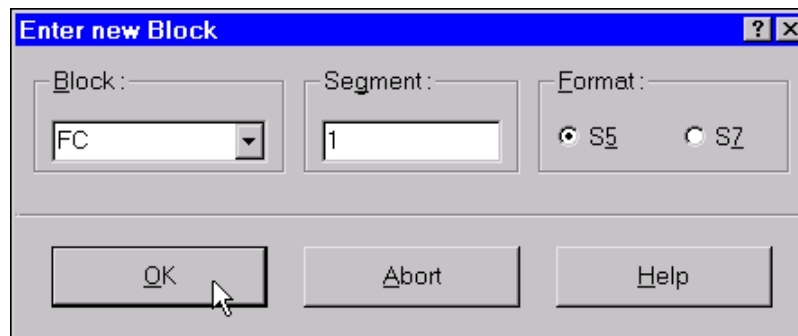


Figure 9-7 Enter new Block (Step Sequence Block) dialog box

9.3.3 Modify Block (Block Menu)

The **Modify** command opens the **PLC Block Editor** window. The selected block from the PLC block list window for is ready for modifications.

◆ Click **Modify** in the block menu.

◆ Press **F10 (ALT + B, M)**.

If a block has been selected (marked) in the PLC block list window, the **PLC Block Editor** window is opened and the first segment of the marked block is ready for modifications.

If no block was selected (marked) in the PLC block list window, the **Modify Block** dialog box opens.

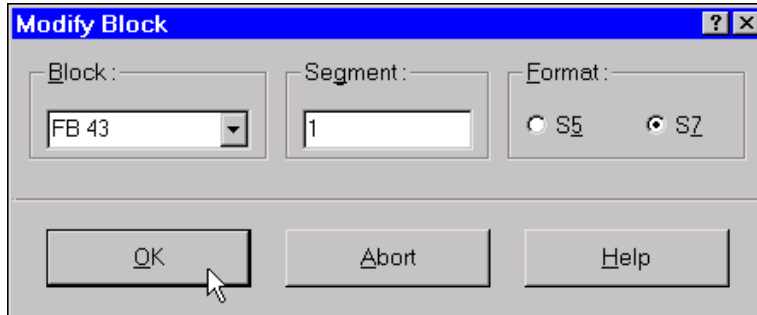
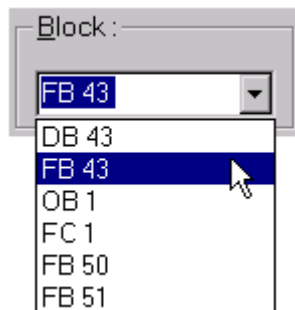


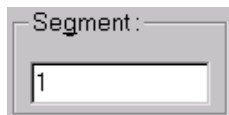
Figure 9-8 Modify Block dialog box

- **Block**



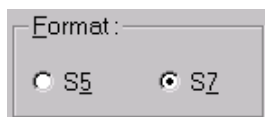
Select the block name to be modified from the drop down list. S5 and S7 use different Block types and different Block names (see tables 9-1, 9-2).

- **Segment (Network)**



Enter the segment (network) number of the block to be modified.

- **Format**



Select the format of the block to be modified. The default block format is set in the **Miscellaneous** tab (Preferred Syntax) of the Preference dialog box (see chapter 3.2.11.5).

Confirm the selection with the **OK** button. The PLC Block Editor window is opened and ready to modify the block.

9.3.4 DB - Masks (Block Menu)

S5 for Windows provides special masks as dialog boxes to generate the data blocks DB1 and DX for the PLC 135U, 155U and 155H. These commands are not available with *S7 for Windows*. For more details see chapter 3.3.9.

◆ Click **DB - Masks** in the block menu.

◆ Press **ALT + B, K**.

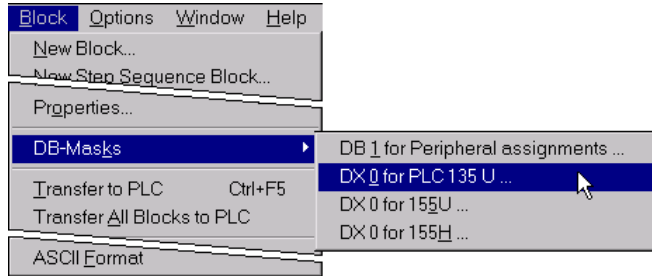


Figure 9-9 DB - Masks menu

9.3.5 Transfer Blocks to PC (Block Menu)

The **Transfer to PC** command is used to transfer blocks to the PC via the serial link. The selected (marked) blocks in the PLC block list window are transferred to the PC. This can be a single block or multiple blocks.

The transfer is done via the serial link defined in the preferences (interface tab) dialog box (see chapter 3.2.11.1). If a block to be transferred already exists in the PC, a dialog box (figure 9.10) will open to allow you to override the block or to cancel the transfer.

◆ Click **Transfer to PC** in the block menu or click the Transfer to PC icon.



◆ Press **CTRL + F5**.

The block transfer to the PC starts immediately.

Note:

If you want to transfer several blocks to the PC, mark these blocks in the PLC block list. For details on how to mark several blocks see chapter 3.1.1. The transfer command starts the block transfer to the PC.

9.3.6 Transfer all Blocks to PC (Block Menu)

The command **Transfer all Blocks to PC**, from the block menu, is used to transfer all blocks listed in the PLC block list window to the PC (transferring a complete PLC program).

- ◆ Click **Transfer All Blocks to PC** in the block menu.
- ◆ Press **ALT + B, A**.

If a block is already stored in the PC, a dialog box (figure 9.10) will open to allow you to overwrite the block or to abort the transfer.

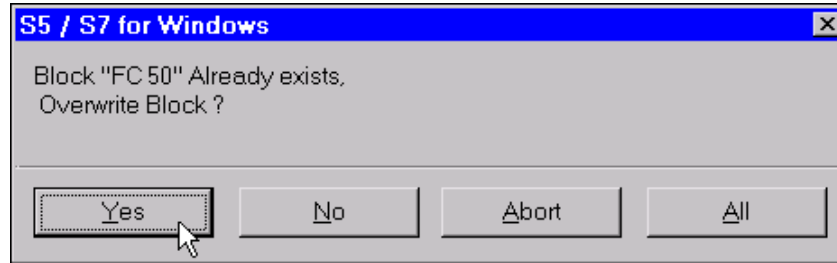
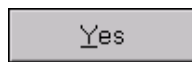
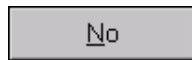


Figure 9-10 Overwrite block dialog box

- **Overwrite block dialog box buttons.**



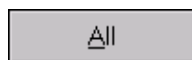
Activating the **Yes** button will only overwrite the PC block listed in the dialog box. If another block is already stored in the PC, the dialog box will be opened again.



If the **No** button is activated, the block listed in the dialog box will not be transferred to the PC. The original block stored in the PC remains in the PC. If another block is already stored in the PC, the dialog box will be opened again.



Activating the **Abort** button will cancel the block transfer to the PC. No further blocks are transferred.



Activating the **All** button will restart the block transfer. The PC block listed in the dialog box will be overwritten. Any other block already stored in the PC will also be overwritten. The dialog box will not be opened again.

Note:

You should only transfer blocks from the PLC to the PC if the selected blocks do not exist in the PC RAM. If a block in the PC is overwritten by a PLC block, it is possible that comments will be shifted and labels may not be valid anymore (labels are exchanged with substitute labels (M001 etc.).

9.3.7 S5 Data Blocks Transfer to the PC

When transferring a Data Block (DB) from the PLC to the PC the Data Word formats are changed. All data words will be displayed in the KH (hexadecimal) format because the S5 PLC does not store the original data word format.

If you transferred a **Data Block** (DB) from the PLC to the PC and the data block did not exist in the PC RAM, the following dialog box will open as soon as you try to edit the data block:

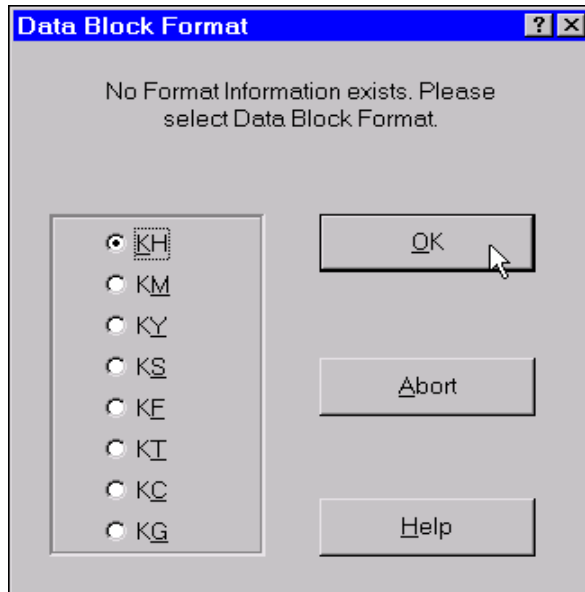


Figure 9-11 S5 Data Block Format dialog box

● **Possible Data Word Formats (constants).**

Format	Limits		Explanation
	lower	upper	
KM	00000000.00000000	11111111.11111111	arbitrary bit pattern (16 bit)
KH	0000	FFFF	hexadecimal code
KY	000.000	255.255	two (2) byte (address)
KS	two ASCII characters, max. 24 chr. per line		text format
KF	- 32768	+ 32767	integer (fixed point number)
KT	000.0	999.3	time value with multiplier
KC	0	999	count
KG	- 1469368 - 38	+ 17014112 + 39	floating point value

Table 9-3 S5 Data Word Formats

9.3.8 Delete Block (Block Menu)

The command **Delete** from the block menu deletes the marked blocks (one or several blocks may be marked) in the PLC.

The marked blocks are deleted from the PLC block list window by the delete command.

◆ Click **Delete** in the block menu or click the **Delete** icon in the tool bar.

◆ Press **Shift + DELETE**



Prior to deleting the block(s) in the PLC, a warning dialog box will be displayed.

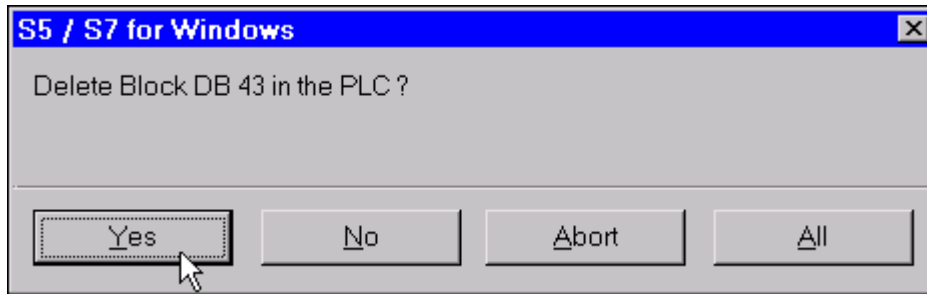
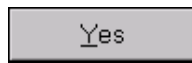
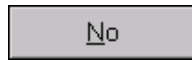


Figure 9-12 Block delete warning dialog box

- **Overwrite block dialog box buttons.**



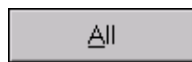
Activating the **Yes** button will delete the PLC block listed in the dialog box. If another block is marked in the PLC block list to be deleted, the dialog box will be opened again prior to deleting the next block.



If the **No** button is activated, the block listed in the dialog box will not be deleted in the PLC. If another block is marked in the PLC block list to be deleted, the dialog box will be opened again prior to deleting the next block.



Activating the **Abort** button will cancel the block delete to the PLC. No further blocks are deleted.



Activating the **All** button will delete all the marked blocks from the PLC block list in the PLC. The dialog box will not be opened again.

9.3.9 Delete All Blocks (Block Menu)

The **Delete All Blocks**, command from the block menu, deletes all blocks shown in the PLC block list in the PLC.

◆ Click **Delete All Blocks** in the block menu.

◆ Press **ALT B, B**

The following warning is displayed prior to deleting all blocks in the PLC.

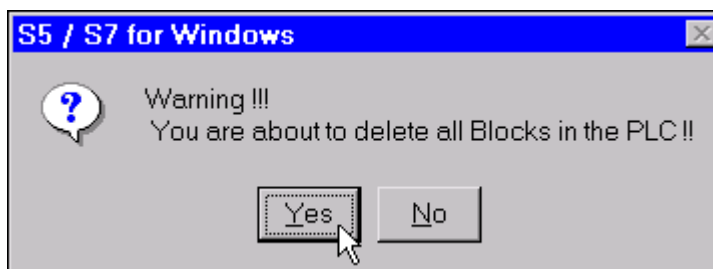


Figure 9-13 Block delete warning

You may only delete all blocks if the PLC is on halt. If the PLC is in the run mode the following message will be displayed.

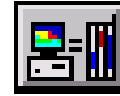


Figure 9-14 PLC run mode warning

9.3.10 Compare Blocks (Block Menu)

The **Compare Blocks** command, from the block menu, compares the blocks (marked in the PLC block list) from the PLC with the blocks stored in the PC RAM (listed in the PC block list).

- ◆ Click **Compare Blocks** in the block menu or click the **Compare Blocks** icon in the tool bar.



- ◆ Press **ALT + B, C**.

If you want to **Compare** several blocks from the PLC, mark these blocks in the PLC block list.

The Block compare window is opened to display the result of the compare (see chapter 9.4).

9.3.11 Compare All Blocks (Block Menu)

The **Compare All Blocks** command, from the block menu, compares all blocks (listed in the PLC block list) from the PLC with the blocks stored in the PC RAM.

- ◆ Click **Compare All Blocks** in the block menu

- ◆ Press **ALT + B, P**.

The Block compare window (chapter 9.4) is opened to display the result of the compare

9.3.12 Extended Comparison (Block Menu)

The **Extended Comparison** command from the Block menu is used to compare the marked block (block from the PLC) with the corresponding block of the PC Block List. This command requires the additional **BlockDiff** option. *S5 / S7 for Windows* offers this powerful software package, *BlockDiff*, to compare PLC Blocks and PLC Programs. You can find detailed information on how to use the *BlockDiff* software option in the *BlockDiff* user's guide.

9.3.13 Compare with File (Block Menu)

The **Compare with File** command from the block menu is used to compare the marked block from the PLC Block List (one block or several blocks) with the corresponding blocks of a PLC program file located at one of the PC drives. This command requires the additional **BlockDiff** option. *S5 / S7 for Windows* offers this powerful software package, *BlockDiff*, to compare PLC Blocks and PLC Programs. You can find detailed information on how to use the *BlockDiff* software option in the *BlockDiff* user's guide.

9.3.14 Compare all Blocks with File (Block Menu)

The **Compare all Blocks with File** command from the block menu is used to compare all block listed in the PLC Block List with the corresponding blocks of a PLC program file located at one of the PC drives. This command requires the additional **BlockDiff** option. *S5 / S7 for Windows* offers this powerful software package, *BlockDiff*, to compare PLC Blocks and PLC Programs. You can find detailed information on how to use the *BlockDiff* software option in the *BlockDiff* user's guide.

9.3.15 Window Menu (PLC Block List Window)

The **Window** menu from the PLC Block List Window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

9.3.16 Help Menu (PLC Block List Window)

The **Help** menu from the PLC Block List Window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

9.4 Block Compare Window

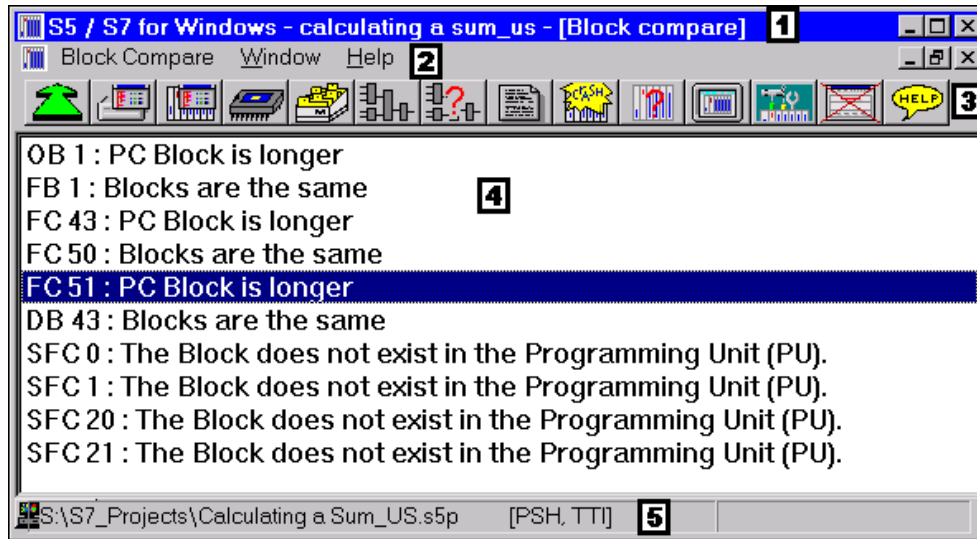
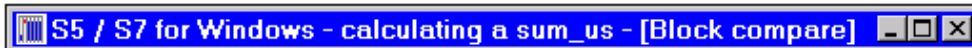


Figure 9-15 Block Compare Window

The **Block Compare Window** displays the result of the compare between the blocks stored in the PLC (PLC block list) and the blocks present in the PC memory (PC block list).

1 S5/S7 PLC Block List Title Bar



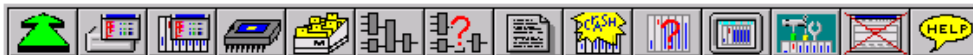
The Title bar displays *S5 / S7 for Windows*, the name of the open project (Calculating a Sum_US) and the name of the window (Block compare).

2 Menu Bar



The menu bar contains a list of menus. You open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character of the menu name. All the commands of the PC Block List menus are described in this chapter.

3 Tool Bar



The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. You can reach these functions with the keyboard via the window menu and/or the function keys.

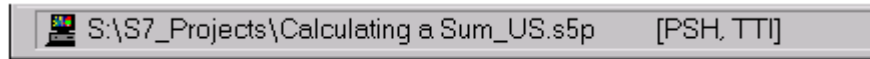
4 Display Field

In the display field the results of the block compare is listed. The following Information is provided:

- The name of the block.
- The results of the compare.

5

Status Bar



The status bar may displays one or more of the following pieces of information :

- The name and the path of the active PLC program or the opened PLC project.
- Information about the active command.
- Name and organization of the registered user.
- Information about the command the mouse is pointing to.

9.4.1 Block Compare Menu - Block Compare Window

With the command from the block compare menu you can open the extended block comparison (S5-S7 BlockDiff option), print the contents of the Block Compare Window, or close the block compare window.

◆ Click **Block Compare** in the menu bar.

◆ Press **ALT + B**.

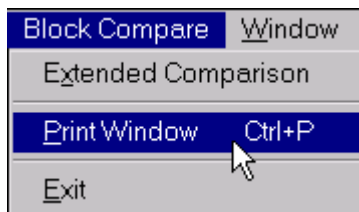


Figure 9-16 Block Compare Menu

9.4.1.1 Extended Comparison

The **Extended Comparison** command of the Block Compare menu is used to compare the marked block (block from the PLC) with the corresponding block of the PC Block List. This command requires the additional **BlockDiff** option. *S5 / S7 for Windows* offers this powerful software package, *BlockDiff*, to compare PLC Blocks and PLC Programs. You can find detailed information on how to use the *BlockDiff* software option in the *BlockDiff* user's guide.

9.4.1.2 Print Window


Executing the print command starts the printing process of the results of the block compare listed in the display field.


◆ Click **Print Window** in the block menu.

◆ Press **CTRL + P**

9.4.1.3 Exit (Block Compare Window)

With the **Exit** command, from the Block Compare menu, you can close the Block Compare Window.

 ◆ Click **Exit** in the Block Compare menu.

 ◆ Press **ALT + B, E**.

9.4.2 Window Menu (Block Compare Window)

The **Window** menu from the block compare window is identical with the window menu from the PC block list window. For more details see chapter 3.5

9.4.3 Help Menu (Block Compare Window)

The **Help** menu from the block compare window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

10 PLC Status

Commands from the **PLC Status** menus are used to perform online functions. These functions are available with an external **Hardware PLC**, *S5 / S7 for Windows PLC in a PC* (Software PLC) and the **S5 / S7 Simulation PLC**.

10.1 PLC Status Window

- **External S7-300/400 Hardware PLC**

The PLC status window is called from the **PLC** block list window.

To open the PLC status window, the PLC must be connected via an MPI converter cable with the PC. The PLC must be powered up and a program must be present in the PLC.

- **Software PLC, the S7 for Windows, PLC in a PC, installed on an external PC**

The PLC status window is called from the **PLC** block list window.

To open the PLC status window, the PC executing the Software PLC must be connected via a null modem with the PC executing *S7 for Windows*. The PC must be powered up, the Software PLC must be running and a PLC program must be present. This could also be the **S7 Simulation PLC**.

- **Software PLC, the S7 for Windows, PLC in a PC, installed on the PC running S7 for Windows**

The PLC status window is called from the **PLC** block list window.

To open the PLC status window the Software PLC must be running and a PLC program must be present in the Software PLC. No external connection is needed. This could also be the **S7 Simulation PLC**.

- **External S5 Hardware PLC**

The PLC status window is called from the **PLC** block list window.

To open the PLC status window the PLC must be connected via a current loop converter (see a appendix) with the PC. The PLC must be powered up and a program must be present in the PLC.

- **Software PLC, the S5 for Windows, PLC in a PC, installed on an external PC**

The PLC status window is called from the **PLC** block list window.

To open the PLC status window the PC executing the Software PLC must be connected via a null modem (see a appendix) with the PC executing *S5 for Windows*. The PC must be powered up, the Software PLC must be running, and a PLC program must be present .

- **Software PLC, the S5 for Windows, PLC in a PC, installed on the PC running S5 for Windows**

The PLC status window is called from the **PLC** block list window.

To open the PLC status window the Software PLC must be running and a PLC program must be present in the Software PLC. No external connection is needed.

- **Integrated S5 Simulation PLC**

The PLC status window is called from the **PC** block list window.

To open the PLC status window the integrated Simulation PLC must be executing a PLC program. No external connection is needed.

- **Opening the PLC Status Window**

- ◆ Select (mark) the block in the in the PLC block list window whose status that you want to display. You may only select a single block.

- ◆ Click the **PLC Status** icon in the tool bar.



- ◆ Press **CTRL + F10**.

The PLC status window is opened immediately and displays the first segment (network) of the marked block.

Addr...	T...	Instruction	RLO	Contents	ACCU1	ACCU2	Status word
009C		A{	1	1			00000110
009E		A M 1.2	0	0			00000001
00A0		S M 3.2	0	1			00000100
00A2		O M 1.7	0	0			00000001
00A4		O M 1.4	0	0			00000001
00A6		R M 3.2	0	1			00000100
00A8		A M 3.2	1	1			00000111
00AA)	1	1			00000111
00AC		AN T 3	1	000.1			00000011
00AE		L S5T#200MS	1		00001002	00001005	00000011
00B2		SD T 2	1	002.1			00000010
00B4		A T 2	0	002.1			00000001
00B6		L S5T#200MS	0		00001002	00001002	00000001
00BA		SD T 3	0	000.1			00000000
00BC		NOP 0	0				00000000

T1	T-REALEAS	Release Time
T2	T-FLASH1	Flash Frequency On-Time
T3	T-FLASH2	Flash Frequency Off-Time
T4	T-PRSS	Press Time
T10	T-ROTATE	Rotation Simulation Time

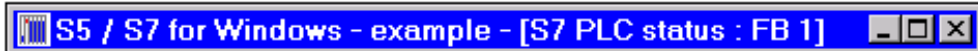
C:\S5W\EXAMPLE\Example.s5p [PSH, TTI] Modified

Figure 10-1 S7 PLC Status Window, STL presentation

The S5 PLC Status Window displays the same information as the S7 PLC Status Window. The addresses displayed in the S5 PLC Status Window are absolute for the whole PLC program.

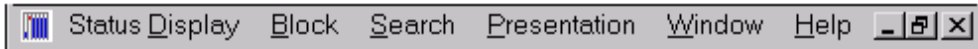
The addresses displayed in the S7 PLC Status Window are relative to the beginning of the PLC Block (each PLC Block starts with the address 0000 hex).

1 S5 / S7 PLC Block List Title Bar



The Title bar displays *S5 / S7 for Windows*, the name of the open project (Example), the name of the window (S7 PLC Block status; / S7 PLC Block status) and the block name (FB1).

2 Menu Bar



The menu bar contains a list of menus. You can open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character of the menu name. All the commands from the PLC Block List menus are described in this chapter.

3 Tool Bar



The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. You can reach these functions with the keyboard via the window menu and/or the function keys.

4 Tool Bar II (PLC Block List)



The tool bar II provides the icons to open another network (segment) and to modify operands. The number of the displayed network (segment) is also displayed.



Open the **Next Network** (Segment)

 Press **F8**.



Open the **Previous Network** (Segment)

 Press **F7**.




Activating this function will **Enlarge** the PLC logic displayed in LAD and CSF presentation or the font in STL presentation. The selected font must be scaleable.

 Press **CTRL + G**.




Activating this function will **Reduce** the PLC logic displayed in LAD and CSF presentation. The selected font must be scaleable.

 Press **CTRL + S**.




A marked **Operand** will be **Set**. A logical one (1) is introduced to the marked bit. The next PLC cycle overwrites the set bit with the actual ROL.

 Press **ALT + F8**.




A marked **Operand** will be **Reset**. A logical zero (0) is introduced to the marked bit. The next PLC cycle overwrites the set bit with the actual ROL.

 Press **ALT + F7**.




The **Change Value** dialog box will be opened to display and modify process variables.

 Press **ALT + F6**.



The displayed **Network** (Segment) is **Printed**.

 Press **CTRL + P**.

5 Workplace Column Title Bar

S7 Name	S5 Name	Format	Length	Name	Family
---------	---------	--------	--------	------	--------

You can customize the Workplace Column Title Bar by selecting the items to be displayed from the *Preferences* dialog box (miscellaneous tab). For additional information see chapter 3.2.11.5. Holding the left mouse button and dragging the column limit will adjust the width of the columns in the symbolic table workplace. The width of the columns may be adjusted to compensate for the font selected (see chapter 3.2.11.4).

6 Workplace

The PLC logic with the status of the signals is displayed in the PLC status workplace. When the entire segment doesn't fit into the workplace, by using the scroll bars you can move parts of the segment into view.

Statement List (STL) presentation

- The results of a logical operation (RLO), the contents of the operators, the contents of the accumulators (Accu1, Accu2), the status, etc. are displayed.
- Light gray parts of a statement list indicate that that part is not executed (jumps).

Ladder Diagram (LAD) presentation

- Thin black dotted lines indicate a logical **Low** (0).
- Bold red (black) solid lines indicate a logical **High** (1).
- A thin black vertical base line indicates that the segment is not executed. If the segment is executed, the vertical base line is displayed as a bold red line.

Control System Flowchart (CSF) presentation

- Thin black dotted lines indicate a logical **Low** (0).
- Bold red (black) solid lines indicate a logical **High** (1).
- No lines indicate that the segment is not executed.

7 Symbolic Table - PLC Status -

Part of the symbolic table may be shown in an additional window (see chapter 10.5.6). The marked operand from the workplace is also highlighted in the displayed symbolic table.

8 Status Bar



The status bar displays one or more of the following :

- The name and the path for the active PLC program or the open PLC project.
- Information about the active command.
- Name and organization of the registered user.
- Status of the project (modified).
- Information about the command the mouse is pointing to.

Note:

The **right mouse button** may be used within the **PLC Block List Workplace**. If the **right mouse button** is clicked, the menu that provides the commands to manipulate the selected (marked) operand is opened.

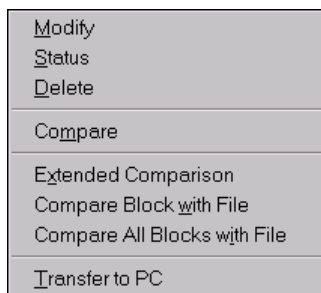


Figure 10-2 Menu opened with the right mouse button click (PLC Status Window)

10.2 Status Display Menu (PLC Status Window)

Commands in the **Status Display** menu allow you to change the signal levels of the operands and to change the value of the variables. A command to close the status window is also provided.

 ◆ Click **Status Display** in the menu bar.

 ◆ Press **ALT + D**.

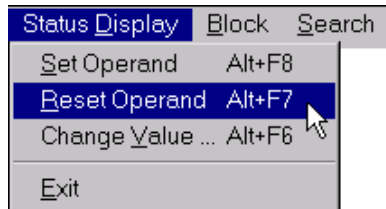

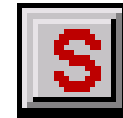



Figure 10-3 Status Display menu

10.2.1 Set Operand (Status Display Menu)

With the **Set Operand** command you can **Set** a previously marked operand (Bit). The value of the corresponding byte is displayed in the tool bar II.

 ◆ Click the **Set Operand** icon in the tool bar or click **Set Operand** in the status display menu.



 ◆ Press **ALT + F8**.

Note:

The **S5 PLC** does not allow **Forcing**. An input or output is always overwritten by the process image. Therefore, setting or resetting an operand may only be valid for one CPU cycle.

The **S5 Simulation PLC** allows **Forcing**. A set or reset operand stays in the forced stage until you change its stage again or it is overwritten by the PLC program.

Currently the **S7-300/400 PLC** also does not allow **Forcing**. An input or output is always overwritten by the process image. Therefore, setting or resetting an operand may only be valid for one CPU cycle.

10.2.2 Reset Operand (Status Display Menu)

With the **Reset Operand** command you can **Reset** an operand that was previously marked and set operand (bit). The value of the corresponding byte is displayed in the tool bar II.

- ◆ Click the **Reset Operand** icon in the tool bar or click **Reset Operand** in the status display menu.
- ◆ Press **ALT + F7**.



10.2.3 Change Value (Status Display Menu)

The **Change Value** command is used to modify and display process variables. A dialog box will be opened. The content of the previously marked variable is displayed in the value text field.

- ◆ Click the **Change Value** icon in the tool bar or click **Change Value** in the status display menu.
- ◆ Press **ALT + F6**.

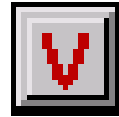


Figure 10-4 Change Value dialog box

- **Name**

The marked variable (operand) is displayed in the text field. You may also enter the name of a variable (operand) you want to display or modify.

- **Value**

The value of the previously marked variable (operand) or the variable entered in the name field is displayed in the text field. To modify the value enter the new value in the text field. The value may be displayed and entered in **different** forms.

● **S7 Name Format to Display or Change Values**

Name Format	Explanation	Example
Cn	Counter	C5
In.n	Input (Bit)	I2.3
IBn	Input (Byte)	IB33
IWn	Input (Word)	IW123
IDn	Input (Double Word)	ID123
Mn.n	Memory (Bit)	M15.6
MBn	Memory (Byte)	MB67
MWn	Memory (Word)	MW45
MDn	Memory (Double Word)	MD234
Qn.n	Output (Bit)	Q25.6
QBn	Output (Byte)	QB14
QWn	Output (Word)	QW17
QDn	Output (Double Word)	QD214
Tn	S5 Time or S7 Time	T1

Table 10-1 S7 Name Format to Display or Change Values

● **S7 Values (Example)**

Displayed Format	Example Name	Example Value
Decimal	QB1	0 - 255;
Decimal	QW4	-32 768 - +32 767
Decimal	QD6	-2 147 483 648 - +2 147 483 647
Hexadecimal	IB1	00 – FF
Hexadecimal	IW4	0000 – FFFF
Hexadecimal	ID6	0000 0000 – FFFF FFFF
Binary	M1.1	0 - 1
Binary	MB1	0000 0000 – 1111 1111
Binary	MW4	0000 0000 0000 0000 – 1111 1111 1111 1111
Binary	MD6	0000 0000 0000 0000 0000 0000 0000 0000 (min) 1111 1111 1111 1111 1111 1111 1111 1111 (max)
Floating Point	QD6	the number is presented with a decimal point (e.g. 44.11) or in the exponential form (e.g. 4.711E-36)
ASCII	IB1	one (1) ASCII character
ASCII	IW4	two (2) ASCII character
ASCII	ID6	four (4) ASCII characters
Counter	MW4	0 - 999

S7 Values (Example) (continued)

Displayed Format	Example Name	Example Value
S5 Time	MW6	0MS – 2H_46M_30S
S7 Time	MD66	-24D_-20H_-31M_-23S_-648MS 24D_20H_31M_23S_647MS
Date	MW4	1990-01-01 - 2168-12-31
Time of Day	MD16	00:00:00 - 23:59:59.999
Pointer	MD65	

Table 10-2 S7 Values (Example)

- **S5 Name Format to Display or Change Values**

Name Format	Explanation	Example
?n (PLC only)	absolute address	?4711 (not for Simulation PLC)
Cn	Counter	C5
DLn , dbn or Xdbn	Data Word (left byte)	DL3,X12 = DL3 of DX12
DRn , dbn or Xdbn	Data Word (right byte)	DR3,X12 = DR3 of DX12
DWn , dbn or Xdbn	Data or Extended DX	DW3,12 = DW3 of DB12
Fn or FBn	Flag (Byte)	F5 or FB67 or F15.6
FWn	(Word)	FW45
In or IBn	Input (Byte)	I1 or IB3 or I47.1
IWn	(Word)	IW123
PWn	(Word)	PW128
PYn or PBn	Peripheral (Byte)	PY34 or PB32
Qn or QBn	Output (Byte)	Q11 or QB14 or Q32.2
QWn	(Word)	QW17
Sn	Extended	S1.5
SWn	Extended	SW23
SYn	Extended	SY5
Tn	Timer	T1

Table 10-3 S5 Name Format to Display or Change Values

- **S5 Values (Example)**


Name	Dec	Hex	Bin	ASCII	Time	Counter	Floating Point	Comment
FB 50	84	54	01010100	" T "				84 decimal
T 25					123.1			KT 123.1
C 33						234		KC 234
FD 55							2E+06	2 * 10 ⁶

Table 10-4 S5 Values (Example)

10.2.4 Exit (Status Display Menu)

With the **Exit** command from the status display menu, you can close the block status window.

 ◆ Click **Exit** in the status display menu.

 ◆ Press **ALT + D, E**.

10.3 Block Menu (PLC Status Window)

With the modify command from the block menu you can open the editor window. If you are executing the modify command from the PLC status window, the PLC block editor window will be opened. Also you can define the block that is calling the block displayed in the status display.

 ◆ Click **Block** in the menu bar.

 ◆ Press **ALT + B**.



Figure 10-5 Block Menu (S7 PLC Status Window)

10.3.1 Modify Block (Block Menu)

The **Modify Block** command will open the editor window and will display the block and segment previously displayed in the status window.

 ◆ Click **Modify Block** in the block menu.

 ◆ Press **F10**.


Special care must be taken when editing a PLC program with the PLC editor. For more details see chapter 4.

10.3.2 Called Block (Block Menu)

The **Called Block** command will open a dialog box where you can select the block that called the block displayed in the status display.

A block, with parameters to be exchanged, may be called from different blocks with different parameters. If the called Block is defined, the status display will only display the status with the parameters provided from the defined block.

 ◆ Click **Called Block** in the block menu.

 ◆ Press **ALT + B, B**.

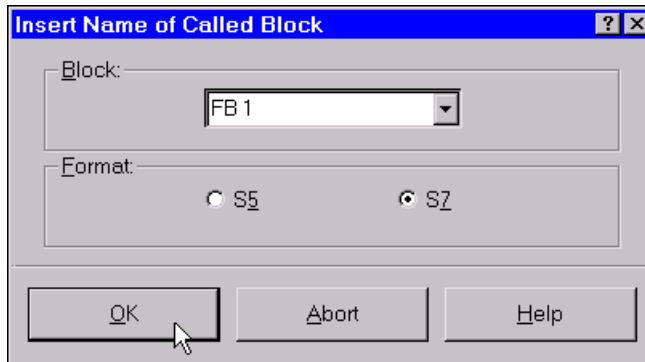


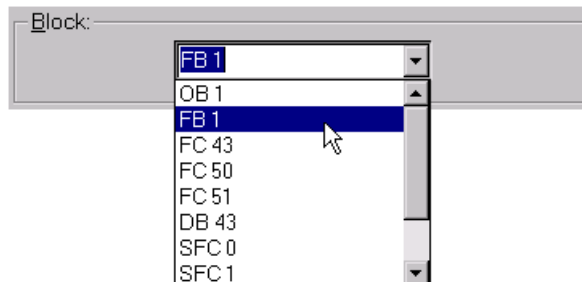
Figure 10-6 Insert Name of Called Block dialog box

Example:

The Block FB33 is called with parameters from the Blocks OB1, FB1, FB24, etc.

If **FB1** is selected in the **Insert Name of Called Block** dialog box, the status display shows FB33 with the parameters provided by FB1 when calling FB33. The status of FB33 with the parameters provided by OB1, FB24, etc. is not displayed. If no block has been selected the status display will show FB33 with the parameters provided by the blocks OB1, FB1, FB24, etc. There is no differentiation as to who called block FB33.

● Block



From the drop-down list select the block that called the block and provided the parameters being displayed in the status display workplace.

● Format



The block that called the block shown in the status display can be in an S5 or the S7 syntax. The format of the block calling the displayed block must be defined. If *S7 for Windows* or *S5 for Windows* only is installed, the format is set to whichever is installed by default.

Click the OK button to confirm the selection and to close the dialog box.

10.4 Search Menu (PLC Status Window)

The commands from the **Search** menu are used to display the status of other segments (networks).

If *G5 for Windows* (S5 graphical step sequence programming) is installed, the commands may also be used to display the status of Steps, Transitions, and SUL's.

 ◆ Click **Search** in the menu bar.

 ◆ Press **ALT + S**.

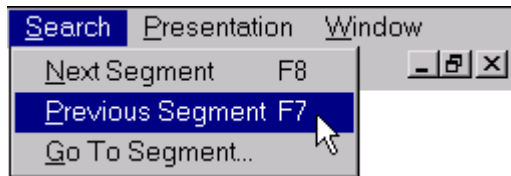




Figure 10-7 Search Menu (S7 PLC Status Window)

10.4.1 Next Segment (Search Menu)

With the command **Next Segment** you may open the next segment (network) of the same block. If you continue this process and the last segment is reached, the command is deactivated and the command (icon) changes to a light gray color.


 ◆ Click **Next Segment** in the search menu or the **Next Segment** icon in  the tool bar.

 ◆ Press **F8**.

The next segment (network) is opened.

10.4.2 Previous Segment (Search Menu)

With the command **Previous Segment** you may open the previous segment (network) of the same block and continue this process until the first segment of a block is displayed. When the first segment is reached, the command is deactivated and the command (icon) changes to a light gray color.

 ◆ Click **Previous Segment** in the search menu or the **Previous Segment** icon in the tool bar.



 ◆ Press **F7**.

The previous segment (network) is opened.

10.4.3 Go to (Go to Segment) (Search Menu)

With the command **Go to** you may open any existing segment (network) of the same Block. If you choose a segment number higher than the last segment number in this block, the last segment is opened. This command opens a dialog box to enter the segment number.

- ◆ Click **Go to Segment** in the search menu.
- ◆ Press **ALT + S, G**.

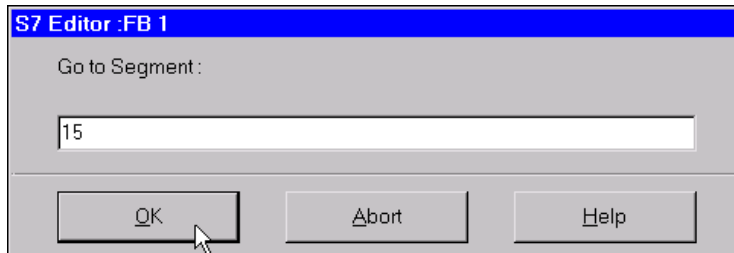


Figure 10-8 Go to segment (network) dialog box

Enter the segment (network) number in the **Go to Segment** text field and confirm with the **OK** button.

10.5 Presentation Menu (PLC Status Window)

The commands from the **Presentation** menu are used to select the logic presentation (STL, CSF, LAD, etc.). Additional commands are available to configure the appearance of the presentations. Not all commands may always be available.

Only commands displayed in bold black may be used.

The commands from the **Presentation** menu are described in this chapter. Two different **Presentation** menus are available. One presentation is used for STL, LAD, and CSF status presentation, and the other is used for the step sequence status presentation.

The **Presentation** menu for the STL, LAD and CSF status presentation is described in this chapter. For details on the step sequence status presentation see the *S5 / S7 for Windows* users manual.

- ◆ Click **Presentation** in the menu bar.
- ◆ Press **ALT + P**.

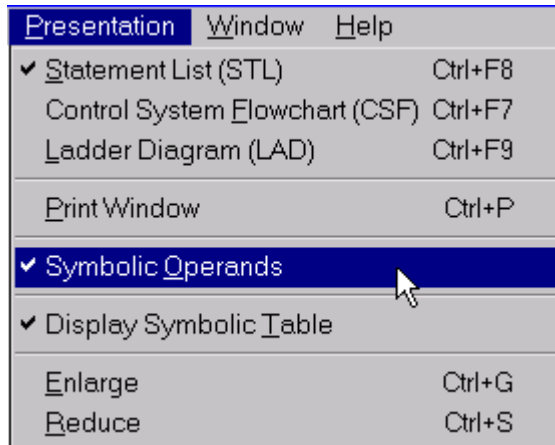



Figure 10-9 Presentation Menu (S7 PLC Status Window)

The selected functions are marked with a 

Note:

The settings (Symbolic Operands, Display Symbolic Table, Enlarge, and Reduce) are valid only in the active status window. As soon as this window is closed the selected preferences are valid (see chapter 3.2.11).

10.5.1 Statement List (STL) (Presentation Menu)


In **Statement List** the control task is described with mnemonic abbreviations in the form of a list. S5 and S7 use different mnemonic abbreviations. For more details see chapter 3.2.11.2.

- **S7 Statement List (STL)**

In the status display of an S7 Statement List (STL), the control task is described with mnemonic abbreviations in the form of a list based on IEC 1131.

- **S5 Statement List (STL)**

In the status display of an S5 Statement List (STL), the control task is described with mnemonic abbreviations in the form of a list based on DIN 19239.

 ◆ Click **Statement List (STL)** in the presentation menu.

 ◆ Press **CTRL + F8 (ALT + P, S)**.

Ad...	Tag	Instruction	RLO	Contents	ACCU1	ACCU2	Status word
0000		L P##INO	0				000000100
0004		LAR1	0		87000168	83000000	000000100
0006		L B[AR1, P#1.0]	0		00000002	87000168	000000100
000A		L 8	0		00000008	00000002	000000100
000E		==I	0				001000001
0010		JC M001	1				001000110
0014		CLR	0				001000000
0016		SAVE	0		00000008	00000002	001000000
0018		L L#-1	0		FFFFFFFF	00000008	001000000
001E		T #OUT1	0		FFFFFFFF	00000008	001000000
0022		T #OUT2	0		FFFFFFFF	00000008	001000000
0026		L S5T#4S	0		00000400	FFFFFFFF	001000000
002A		SD "T-PRSS"	0	000.0			001000000
T3		T-FLASH2		Flash Frequency Off-Time			
T4		T-PRSS		Press Time			
T10		T-ROTATE		Rotation Simulation Time			
T11		T-DOWN		Downward Simulation Time			
T12		T-UP		Upward Simulation Time			

S:\S7_Projects\Calculating a Sum.s5p [PSH, TTI]

Figure 10-10 Status display, S7 STL Presentation

In the example (Figure 10-10) of a statement list presentation, the RLO, the contents (bit commands), the accumulator 1 and 2, and the status word are displayed. The Workplace Column Title Bar can be customized by selecting the items from the *Preferences* dialog box (miscellaneous tab) that are to be displayed. For additional details see chapter 3.2.11.5. By holding the left mouse button and dragging the column limit, you can adjust the width of the columns in the symbolic table workplace. The operands can be displayed in absolute or as a symbol. The symbol table can be displayed simultaneously.

The width of the columns may be adjusted to compensate for the font selected (see chapter 3.2.11.4).

The S5 PLC Status Window displays the same information than the S7 PLC Status Window. *S5 for Windows* uses the STEP® 5 mnemonic abbreviations and *S7 for Windows* uses the STEP® 7 mnemonic abbreviations. The addresses displayed in the S5 PLC Status Window are absolute for the whole PLC program.

The addresses displayed in the S7 PLC Status Window are relative to the beginning of the PLC Block (each PLC Block starts with the address 0000 hex).

Address	Instruction	RLO	Contents	ACCU1	ACCU2
Indicator Lamp Control					
D472	A -S-FLASH	0	0		
D474	S -M-FLASH	0	1		
D476	O -S-CONTIN	0	0		
D478	R -M-FLASH	0	1		
D47A	A -M-FLASH	1	1		
D47C	AN -T-FLASH2	1	000.1		
D47E	L KT 002.1	1		1002	1005
D480	SD -T-FLASH1	1	002.1		
D482	A -T-FLASH1	0	002.1		
D484	L KT 002.1	0		1002	1002
D488	SD -T-FLASH2	0	000.1		

F3.4	START	Start Flag
T1	T-REALEAS	Release Time
T2	T-FLASH1	Flash Frequency On-Time
T3	T-FLASH2	Flash Frequency Off-Time

Figure 10-11 Status display, S5 STL Presentation

S5 for Windows

In the **S5 Status Display**, statement list presentation, the absolute address, the RLO, the contents (bit commands), the accumulator 1 and 2, and the status of the result display are displayed. The information columns and their width are fixed.

In *S5 / S7 for Windows* the operands may be displayed in absolute or as a symbol. The symbol table may be displayed simultaneously.

When the entire network (segment) doesn't fit in the workplace, by using the scroll bars you can move parts of the segment into view.

Light gray parts of a statement list indicate that that part is not executed (jump or network not called) by the PLC.

If an operand was marked, the absolute name (operand), its symbolic name, and the comment are displayed in the symbolic table. Also the use of the marked operand can be directly shown in the cross-reference list (click the cross-reference icon or press the key F4).

10.5.2 Control System Flowchart (CSF) (Presentation Menu)

In a **Control System Flowchart**, the control task is described with symbols. For additional details see chapter 3.2.11.2.

◆ Click **Control System Flowchart (CSF)** in the presentation menu.

◆ Press **CTRL+F7**.

The operands may be displayed in absolute or as a symbol. The symbol table may be displayed simultaneously.

The width of the columns may be adjusted to compensate for the font selected (see chapter 3.2.11.4).

When the entire network (segment) doesn't fit in the workplace, by using the scroll bars you can move parts of the segment into view.

If an operand was marked, the absolute address, its symbolic name, and the comment are displayed in the symbolic table. Also the use of the marked operand can be directly shown in the cross-reference list (click the cross reference icon or press the key **F4**).

- Thin black dotted lines indicate a logical **Low** (0).
- Bold red (black) solid lines indicate a logical **High** (1).
- No lines indicate that the segment is not executed.

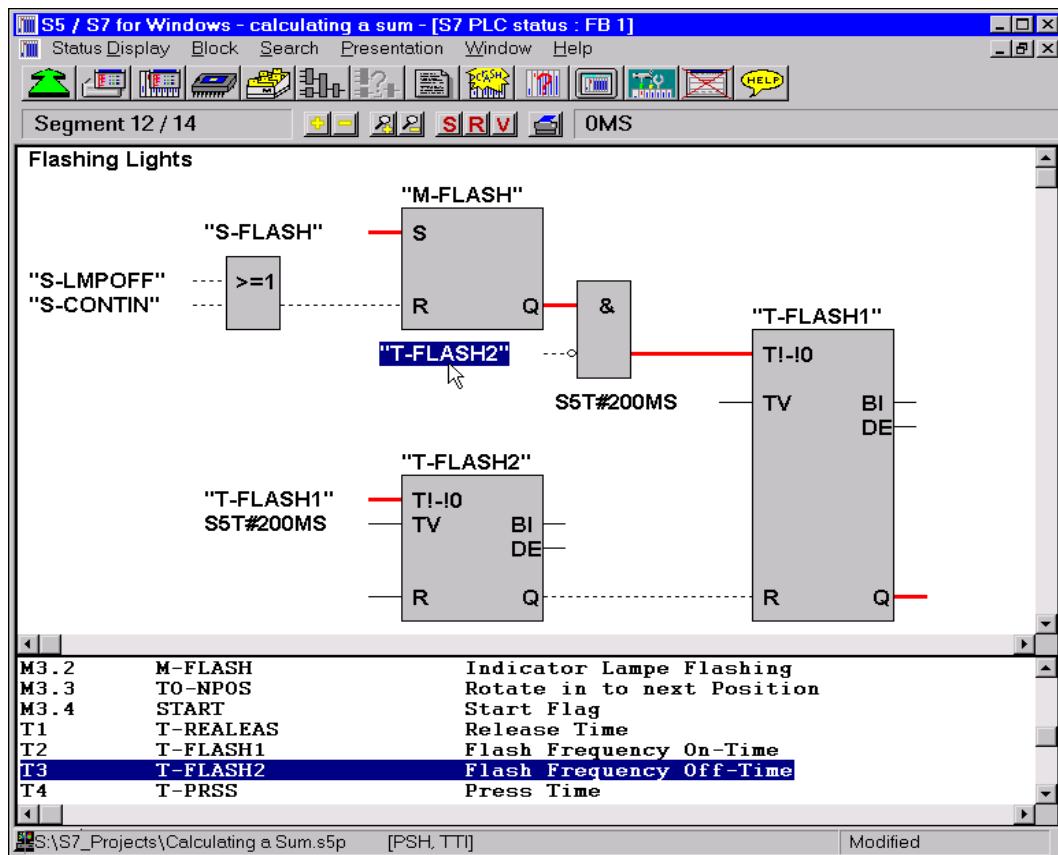


Figure 10-12 Status display, S7 CSF Presentation

• S5 for Windows

With *S5 for Windows* in the Status display **Control System Flowchart (CSF)** presentation, the control task is described with symbols based on DIN 40700. The segment (*G5 for Windows* - step, transition, or SUL in the Detail Display) is displayed in the status window as a control system flowchart (CSF).

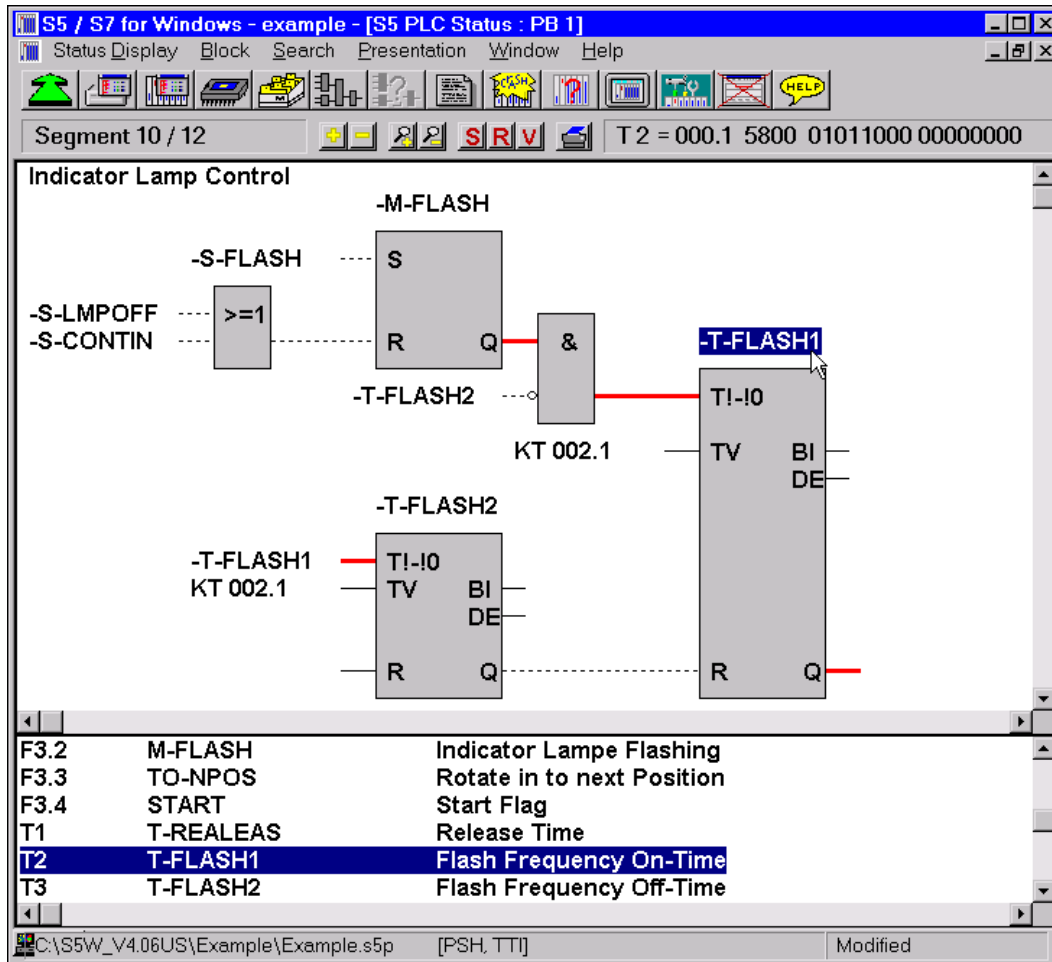


Figure 10-13 Status display, S5 CSF Presentation

10.5.3 Ladder Diagram (LAD) (Presentation Menu)

In a **Ladder Diagram** the control task is described with symbols similar to those used in circuit diagrams. The symbols are basically NO and NC contacts. Complex functions are displayed with symbols based on DIN 40700.

- ◆ Click **Ladder Diagram (LAD)** in the presentation menu.
- ◆ Press **CTRL + F9**.

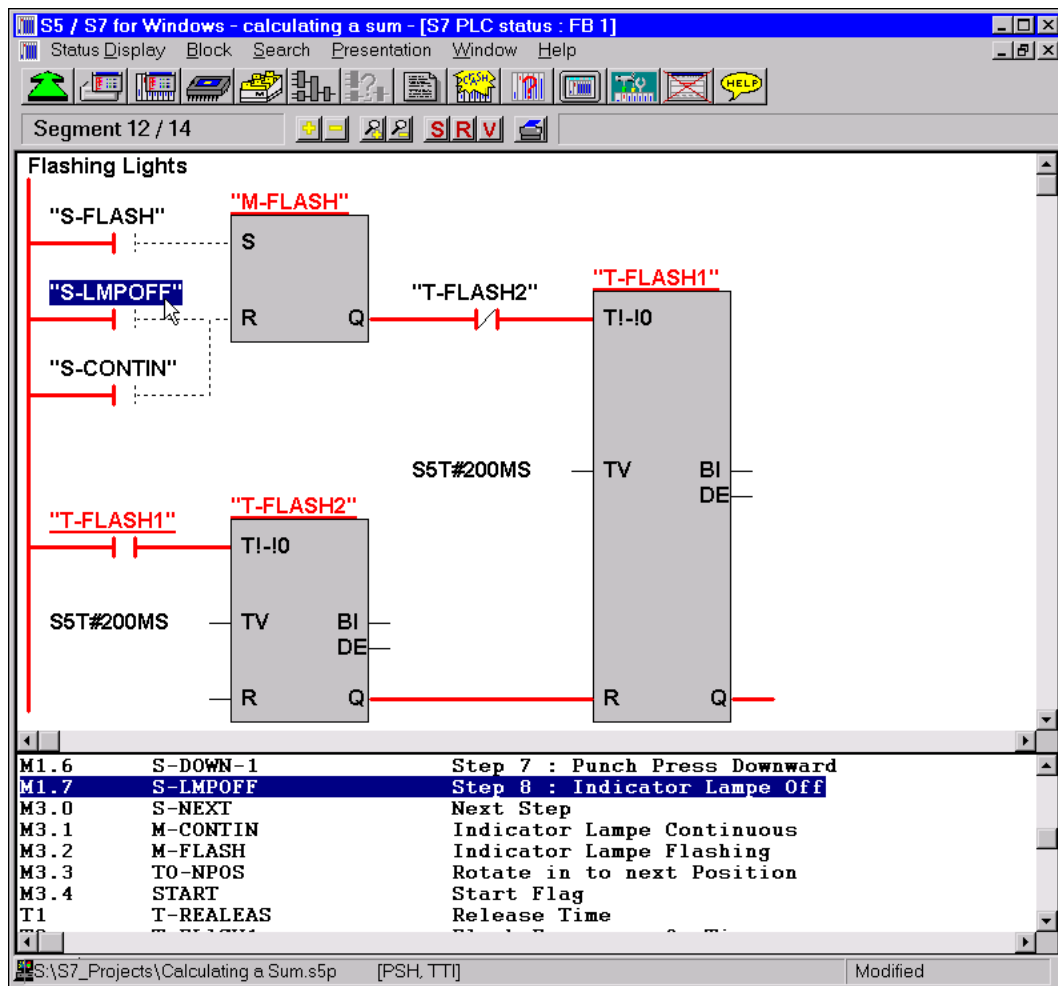


Figure 10-14 Status display, S7 LAD Presentation

The operands may be displayed in absolute or as a symbol. The symbol table may be displayed simultaneously.

The width of the columns may be adjusted to compensate for the font selected (see chapter 3.2.11.4).

When the entire network (segment) doesn't fit in the workplace, by using the scroll bars you can move parts of the segment into view.

If an operand was marked, the absolute address, its symbolic name, and the comment are displayed in the symbolic table. Also the use of the marked operand can be directly shown in the cross-reference list (click the cross-reference icon or press the key **F4**).

- Thin black dotted lines indicate a logical **Low** (0).
- Bold red (black) solid lines indicate a logical **High** (1).
- A thin black vertical base line indicates that the network (segment) is not executed. If the segment is executed, the vertical base line is displayed as a bold red line.

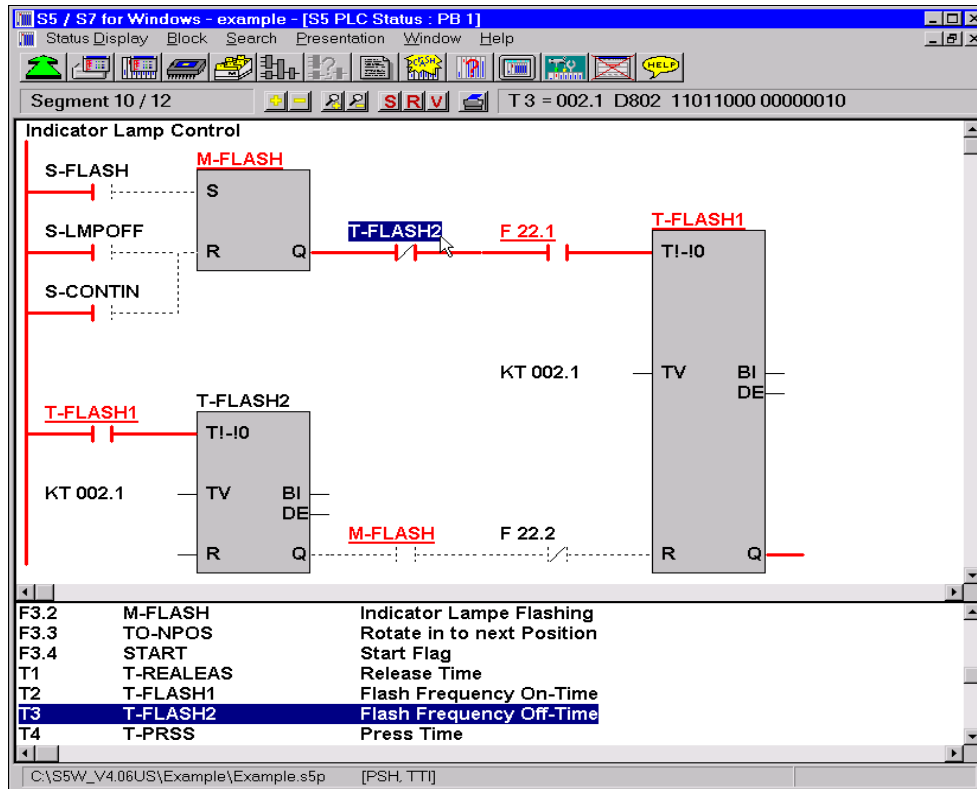


Figure 10-15 Status display, S5 LAD Presentation

10.5.4 Print Window (Presentation Menu)

The workplace of the status window is printed.

- ◆ Click **Print Window** in the presentation menu or the **Print** icon in the tool bar.
- ◆ Press **Ctrl + P**.



A dialog box to setup the printer and start the printing process is opened.

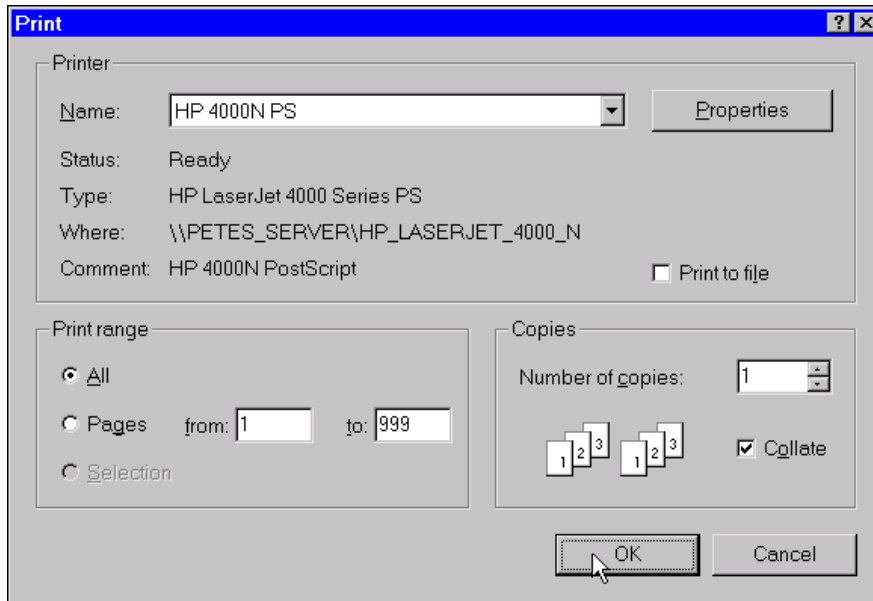


Figure 10-16 Printing dialog box

This dialog box provides buttons for printing a single page, selected pages or all pages. The number of copies may also be selected or the documentation may be printed to a file.

The button **Properties** opens another dialog box to setup the active printer. From the drop down list **Name**, you can select another printer.

The appearance of the dialog box **Print** and the other dialog boxes that can be opened from the **Print** dialog box, depend on the printers installed under Windows.

Activating the **OK** button starts the actual printing process.

10.5.5 Symbolic Operands (Presentation Menu)

Symbolic operands (Symbolic names) may be displayed instead of absolute operands (identifier and parameter - Q32.4). A symbolic table must be present in the PC to use symbolic operands.

- ◆ Click **Symbolic Operands** in the presentation menu.
- ◆ Press **ALT + P, O**.

Addr...	T...	Instruction	RLO	Conte...	ACCU1	ACCU2	Status word
00AA		A{	1	1			001000110
00AC		A M 1.2	0	0			001000001
00AE		S M 3.2	0	1			001000100
00B0		O M 1.7	0	0			001000001
00B2		O M 1.4	0	0			001000001
00B4		R M 3.2	0	1			001000100
00B6		A M 3.2	1	1			001000111
00B8		}	1	1			001000111
00BA		AN "T-FLASH2"	1	000.0			001000011
00BC		L S5T#200MS	1		00000020	00000001	001000011
00C0		SD "T-FLASH1"	1	005.0			001000010
00C2		A "T-FLASH1"	0	005.0			001000001
00C4		L S5T#200MS	0		00000020	00000020	001000001
00C8		SD "T-FLASH2"	0	000.0			001000000
00CA		NOP 0	0				001000000
00CC		NOP 0	0				001000000

Figure 10-17 Example of a status window displaying absolute and symbolic names (operands).

- **S7 for Windows**

Symbols defined in the symbolic table are shown in quotation marks "..." if used in the Statement List (STL), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

Symbols defined in the variable declaration are shown with the "#" character in front of name.

- **S5 for Windows**

Symbols defined in the symbolic table are shown with a hyphen (-) in front of the symbolic name if used in the Statement List (STL), Ladder Diagram (LAD), or Control System Flowchart (CSF) presentation.

10.5.6 Display Symbolic Table (Presentation Menu)

The **Symbolic Table** may be shown simultaneously with the network (segment) displayed in the S7 Status Window workplace. A marked operand in the network is also highlighted in the symbolic table showing the absolute address, its symbolic name, and the symbol comment.

◆ Click **Display Symbolic Table** in the presentation menu.

◆ Press **ALT + P, T**.

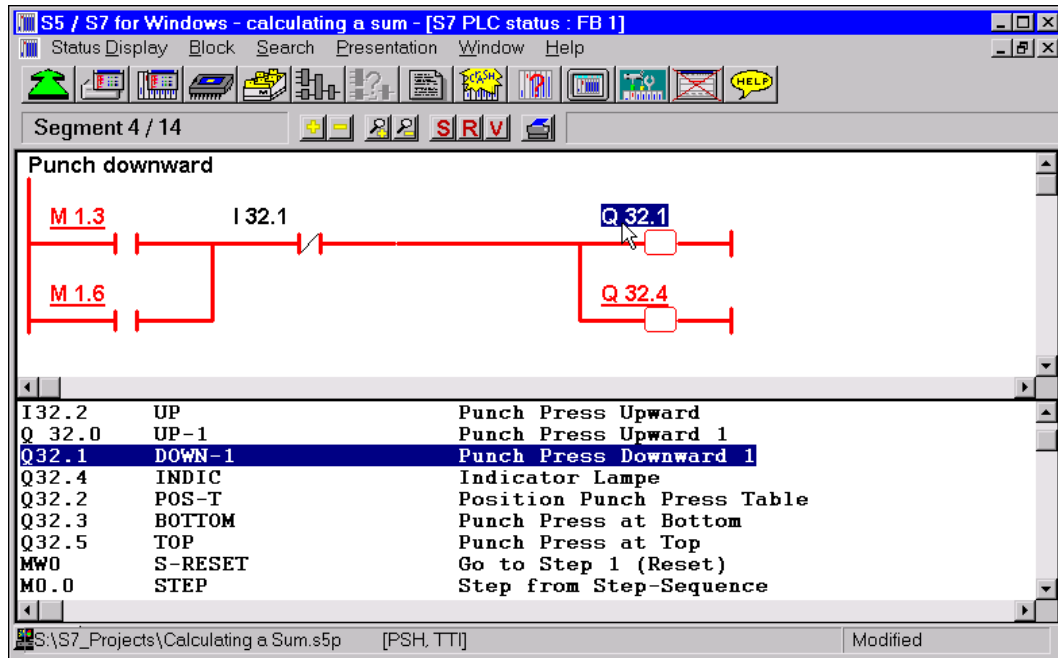



Figure 10-18 Example of a status window (LAD presentation) displaying a symbolic table.

10.5.6.1 Enlarge (Presentation Menu)

This command allows you to adjust the size of the PLC logic displayed (CSF and LAD). Each time you use the **Enlarge** command, the logic will be displayed in a larger scale. The **Enlarge** and the **Reduce** command provide the tools to scale the display of the logic for the momentary needs.


 ◆ Click **Enlarge** in the presentation menu or click the icon in the tool bar.



 ◆ Press **CTRL + G**, (**Alt + P, E**).

10.5.6.2 Reduce (Presentation Menu)

This command allows you to adjust the size of the PLC logic displayed (CSF and LAD). Each time you use the **Reduce** command, the logic will be displayed in a smaller scale. The **Enlarge** and the **Reduce** command provide the tools to scale the display of the logic for the momentary needs.

 ◆ Click **Reduce** in the presentation menu or click the icon in the tool bar.



 ◆ Press **CTRL + S**, (**Alt + P, R**).

Note:

Only scaleable fonts may be enlarged or reduced. All True Type fonts are scaleable. The default **System** font is not scaleable

10.6 Picture Blocks (BB) (PLC Status Window)

In *S5 for Windows* Picture Blocks are used to display the status of several operands (process variables) in a list. See chapter 3.3.1.

If a picture block was marked prior to calling the PLC status the BB is shown in the PLC status window workplace

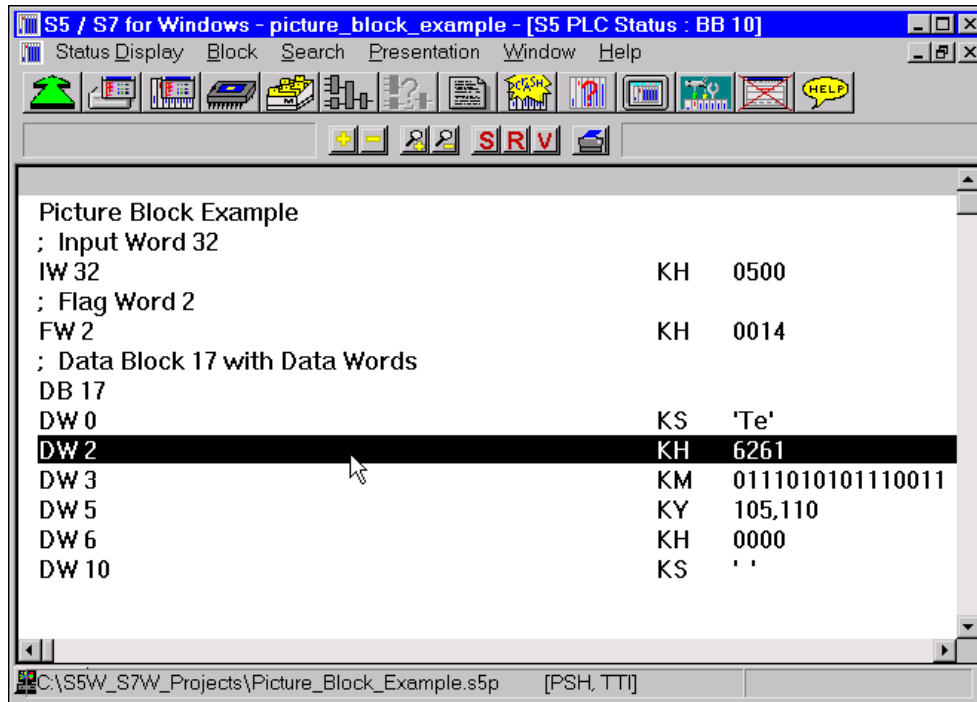


Figure 10-19 Example of a Picture Block (BB)

10.6.1 Changing Values in a Picture Block

You may change the value of a process variable or display the value in another form using the change value dialog box.

- ◆ Mark the process variable you want to modify or display. The line with the marked process variable is shown with a black background.
- ◆ Click **Change Value** in the status display menu.
- ◆ Press **ALT + F6**.

The **Modify Value** dialog box opens, showing the value of the marked process variable. By marking another button the value may be displayed in another form.

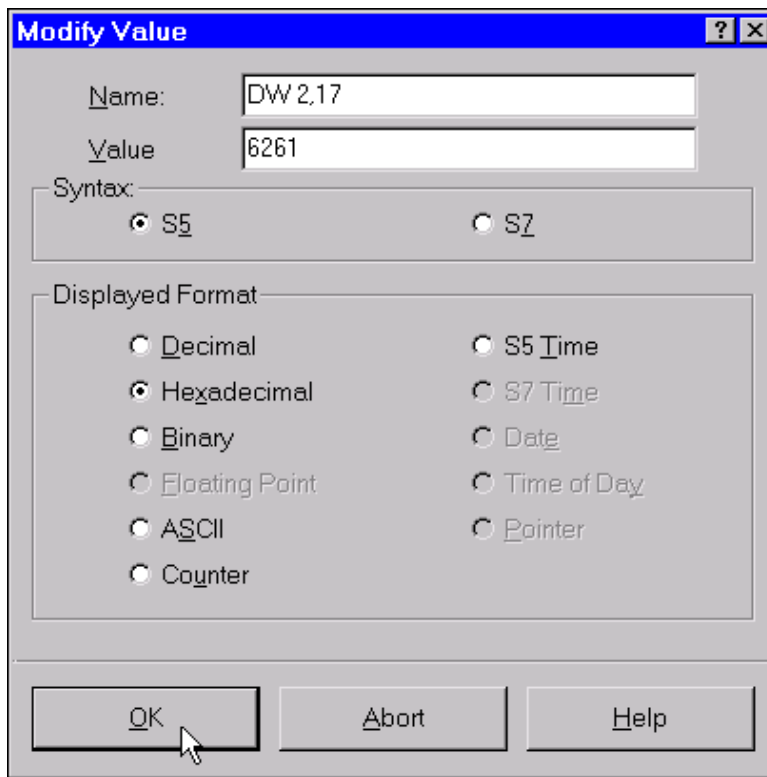


Figure 10-20 Modify value of the DW2 of DB17 (from Picture Block BB1)

You may alter the value in the text field. For more information on how to enter the value see chapter 11.2.3.

10.7 Window Menu (PLC Status Window)

The **Window** menu from the S7 PLC Status Window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

10.8 Help Menu (PLC Status Window)

The **Help** menu from the S7 PLC Status Window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

11 External PLC Status

The commands from the external PLC status window are used to set and reset inputs, outputs, and memory bits, and to display and change values (**Online** functions).

These functions are available with an external **Hardware PLC**, our Software PLC, the **PLC in a PC**, the **S7 Simulation PLC**, and the **S5 Extended Simulation PLC**.

11.1 External PLC Status Window

- **S7 for Windows**

External Hardware PLC

To open the External PLC status window the PLC must be connected with the PC via an MPI converter cable. The PLC must be powered up and a program must be present in the PLC.

Software PLC, the **PLC in a PC** installed on an external PC

To open the External PLC status window, the PC executing the Software PLC must be connected via a null modem with the PC executing *S7 for Windows*. The PC must be powered up, the Software PLC must be running and a PLC program must be present. This could also be the **S7 Simulation PLC**.

Software PLC, the **PLC in a PC** installed on the PC running *S7 for Windows*

To open the External PLC status window, the Software PLC must be running and a PLC program must be present in the Software PLC. No external connection is needed. This could also be the **S7 Simulation PLC**.

- **S5 for Windows**

External Hardware PLC

To open the External PLC status window the PLC must be connected with the PC via a current loop converter cable. The PLC must be powered up and a program must be present in the PLC.

Software PLC, the **PLC in a PC** installed on an external PC

To open the External PLC status window, the PC executing the Software PLC must be connected via a null modem with the PC executing *S5 for Windows*. The PC must be powered up, the Software PLC must be running and a PLC program must be present. This could also be the **S5 Extended Simulation PLC**.

Software PLC, the **PLC in a PC** installed on the PC running *S5 for Windows*

To open the External PLC status window, the Software PLC must be running and a PLC program must be present in the Software PLC. No external connection is needed. This could also be the **S5 Extended Simulation PLC**.

● Opening the External PLC Status Window

The External PLC status window may be called from any of the *S5 / S7 for Windows*.

◆ Click the **External PLC Status** icon in the tool bar.



◆ Press **CTRL + F10**.

The External PLC Status Window is identical for *S5 for Windows* and *S7 for Windows*.

Note:

You may use this window to test the hardware wiring of a PLC. With no program being executed on the PLC but having the PLC in its **RUN** mode you may click an output bit in the **Memory Bit Field** and the corresponding output and the connected device (e.g. relay) will be energized.

Activating an input device (e.g. limit switch) will mark the corresponding bit in the **Memory Bit Field**.

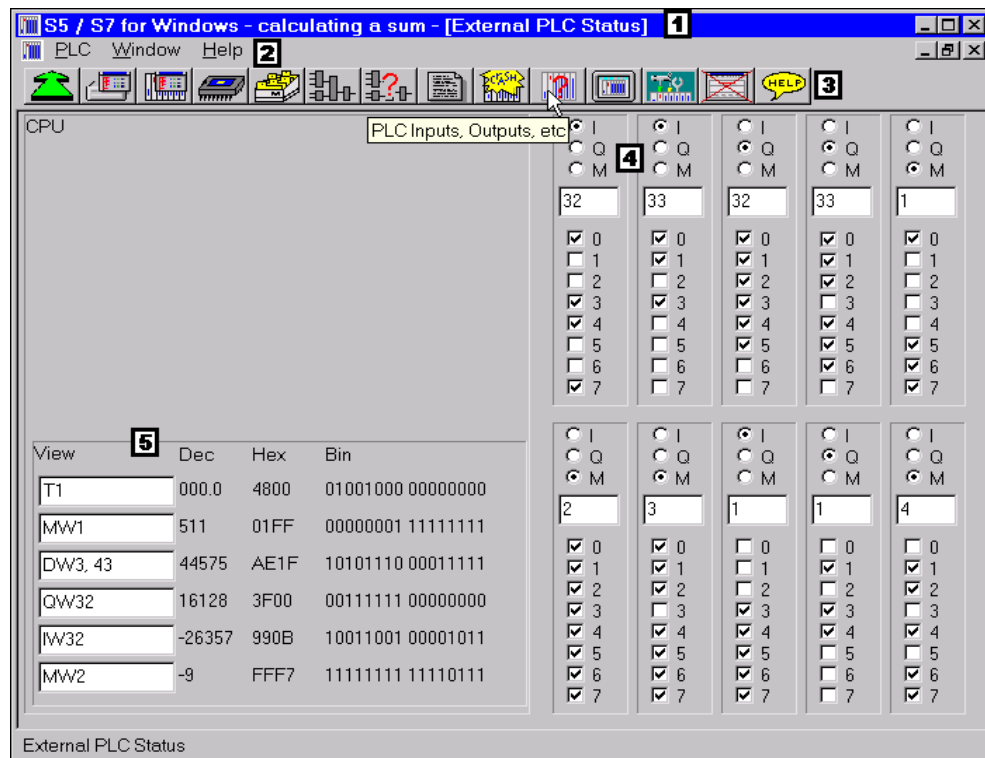
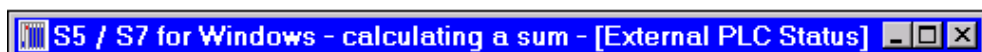


Figure 11-1 External PLC Status Window

1 S5 / S7 External PLC Status Title Bar



The Title bar displays *S5 / S7 for Windows*, the name of the open project (Calculating a sum), and the name of the window (External PLC Status).

2 Menu Bar



The menu bar contains a list of menus. You can open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character of the menu name. All the commands from the External PLC Status menus are described in this chapter.

3 Tool Bar



The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. You can reach these functions with the keyboard via the window menu and/or the function keys.

4 Input, Output, Memory Bit Field



Ten (10) fields to define input, output, and memory bits (one byte) is provided. To define a byte, enter the desired byte number in the text field. An I for an input byte, a Q for an output byte, or an M for a memory byte must be entered in front of the byte number. The PLC program will put a mark in the corresponding bit position if the bit is a logical one (high). You may set (or reset) a bit by clicking the corresponding bit position.

Note:

The **S5 PLC** does not allow **Forcing**. An input or output is always overwritten by the process image. Therefore, setting or resetting an operand may only be valid for one CPU cycle.

The **S5 Simulation PLC** allows **Forcing**. A set or reset operand stays in the forced stage until you change its stage again or it is overwritten by the PLC program.

Currently the **S7-300/400 PLC** also does not allow **Forcing**. An input or output is always overwritten by the process image. Therefore, setting or resetting an operand may only be valid for one CPU cycle.

5 View Field

View	Dec	Hex	Bin
T1	000.0	4800	01001000 00000000
MW1	511	01FF	00000001 11111111
DW3.43	44575	AE1F	10101110 00011111
QW32	16128	3F00	00111111 00000000
IW32	-26357	990B	10011001 00001011
MW2	-9	FFF7	11111111 11110111

Six (6) fields are provided to display variables. The value of the variable (Operand) entered in the name field is displayed in **Decimal**, **Hex**, and **Binary** form. The decimal value shown for the timers and counters are the decimal decoded values. The value shown in the Hex and Bin fields are the momentary time or counter values.

11.2 PLC Menu (External PLC Status Window)

The commands of the PLC menu allow you to change the value of variables and to save the arrangement of the view field and the input, output, memory field. A command to close the external PLC status window is also provided.

◆ Click **PLC** in the menu bar.

◆ Press **ALT + P**.

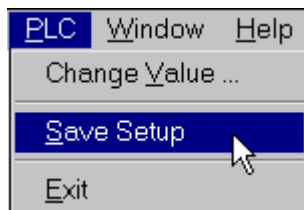


Figure 11-2 PLC menu (External PLC Status Window)

11.2.1 Change Value (PLC Menu)

The **Change Value** command opens a dialog box to enter a process variable. The value of the process variable displayed may be changed.

◆ Click **Change Value** in the PLC menu.

◆ Press **ALT + F6**.

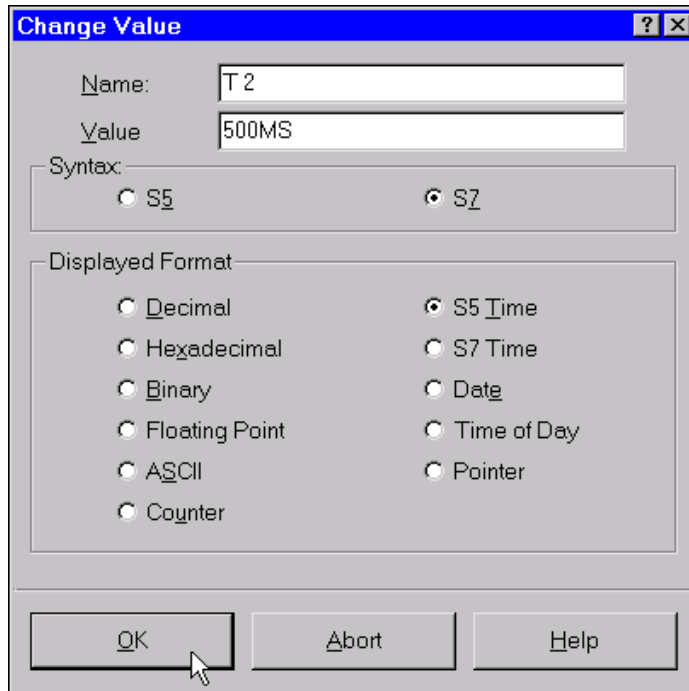


Figure 11-3 Change Value dialog box

The value of the process variable (operand) entered in the name field is displayed in the text field. To modify the value enter the new value in the text field.

- **Name**



The marked variable (operand) is displayed in the text field. You may also enter the name of a variable (operand) you want to display or modify.

- **Value**



The value of the previously marked variable (operand) or the variable entered in the name field is displayed in the text field. To modify the value enter the new value in the text field. The value may be displayed and entered in **different** forms.

- **S7 Name Format to Display or Change Values**

Name Format	Explanation	Example
Cn	Counter	C5
In.n	Input (Bit)	I2.3
IBn	Input (Byte)	IB33
IWn	Input (Word)	IW123
IDn	Input (Double Word)	ID123
Mn.n	Memory (Bit)	M15.6
MBn	Memory (Byte)	MB67
MWn	Memory (Word)	MW45
MDn	Memory (Double Word)	MD234

S7 Name Format to Display or Change Values (continued)

Name Format	Explanation	Example
Qn.n	Output (Bit)	Q25.6
QBn	Output (Byte)	QB14
QWn	Output (Word)	QW17
QDn	Output (Double Word)	QD214
Tn	S5 Time or S7 Time	T1

Table 11-1 S7 Name Format to Display or Change Values

● **S7 Values (Example)**

Displayed Format	Example Name	Example Value
Decimal	QB1	0 - 255;
Decimal	QW4	-32 768 - +32 767
Decimal	QD6	-2 147 483 648 - +2 147 483 647
Hexadecimal	IB1	00 – FF
Hexadecimal	IW4	0000 – FFFF
Hexadecimal	ID6	0000 0000 – FFFF FFFF
Binary	M1.1	0 - 1
Binary	MB1	0000 0000 – 1111 1111
Binary	MW4	0000 0000 0000 0000 – 1111 1111 1111 1111
Binary	MD6	0000 0000 0000 0000 0000 0000 0000 0000 (min) 1111 1111 1111 1111 1111 1111 1111 1111 (max)
Floating Point	QD6	the number is presented with a decimal point (e.g. 44.11) or in the exponential form (e.g. 4.711E-36)
ASCII	IB1	one (1) ASCII character
ASCII	IW4	two (2) ASCII character
ASCII	ID6	four (4) ASCII characters
Counter	MW4	0 - 999
S5 Time	MW6	0MS – 2H_46M_30S
S7 Time	MD66	-24D_-20H_-31M_-23S_-648MS 24D_20H_31M_23S_647MS
Date	MW4	1990-01-01 - 2168-12-31
Time of Day	MD16	00:00:00 - 23:59:59.999
Pointer	MD65	

Table 11-2 S7 Values (Example)

● **S5 Name Format to Display or Change Values**

Name Format	Explanation	Example
?n (PLC only)	absolute address	?4711 (not for Simulation PLC)
Cn	Counter	C5
DLn , dbn or Xdbn	Data Word (left byte)	DL3,X12 = DL3 of DX12
DRn , dbn or Xdbn	Data Word (right byte)	DR3,X12 = DR3 of DX12
DWn , dbn or Xdbn	Data or Extended DX	DW3,12 = DW3 of DB12
Fn or FBn	Flag (Byte)	F5 or FB67 or F15.6
FWn	(Word)	FW45
In or IBn	Input (Byte)	I1 or IB3 or I47.1
IWn	(Word)	IW123
PWn	Peripheral (Word)	PW128
PYn or PBn	(Byte)	PY34 or PB32
Qn or QBn	Output (Byte)	Q11 or QB14 or Q32.2
QWn	(Word)	QW17
Sn	Extended	S1.5
SWn	Extended	SW23
SYn	Extended	SY5
Tn	Timer	T1

Table 11-3 S5 Name Format to Display or Change Values

● **S5 Values (Example)**

Name	Dec	Hex	Bin	ASCII	Time	Counter	Floating Point	Comment
FB 50	84	54	01010100	" T "				84 decimal
T 25					123.1			KT 123.1
C 33						234		KC 234
FD 55							2E+06	2 * 10 ⁶

Table 11-4 S5 Values (Example)

11.2.2 Save Setup (PLC Menu)

The process variable (operand) entered in the name field and the arrangement of the input, output, and memory bit fields may be saved for future use. The settings are saved in the project file and are available whenever you call the project.

 ◆ Click **Save Setup** in the PLC menu.

 ◆ Click **ALT + P, S**.

11.2.3 Exit (PLC Menu)

With the **Exit** command of the PLC menu, you can close the **External PLC Status** window.



◆ Click **Close**.



◆ Press **ALT + P, E**.

11.3 Window Menu (External PLC Status Window)

The **Window** menu of the external PLC status window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

11.4 Help Menu (External PLC Status Window)

The **Help** menu of the external PLC status window is identical with the help menu from the PC block list window. For more details see chapter 3.6.

12 Interrupt Stack

If the PLC is in a stop condition, the **Interrupt Stack** (I-Stack) will display the reasons for the stop condition. *S7 for Windows* and *S5 for Windows* have different stack displays for diagnostics.

12.1 S7 Interrupt Stack Display

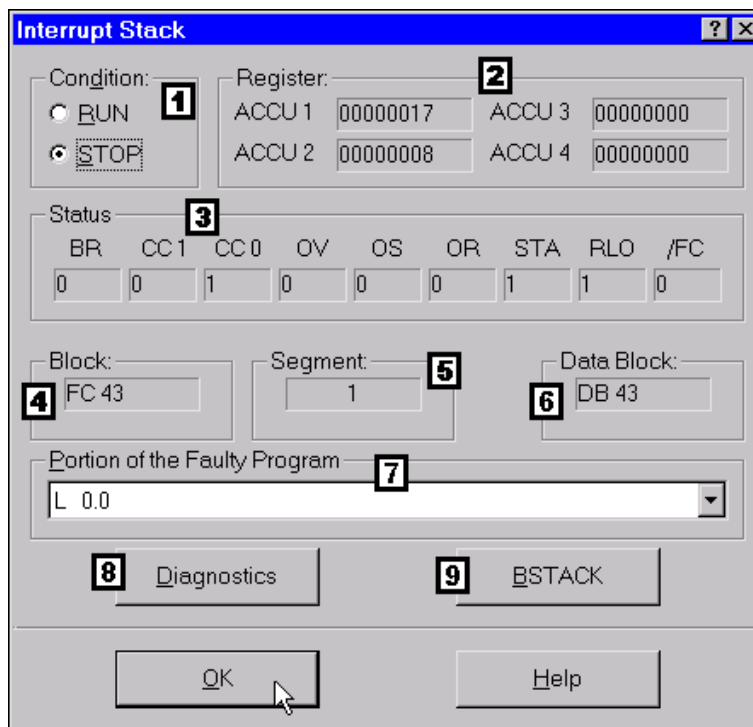


Figure 12-1 S7 Interrupt Stack (I-Stack) display

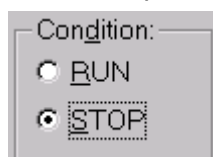
- **Opening the Interrupt Stack Display**

- ◆ Click the **Interrupt Stack** icon in the tool bar or click **PLC Interrupt Stack** in the windows menu.



- ◆ Press **ALT + W, S**.

1 **Condition (External PLC Mode)**



RUN

The PLC is in a the RUN condition. Clicking the button puts the PLC into a RUN condition.

STOP

The PLC is in a STOP condition. Clicking the button puts the PLC into a STOP condition

2 Register (ACCU's)

Register:

ACCU 1	00000017	ACCU 3	00000000
ACCU 2	00000008	ACCU 4	00000000

The contents of accumulators 1, 2, 3 and 4 are displayed in hexadecimal form. The PLC S7-300 CPU's provides two (2) accumulators.

3 Status

Status

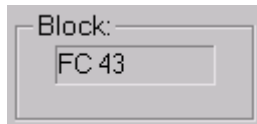
BR	CC1	CC0	OV	OS	OR	STA	RLO	/FC
0	0	1	0	0	0	1	1	0

The relevant bits (bit 9 ... 15 unassigned) of the Status Word are displayed.

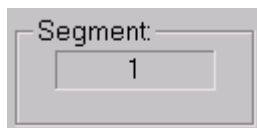
Assignment	Bit	Description	
BR	8	Binary Result	<p>The BR bit is used to indicate whether or not an error occurred during the execution of an SFB or SFC.</p> <ul style="list-style-type: none"> ● If an error occurred the BR bit is 0 ● If no error occurred the BR bit is 1
CC 1, CC 0	7, 6	Condition Code 1 Condition Code 0	<p>The CC1 and the CC0 bits provides information about the results of various operations:</p> <ul style="list-style-type: none"> ● Results of a math instruction ● Results of a shift or rotate instruction ● Results of a comparison instruction ● Results of a word logic instruction
OV	5	Overflow	<p>The OV bit is set if an error occurred during an arithmetic function, math function or compare function. The OV bit is reset if the fault is cleared.</p>
OS	4	Stored Overflow	<p>The OS bit is set together with the OV bit but is not reset if the fault is eliminated. The bit can be reset with the Jump if OS=1 (JOS), the block call, or the block end commands.</p>

Assignment	Bit	Description	
OR	3	Or (AND before OR)	The OR bit is used during the execution of a logical AND instruction (A, AN, A(, AN(,)and NOT) prior the OR operation. If the RLO of the logical AND instruction a "1", the OR bit is set. Any other logical bit instruction resets the OR bit.
STA	2	Status	The STA bit stores the value of the addressed (referenced) bit.
RLO	1	Result of Logic Operation (previous)	The RLO bit stores the result of a logical operation triggered by a bit logic instruction or math comparing instructions.
/FC	0	First Check Bit (negated)	The value of the FC bit is used to control chained logical and compare instruction.

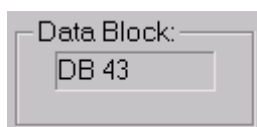
Table 12-1 S7 Status Word Register

4**Block**

The block where the PLC program was interrupted (stop condition) is displayed.

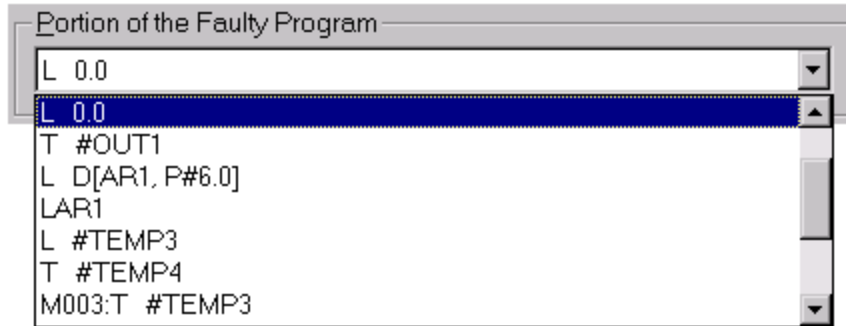
5**Segment (Network)**

The segment (network) number where the PLC program was interrupted (stop condition) is displayed.

6**Data Block**

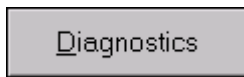
If a data block (DB) was active when the PLC program was interrupted, the data block number will be displayed.

7 Portion of Faulty S7 PLC Program



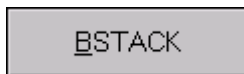
A pull down list field is provided to display the portion of the PLC where the fault occurred. The statement where the PLC went in a STOP condition is displayed with a blue background.

8 Diagnostics



A button is provided to open the diagnostic buffer (see chapter 12.2)

9 Block Address Stack



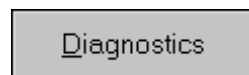
A button is provided to open the block address stack (see chapter 12.3).

12.2 S7 Diagnostic Buffer

Each S7-300/400 CPU has a diagnostic buffer. This buffer stores detailed information about diagnostic events. The events are stored in the order they occur.

The **Diagnostic Buffer** is called from the I Stack.

- ◆ Click the **Diagnostics** button.



- ◆ Press **D**.

The diagnostic buffer is designed as a cyclical *first in first out* buffer. If a new diagnostic event occurs, all the information in the buffer is shifted down and the new event is saved at the top of the buffer. If the buffer overflows, the oldest event is deleted. The maximum size of the buffer depends on the S7-300/400 CPU in use.

The events are displayed with the date and time that they occurred.

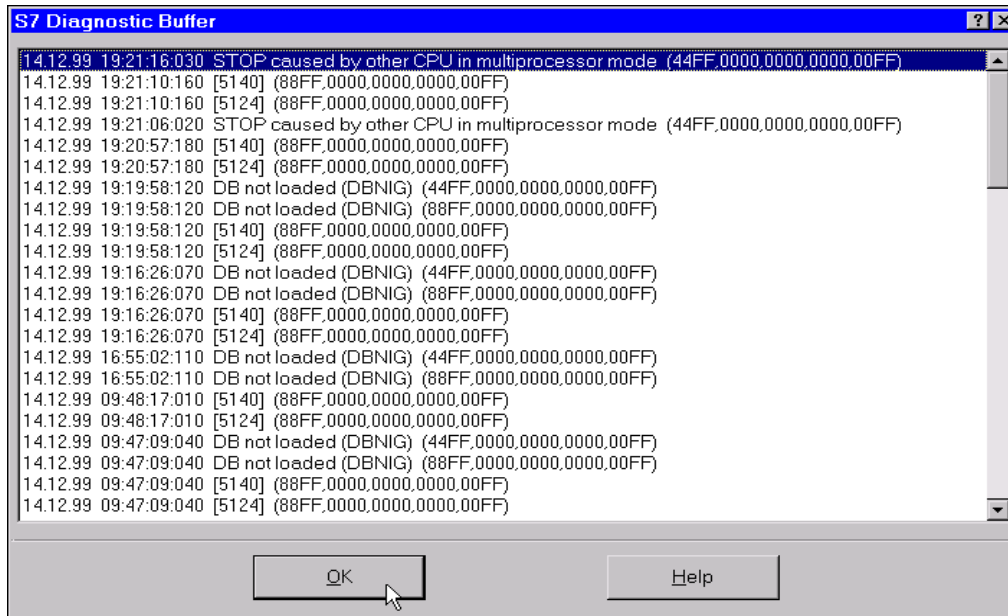


Figure 12-2 S7 Diagnostic Buffer

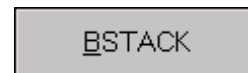
12.3 S7 Block Stack (B-Stack)

During the program execution the jump instructions enter data in the block stack.

The block where the jump (block call) originated and the following locations are listed.

The S7 Block Stack is called from the I Stack.

◆ Click the **BSTACK** button.



◆ Press **B**.

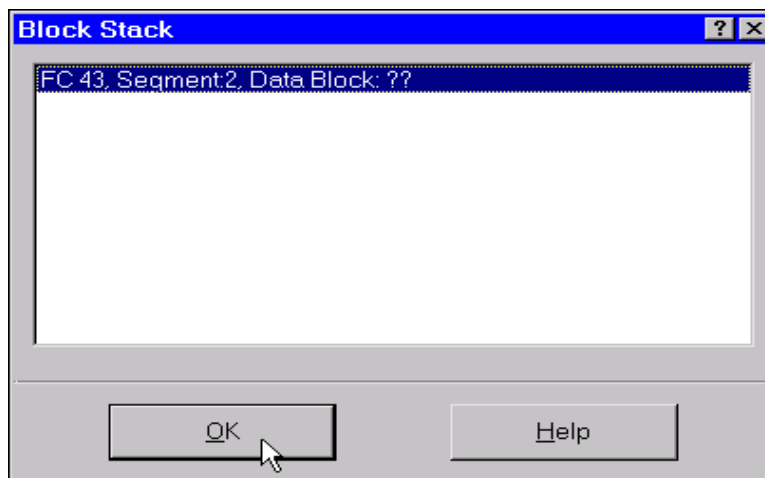


Figure 12-3 S7 Block Stack display

The block stack lists all the blocks that were called but had not been completely processed prior to the CPU going into its STOP mode.

12.4 S5 Interrupt Stack Display

- Opening the S5 Interrupt Stack Display

- ◆ Click the **Interrupt Stack** icon in the tool bar or click **PLC Interrupt Stack** in the windows menu.



- ◆ Press **ALT + W, S**.

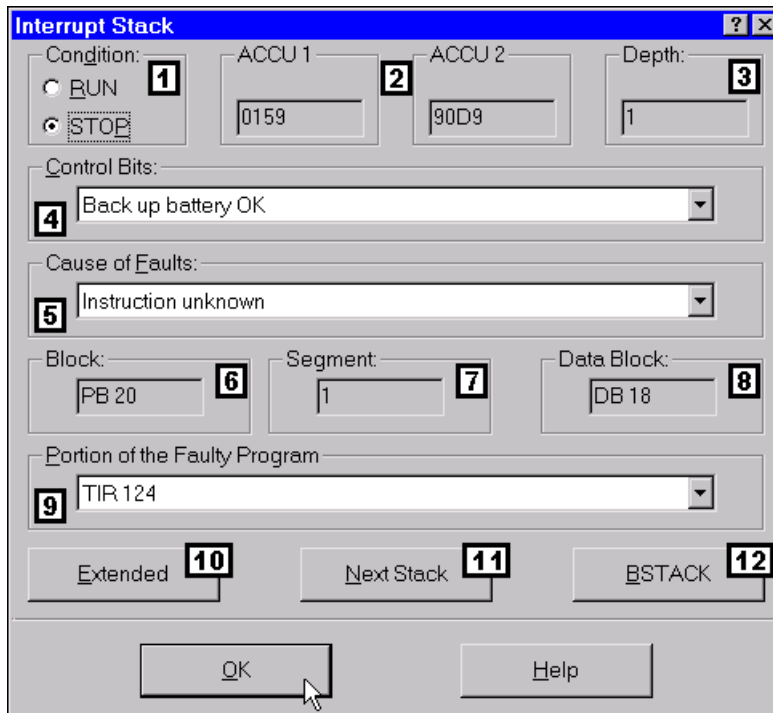
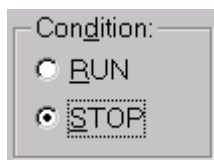


Figure 12-4 S5 Interrupt Stack (I-Stack) display

1 Condition (External PLC Mode)



RUN

The PLC is in a RUN condition. Clicking the button puts the PLC into a RUN condition.

STOP

The PLC is in a STOP condition. Clicking the button puts the PLC into a STOP condition.

2 Register (ACCU's)

The screenshot shows two rectangular boxes side-by-side. The left box is labeled 'ACCU 1' and contains the hexadecimal value '0159'. The right box is labeled 'ACCU 2' and contains the hexadecimal value '90D9'.

The contents of accumulators 1 and 2 are displayed in hexadecimal form. The contents of the additional accumulators, 3 and 4 (certain S5 CPU's only) are displayed in the **Extended Interrupt Stack** display.

3 Depth

The screenshot shows a rectangular box with the label 'Depth:' above it. Inside the box, the number '1' is displayed.

Depending on the fault and the CPU type, several levels of I-Stack information may be supplied. Additional information will be shown in the next display level. With the **Next** button you may open the next level of I-Stack display.

4 Control Bits

The screenshot shows a rectangular box with the label 'Control Bits:' above it. Below the label is a pull-down list menu. The menu is open, showing four options: 'Back up battery OK', 'STOP display' (which is highlighted in blue), 'STOP state (external request)', and 'Alarm release'.

A pull down list field is provided to display the control bits in a man-readable form.

5 Cause of Faults

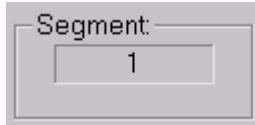
The screenshot shows a rectangular box with the label 'Cause of Faults:' above it. Below the label is a pull-down list menu. The menu is open, showing the option 'Instruction unknown'.

A pull down list field is provided to display the faults in a man-readable form.

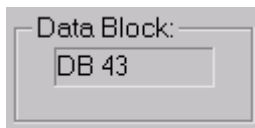
6 Block

The screenshot shows a rectangular box with the label 'Block:' above it. Inside the box, the value 'FC 43' is displayed.

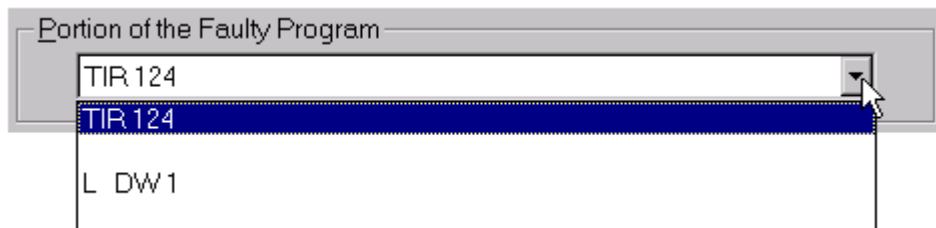
The block where the PLC program was interrupted (stop condition) is displayed.

7 Segment (Network)

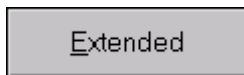
The segment (network) number where the PLC program was interrupted (stop condition) is displayed.

8 Data Block

If a data block (DB) was active when the PLC program was interrupted, the data block number will be displayed.

9 Portion of Faulty S5 PLC Program

A pull down list field is provided to display the portion of the PLC where the fault occurred. The statement where the PLC went into a STOP condition is displayed with a blue background.

10 Extended Interrupt Stack

A button is provided to switch to extended interrupt stack (see chapter 12.5).

11 Next level of the I-Stack

A button is provided to switch to the next level of the I-Stack (see **Depth**).

12 Block Address Stack

A button is provided to open the block address stack (see chapter 12.6).

12.5 S5 Extended Interrupt Stack

Depending on the fault and the type of the S5 CPU, additional information about the fault and the status of the CPU are displayed in the S5 Extended Interrupt Stack. See the hardware manual of the CPU in use for additional details.

The **S5 Extended Interrupt Stack** is called from the I Stack.

 ◆ Click the **S5 Extended Interrupt Stack** button.

Extended

 ◆ Press **E**.



Interrupt Stack (Extended)

BEF-REG: 487C SAZ(new): D948 DB-ADR: D6F0 BA-ADR:

BST-STP: EB0B Block: PB 20 Block: DB 18 Block:

Level: REL-SAZ: 0002 DBL-REG: BS-REG:

Tile No.: SAZ (old): UAMK: UALW:

Brackets: Depth: 1

Result Display

anz1 anz0 ovfl ovfls or erab stat RLO

ACCU1: 0159 ACCU2: 90D9 ACCU3: ACCU4:

OK Help

Figure 12-5 Extended Interrupt Stack

- **S5 Extended Interrupt Stack information**

Mnemonics	Explanation
Depth	The nesting level is shown
BEF-REG	Statement register
SAZ (new)	Step address counter (new)
DB-ADR	Data block address

S5 Extended Interrupt Stack information (continued)

Mnemonics	Explanation		
BA-ADR	Block address		
BST-STP	Block stack pointer		
Block	Block type and number		
Level	Number of nesting levels		
REL-SAZ	Relative step address counter		
DBL-REG	Data block register		
BS-REG	Block register		
Tile No.	Number of tiles		
SAZ (old)	Step address counter (old)		
UAMK	Interrupt display high word		
UALW	Interrupt display low word		
Brackets	Nesting stack entry 1 to 6 entered for A(and O(
anz1	0	0	1
anz0	0	1	0
	Accu 1=0 or 0 is shifted	Accu 1>0 or 1 is shifted	Accu 1<0
ovfl	Arithmetic overflow		
ovfls	Arithmetic overflow latched		
or	OR memory		
erab	First scan (negated signal)		
stat	Status of the operand of the last binary statement executed		
ROL	Result of logical operation		
ACCU 1-4	Contents of the accumulators 1 -4		

Table 12-2 S5 Extended Interrupt Stack information

12.6 S5 Block Stack (B-Stack)

During the program execution the jump instructions enter data in the block stack.

The block where the jump (block call) originated and the following locations are listed.

The S5 Block Stack is called from the I Stack.

 ◆ Click the **BSTACK** button.

BSTACK

 ◆ Press **B**.

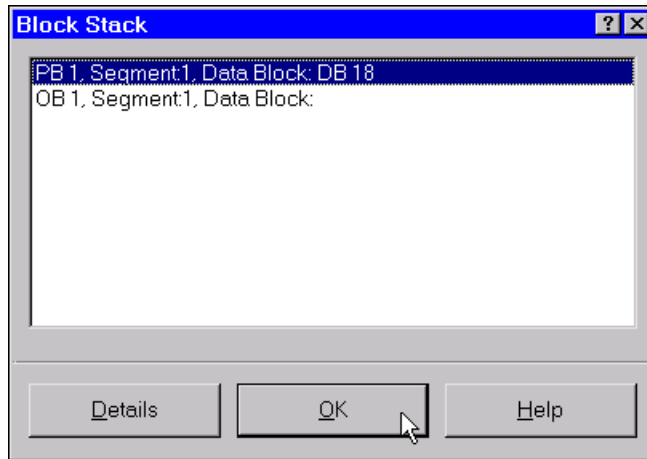


Figure 12-6 S5 Block Stack display

The block stack lists all the blocks that were called but had not been completely processed prior to the CPU going into its STOP mode.

A button is provided to display details about the selected block (segment). Mark the Block that you want details on.



- ◆ Click the **Details** button.



- ◆ Press **D**.

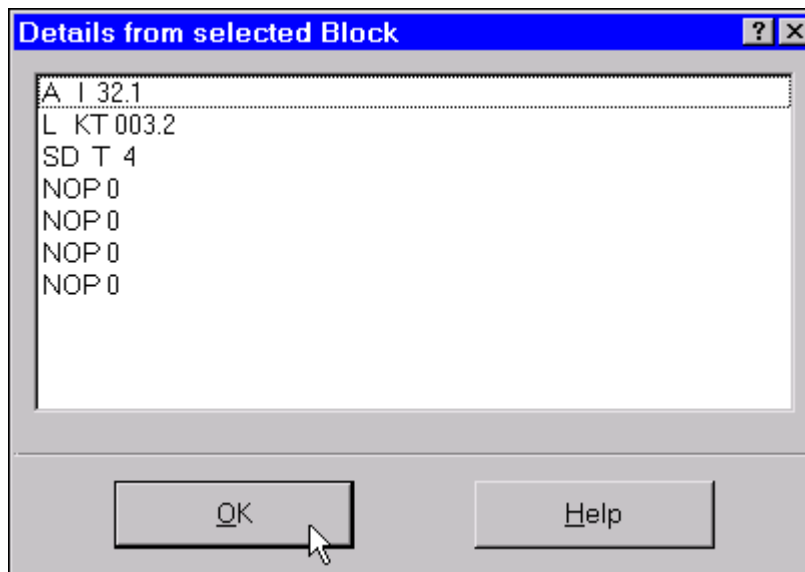


Figure 12-7 Details from selected Block display

13 S7 Hardware Configuration



S7 for Windows provides an integrated program to configure and set the parameters and addresses of the S7-300/400 hardware CPU's and modules.

With the *S7 for Windows* hardware configuration program it is possible to build a S7-300/400 PLC configuration off-line by using the integrated hardware catalog. It is also possible to read in a configuration of an existing S7-300/400 PLC (on-line).

The newly generated or existing PLC hardware configuration may be transferred to an S7-300/400 PLC via a serial link (MPI cable).

The configuration data is saved in the System Data Blocks and may be transferred to a PLC as part of the PLC program.

13.1 S7 Hardware Configuration Window

- **Opening the Configuration Window**
 - ◆ Open the **PC Block List Window**.
 -  ◆ Click **Open S7 Hardware Configuration** in the **Options** menu (see chapter 3.4.13).
 - ◆ You may also double click an existing System Data Block, containing hardware configuration data, to open the S7 hardware configuration window. The workplace will display the current hardware configuration.
 -  ◆ Press **ALT + O, 7**.

If a project has a hardware configuration file already assigned the command S7 Hardware Configuration opens this file and is ready for modifications (see chapter 3.2.5.2).

If no hardware configuration file is assigned to the project a new S7 hardware configuration file can be generated and assigned to the project.

The hardware configuration file is saved using the project name with the file name extension ***.CF7**.

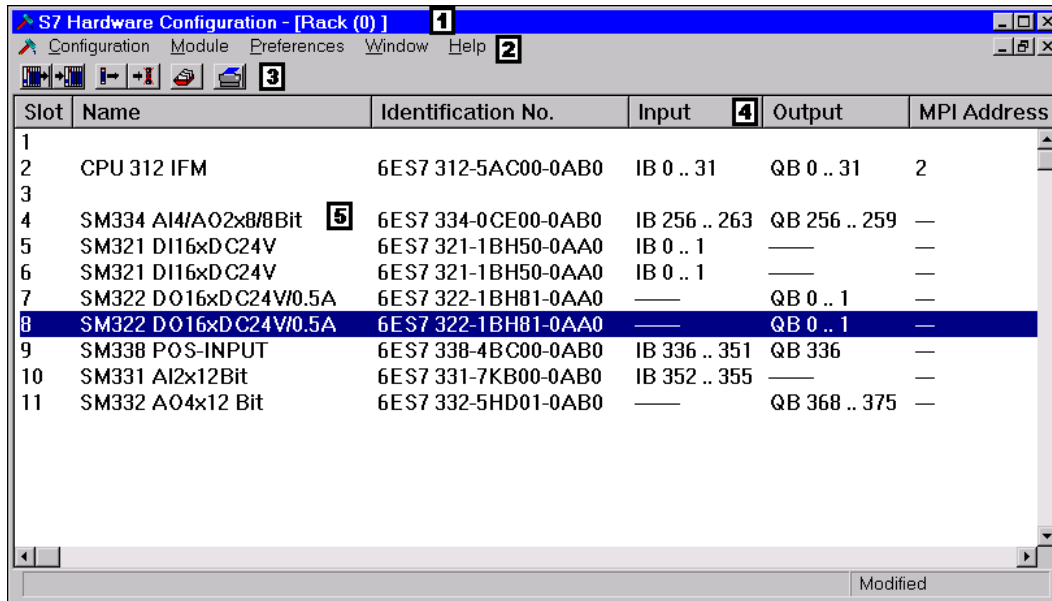


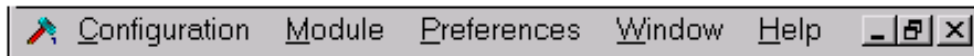
Figure 13-1 S7 Hardware Configuration Window

1 S7 Hardware Configuration Title Bar



The title bar displays the name of the window and the card rack of the PLC.

2 S7 Hardware Configuration Menu Bar

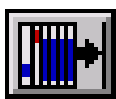


The menu bar contains a list of menus. You open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character from the menu name. All the commands from the External PLC Status menus are described in this chapter.

3 S7 Hardware Configuration Tool Bar

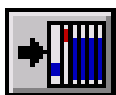


The tool bar provides instant access to frequently used commands. Click an icon with the mouse and the command is executed. With the keyboard you can reach these functions via the window menu and/or the function keys.



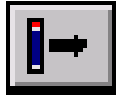
Transfer hardware configuration data from the S7-300/400 PLC to the PC.

 **Press ALT + C, T**



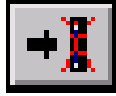
Transfer the hardware configuration data displayed from the PC to the S7-300/400 PLC.

 **Press ALT + C, T**



Insert. The module selected (marked) in the hardware catalog is inserted into the marked position (slot) of the PLC module rack.

 **Press ALT + C, T**



Delete. The module selected (marked) in the PLC module rack (slot) is deleted.

 **Press ALT + C, T**



Hardware Catalog. Clicking this icon will open the S7-300/400 hardware catalog to select modules.

 **Press ALT + C, T**



Print the hardware configuration data of the S7-300/400 PLC shown in the S7 hardware configuration workplace.

 **Press ALT + C, T**

4 S7 Hardware Configuration Workplace Column Title Bar

Slot	Name	Identification No.	Input	Output	MPI Address
------	------	--------------------	-------	--------	-------------

By holding the left mouse button and dragging the column limit the width of the columns in the Workplace Column Title Bar can be adjusted. The width of the columns may be adjusted to accommodate the font selected (see chapter 3.2.11.4).

	Description	Example
Slot	The S7-300/400 PLC's has slot orientated addressing for modules (default addressing). The slot number where the module is located is displayed.	4
Name	The short name of the module is displayed.	SM334 AI4 / AO2 x 8 / 8Bit
Identification No.	The number identifying the module (with the revision number) is displayed.	6ES7 334-0CE00-0AB0
Input	The input address area occupied by the module is displayed.	IB 256 .. 263
Output	The output address area occupied by the module is displayed.	QB 256 .. 259
MPI Address	The MPI address occupied by the module is displayed.	2

Table 13-1 Hardware Configuration Workplace Column Titles

5 S7 Hardware Configuration Workplace

All the modules of the PLC S7-300/400 are displayed in the S7 hardware configuration display field.

13.2 Configuration Menu (S7 Hardware Configuration)

With the commands from the **Configuration Menu**, the hardware configuration data for an S7-300/400 PLC can be manipulated. Data can be transferred and saved. Font selection and printing is also controlled by commands from this menu.

 ◆ Click **Configuration** in the menu bar

 ◆ Press **Alt, C**.

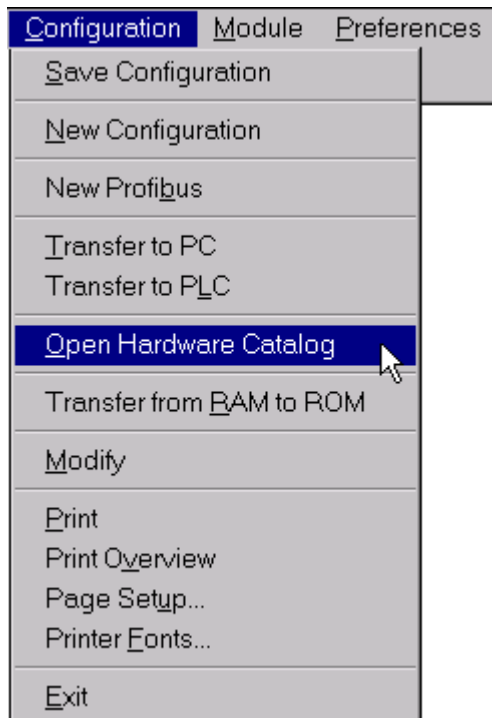



Figure 13-2 Configuration Menu, S7 Hardware Configuration

13.2.1 Save Configuration (Configuration Menu - S7 Hardware Configuration)

The S7 hardware configuration, from the S7 Hardware Configuration workplace, (see chapter 13.1) is saved on disk under the current project name. System Data Blocks shown in the PC Block List are also generated.

 ◆ Click **Save Configuration** in the configuration menu.

 ◆ Press **Alt + C, S**.

13.2.2 New Configuration (Configuration Menu - S7 Hardware Configuration)

The **New Configuration** command is used to create a new S7-300/400 hardware configuration. The S7 Hardware Configuration workplace is cleared.

- ◆ Click **New Configuration** in the configuration menu.
- ◆ Press **Alt + C, N**.

If an existing hardware configuration is displayed in the workplace, *S7 for Windows* prompts you to save the open S7 hardware configuration.

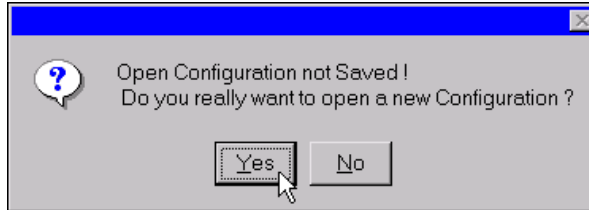


Figure 13-3 New Configuration warning

Activating the **Yes** button will clear the S7 hardware configuration workplace and the open S7 hardware configuration is lost.

13.2.3 New Profibus (Configuration Menu - S7 Hardware Configuration)

The **New Profibus** command is used to create a new S7-300/400 Profibus hardware configuration. An additional window (Profibus(1)) is opened in the S7 Hardware Configuration workplace to generate a new Profibus structure.

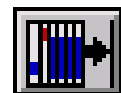
- ◆ Click **New Configuration** in the configuration menu.
- ◆ Press **Alt + C, N**.

If an existing Profibus configuration is displayed in the workplace, *S7 for Windows* will open an additional Profibus window to layout an additional Profibus structure (additional coupling module).

13.2.4 Transfer to PC (Configuration Menu - S7 Hardware Configuration)

The **Transfer to PC** command is used to transfer the S7 hardware configuration to the PC via the serial link (MPI-PC cable). After transferring the S7 hardware configuration to the PC, the configuration data can be modified and transferred back to the S7-300/400 PLC. The S7 hardware configuration data can also be saved on disk (see chapter 13.2.1).

- ◆ Click the **Transfer to PC** icon in the tool bar or click **Transfer to PC** in the configuration menu.



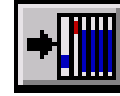
- ◆ Press **ALT + C, T**.

The S7 hardware configuration is shown in the S7 Hardware Configuration workplace.

13.2.5 Transfer to PLC (Configuration Menu - S7 Hardware Configuration)

The **Transfer to PLC** command is used to transfer the S7 hardware configuration listed in the **S7 Hardware Configuration Window** (see chapter 13.1) to the PLC via the serial link (MPI-PC cable).

- ◆ Click the **Transfer to PLC** icon in the tool bar or click **Transfer to PLC** in the configuration menu.



- ◆ Press **ALT + C, L**.

The S7 hardware configuration is transferred to the S7-300/400 PLC. The configuration data is saved in System Data Blocks on the CPU.

13.2.6 Open Hardware Catalog (Configuration Menu - S7 Hardware Configuration)

The **Open Hardware Catalog** command opens the integrated S7-300/400 Hardware Catalog. In this catalog S7-300/400 components are listed in a tree structure to build up an S7-300/400 PLC offline. Profibus components are also listed to build a Profibus hardware structure.

- ◆ Click the **Open Hardware Catalog** icon in the tool bar or click **Open Hardware Catalog** in the configuration menu.



- ◆ Press **ALT + C, O**.

The size of the hardware catalog window may be changed any time. The catalog is built up in the explorer like a tree structure.

The hardware catalog may be extended any time. To update and to add additional modules to the S7-300/400 hardware catalog an update service has been set up.

Via the homepage www.IBHsofttec.de you may download additional and updated *.CFB files.

Just copy the downloaded files into the CFB folder located in the *S5 / S7 for Windows* system folder (usually S5W). The next time *S7 for Windows* is started the new or updated *.CFB files are automatically integrated into the hardware catalog.

A *.CFB file holds all the necessary information to configure an S7-300/400 hardware module (CPU, Input Module, Output Module, etc.) when using the *S7 for Windows* hardware configuration software.

It is also possible to update and to extend the Profibus components of the *S7 for Windows* hardware catalog. The manufactures of Profibus components supply GSD files describing the hardware and the required configuration settings. *S7 for Windows* can read the standardized GSD files. Copy the GSD files into the GSD folder located in the *S5 / S7 for Windows* system folder (usually S5W). The next time *S7 for Windows* is started the new or updated *.GSD files are automatically integrated into the Profibus portion of the hardware catalog.

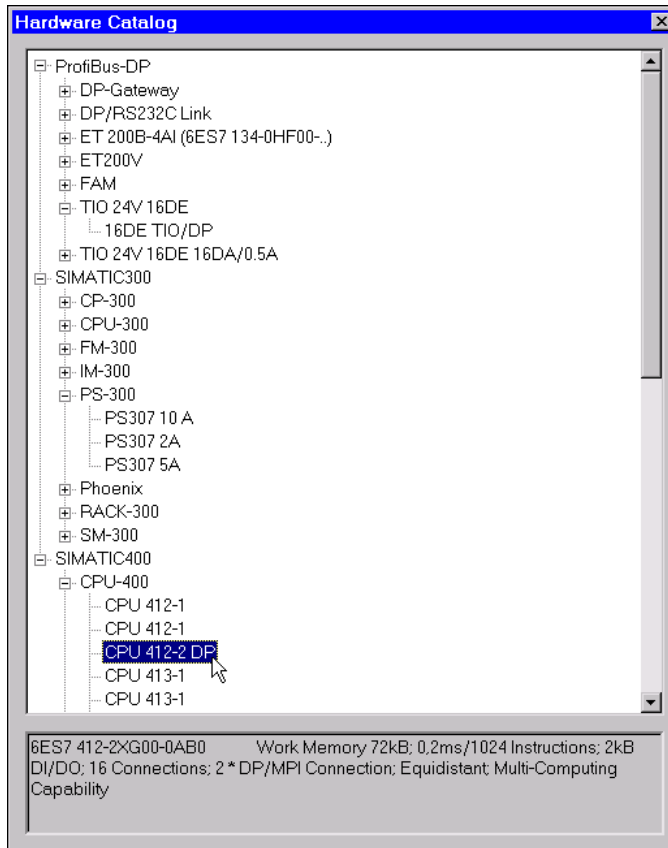


Figure 13-4 Hardware Catalog Window

13.2.7 Transfer from RAM to ROM (Configuration Menu - S7 Hardware Configuration)

Some CPU's (e.g. CPU 312) have the ability to transfer the contents of the PLC work memory (RAM = volatile memory) into non-volatile memory (ROM). The ROM area is physically made up of EEPROM modules.

◆ Click **Transfer from RAM to ROM** in the configuration menu.

◆ Press **ALT + C, R**.

To initiate the PLC program transfer from the RAM area into the non-volatile ROM area, the CPU key switch must be in the STOP position. If the **Transfer from RAM to ROM** command was initiated without having the key switch in the STOP position, a warning will be displayed and the command is aborted. Confirm the warning, place the key switch in the STOP position and repeat the **Transfer from RAM to ROM** command.

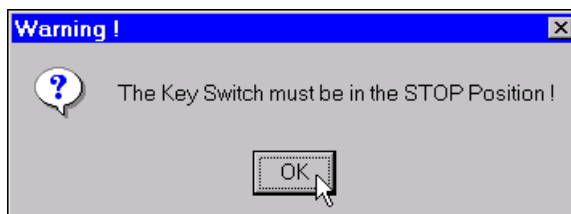


Figure 13-5 Transfer from RAM to ROM warning.

The successful transfer of the PLC program from RAM to the ROM is indicated.



Figure 13-6 Successful RAM to the ROM transfer indication

Note:


In the CPU (e.g. CPU 312) the integrated EEPROM (ROM) modules can only be overwritten. It is not possible to delete the contents directly. The EEPROM module must be overwritten with "null" data.


If there is no PLC Program located in the RAM area of the CPU and the **Transfer from RAM to ROM** command is executed all data in the EEPROM module is erased.

13.2.8 Modify (Configuration Menu - S7 Hardware Configuration)

With the **Modify** command, the **Parameter** dialog box of the S7-300/400 module, marked in the S7 hardware configuration workplace window, is opened. The **Parameter** dialog box lists all the parameter of the module.

Double click the parameter for modification. A dialog box regarding this parameter is opened. The limits are displayed regarding the changes in the parameter. The integrated help may directly be open by activating the **Help** button of the **Modify Parameter** dialog box and explains the use of the parameter and provides some background information.

 ◆ Click **Modify** in the configuration menu.

 ◆ Press **ALT + C, M**.

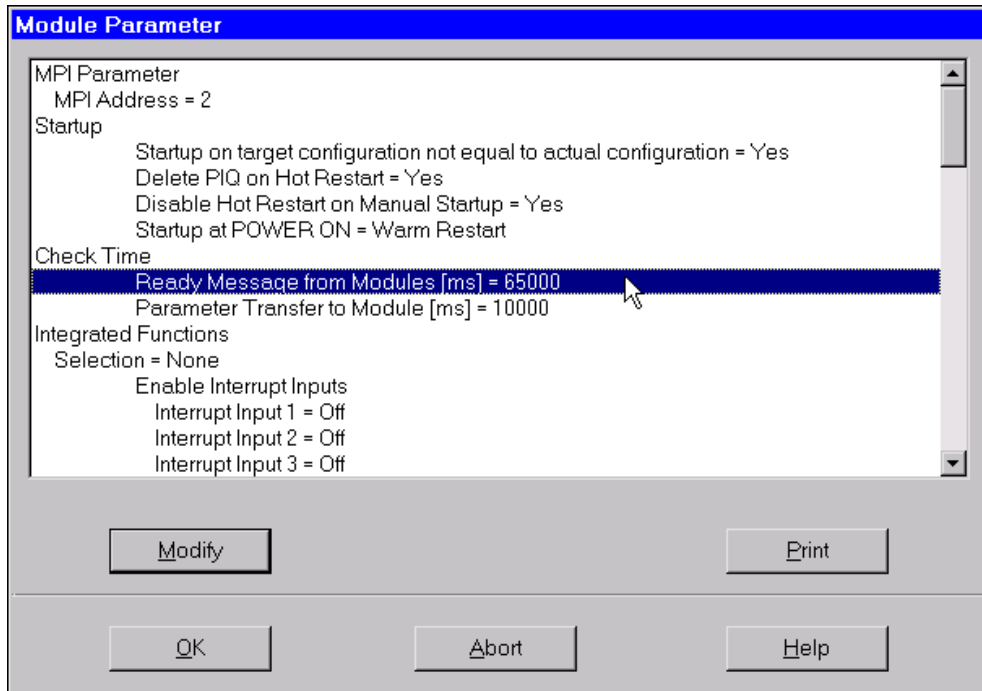


Figure 13-7 Module Parameter dialog box

The **Module Parameter** dialog box has a vertical scroll bar to display very large parameter list. All parameter are preset.

- **Modify**

- ◆ Mark the parameter you want to modify.
- ◆ Click the Modify button or double click the parameter name.
- ◆ Press the **M** key.



The dialog box **Modify Parameter** is opened. Depending on the type of parameter, the dialog box may give you a choice of parameters to select from or you may have to enter a value. The limits and the dimension are displayed. The valid parameter is shown (value or marked choice). The integrated help may be called by activating the help button to give you some background information on the parameter.

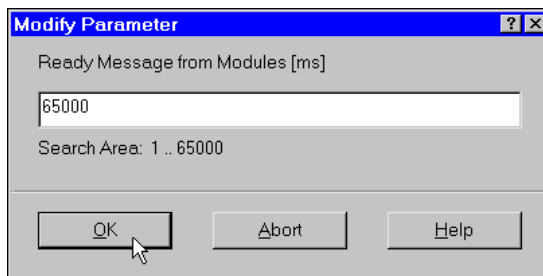


Figure 13-8 Modify Parameter dialog box to enter a value

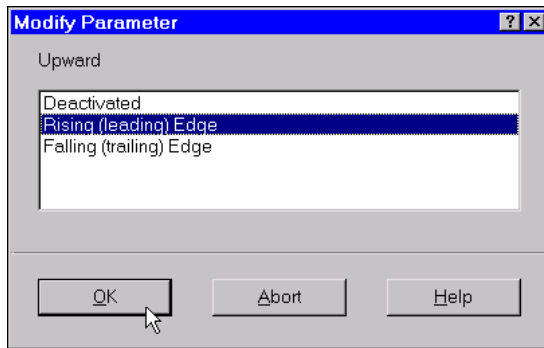


Figure 13-9 Modify Parameter dialog box, a choice of parameters

● Print



Activating the Print button will print the contents of the Module Parameter dialog box. The printout is done using the settings from the dialog boxes, **Page Setup** and **Printer Fonts**, which can be opened from the Configuration menu (see chapter 13.2.11, 13.2.12).

13.2.9 Print (Configuration Menu - S7 Hardware Configuration)

The **Print** command from the **Configuration** menu is used to print the complete S7 Hardware Configuration. The printout is done using the settings from the dialog boxes, **Page Setup** and **Printer Fonts**, which can be opened from the Configuration menu (see chapter 13.2.11, 13.2.12)..



- ◆ Click the **Print** icon in the tool bar or click **Print** in the configuration menu.



- ◆ Press **ALT + C, P**.

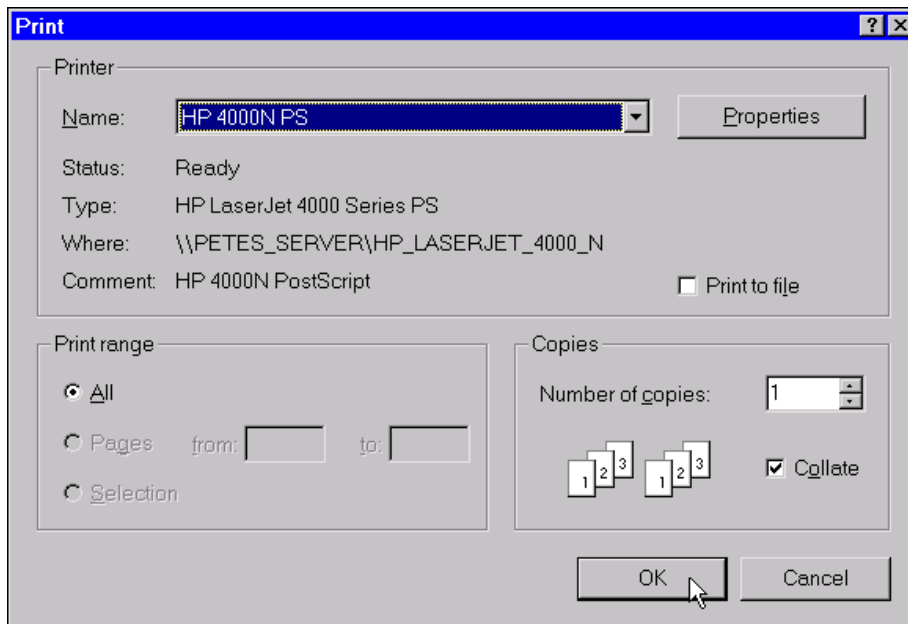


Figure 13-10 Print dialog box

With the dialog box you may select the number of copies to be printed. The documentation can also be printed to a file.

The button **Properties** opens another dialog box to setup the active printer. From the drop down list **Name** you can select another printer.

The appearance of the dialog box, **Print**, and the other dialog boxes, which can be opened from the **Print** dialog box, is dependant on the printers installed under Windows.

Activating the **OK** button starts the actual printing process.

13.2.10 Print Overview (Configuration Menu - S7 Hardware Configuration)

The **Print** command from the **Configuration** menu is used to print an overview of the S7 Hardware Configuration. This overview lists the S7-300/400 hardware modules of the project defined in the S7 Hardware Configuration Window. The printout is done using the settings from the dialog boxes, **Page Setup** and **Printer Fonts**, which can be opened from the Configuration menu (see chapter 13.2.11, 13.2.12)..



- ◆ Click **Print Overview** in the configuration menu.



- ◆ Press **ALT + C, V**.

The command opens the print dialog box (see figure 13-10) where you can select a printer and to start the actual printing process.

13.2.11 Page Setup (Configuration Menu - S7 Hardware Configuration)

The command **Page Setup** opens the corresponding dialog box.



- ◆ Click **Page Setup** in the configuration menu.



- ◆ Press **ALT + C, U**.

The standard Windows page setup dialog box allows you to select the size, the source, the orientation, and the margins of the paper you want to print on.

The **Printer** button of the page setup dialog box opens up a dialog box to select a printer from the list of the printers you have installed under Windows. Additional buttons are provided to setup the printer options. The setup possibilities depend on the selected printer.

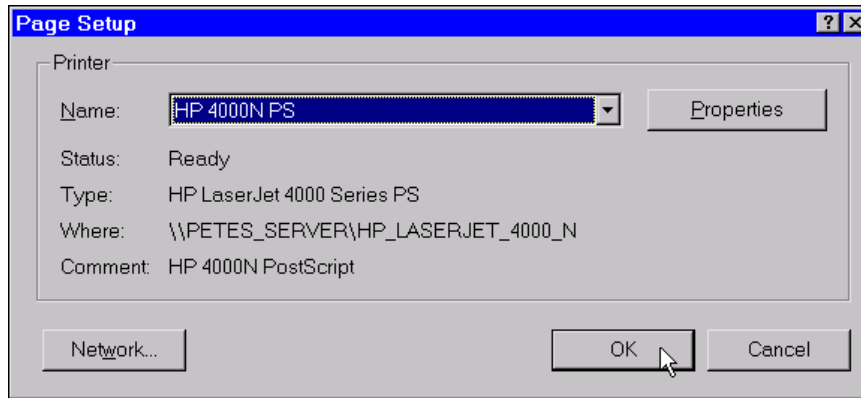


Figure 13-11 Page Setup dialog box

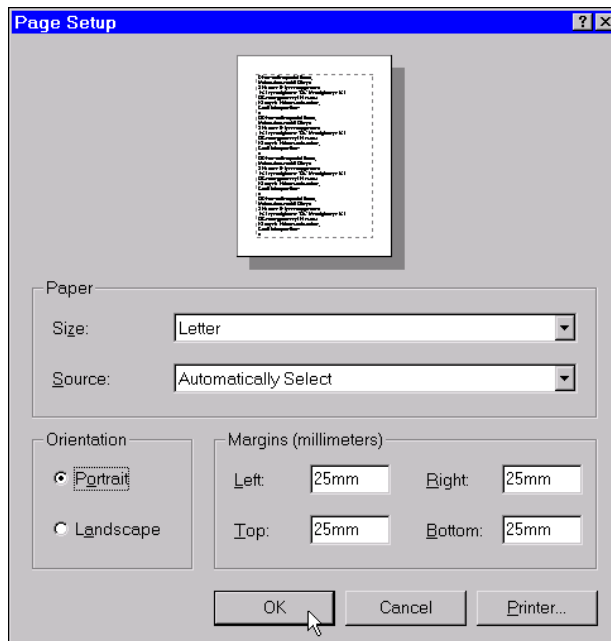


Figure 13-12 Page Setup printer selection dialog box

Note:

The settings of the **Page Setup** dialog box and the Printer selection as well as all the printer option selections are standard windows settings. These settings are only saved in Windows. They are not saved with the project.

All the selections from the **Page Setup** dialog box can be overwritten for the current print job with the settings from the **Print** dialog box (see chapter 13.2.9, 13.2.10).

13.2.12 Printer Fonts (Configuration Menu - S7 Hardware Configuration)

The **Printer Fonts** command from the **Configuration** menu is used to select the font to be used for the printouts initiated from the S7 Hardware Configuration window.

◆ Click **Printer Fonts** in the configuration menu.

◆ Press **ALT + C, F**.

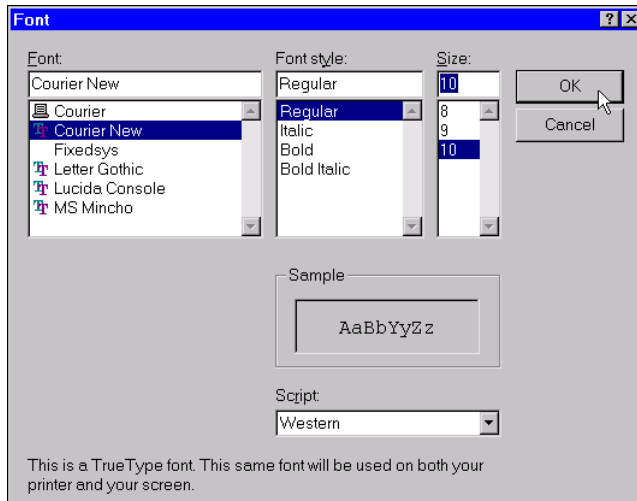


Figure 13-13 Printing font selection dialog box

- **Font:**
Select the font from the list field. All the fonts offered by windows may be selected.
- **Font style:**
The font style may also be selected.
- **Size:**
The selection of the font size depends on the size of the paper (landscape, portrait) used for the printout. You may have to decrease the size of the font to fit the Overview Printing on a single sheet without line breaking.

Note:

The font selection done via the **Fonts Type** settings are used for printing only.

13.2.13 Exit (Configuration Menu - S7 Hardware Configuration)

With the **Exit** command, from the configuration menu, you can close the S7 Hardware Configuration window.

◆ Click **Exit** in the configuration menu.

◆ Press **ALT + C, E**.

13.3 Module Menu (S7 Hardware Configuration)

The commands from the **Module** menu are used to manipulate a module marked in the S7 Hardware Configuration window workplace.

 ◆ Click **Module** in the menu bar

 ◆ Press **Alt, M**.

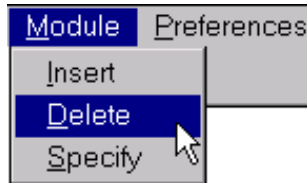




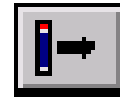
Figure 13-14 **Module** menu, S7 Hardware Configuration

13.3.1 Insert (Module Menu - S7 Hardware Configuration)

With the command **Insert**, the module marked in the S7-300/400 hardware Catalog is inserted into the marked slot in the **Module Rack** shown in the S7 Hardware Configuration window workplace.

 ◆ Click the **Insert** icon in the tool bar or click **Insert** in the module menu.


 ◆ Press **ALT + M, I**.




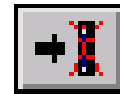
Some modules require a particular slot location other modules may occupy more than one (1) slot.

13.3.2 Delete (Module Menu - S7 Hardware Configuration)

With the command **Delete**, the marked module is deleted from the **Module Rack** shown in the S7 Hardware Configuration window workplace.


 ◆ Click the **Delete** icon in the tool bar or click **Delete** in the module menu.

 ◆ Press **ALT + M, D**.



13.3.3 Specify (Module Menu - S7 Hardware Configuration)

With the command **Specify**, the marked module is from the **Module Rack** shown in the S7 Hardware Configuration window workplace can be specified. A corresponding dialog box is opened.

 ◆ Click the **Specify** icon in the tool bar or click **Specify** in the module menu.

 ◆ Press **ALT + M, I**.

Only certain modules have the capability of further specification. If the command is executed and the module does not have the capability of a further specification a warning is displayed.



Figure 13-15 No further specification possible warning

13.4 Preferences Menu (S7 Hardware Configuration)

Commands from the **Preferences** menu are used to select the module that data will be transferred to (MPI address), set the date and time of the selected module, and to change the display format of I/O addresses. The PC must be connected on-line with a S7-300/400 PLC to use the **MPI Address** and the **PLC Date and Time** commands.

◆ Click **Preferences** in the menu bar

◆ Press **Alt, P**.

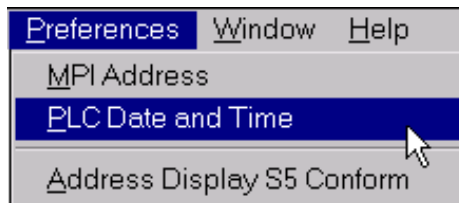


Figure 13-16 Preferences menu, S7 Hardware Configuration

13.4.1 MPI Address (Preferences Menu - S7 Hardware Configuration)

Via the MPI (multi point interface) several S7-300/400 CPU's and/or programmable modules may be connected with the PC running the S7 hardware configuration program. Each of the CPU's and modules connected together must have unique MPI addresses.

The command **MPI Address** allows you to select the CPU (module) you want to communicate with.

Note:

If, in addition to the CPU, communication processors (CP's) and other programmable modules (FM's) are located in the S7-300/400 PLC, these modules (CP, FM) will have an MPI address automatically assigned.

The firmware assigns the MPI address of the CPU + 1 to the first module. The second module will get the CPU MPI address + 2 etc..

The communication rate is dependent on the setting of the PC-MPI cable and may be between 19.2 and 115.2 kBaud (187.5 kBaud between the modules). See chapter 3.2.11.1 for information on the interface settings.


The maximum cable length of the complete network (without additional amplifiers) is limited to 50 meters (160 ft.).

The table shows some default MPI address settings. Unique MPI addresses must be assigned to the devices prior to connecting the devices to the MPI network.

Device (Node)	Default MPI Address	Highest Default MPI Address
Programming Device (PG)	0	15
Operators Panel (OP)	1	Depending on the OP type
CPU	2	15

Table 13-2 Default MPI address settings

 ◆ Click **MPI Address** in the preference menu.

 ◆ Press **ALT+ P, M**.

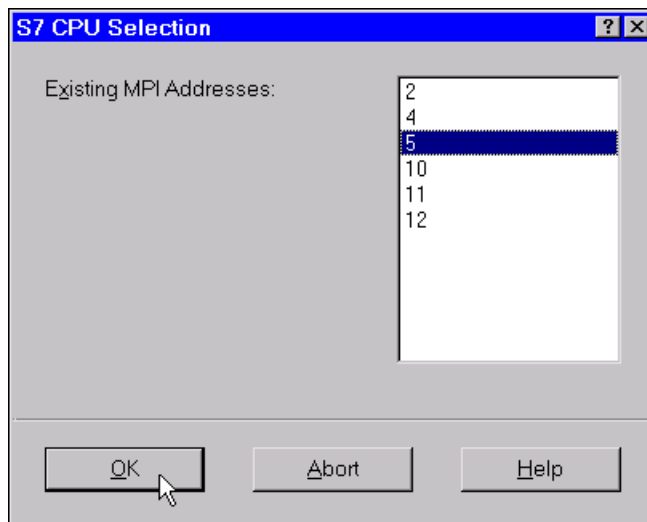


Figure 13-17 S7 CPU Selection dialog box, existing MPI addresses

Not all the devices in the S7-300/400 PLC series can be set to the same maximum MPI address. It is very important to limit the maximum MPI address of all devices being connected to a bus to the same value (see chapter 3.2.11.1). All devices of the S7-300/400 PLC series allow the setting of 15 to be the maximum MPI address. The default setting of the maximum MPI address of *S5 / S7 for Windows* is 15.

MPI addresses between 0 and 126 may be assigned to the devices connected to the MPI network.

Note:

Make sure that all devices connected to one MPI Bus have the same **Max. MPI Address** setting. If devices with different **Max. MPI Address** settings are connected on one bus the devices will not be recognized and communication cannot take place.

The **S7 CPU Selection** dialog box displays the MPI addresses of all the devices connected via the MPI network. The device you want to communicate with can be selected.

13.4.2 PLC Date and Time (Preferences Menu - S7 Hardware Configuration)

The **PLC Date and Time** command from the preference menu opens the **PLC Date and Time** dialog box to set the date and time of the S7-300/400 PLC CPU. The PLC internal clock has a battery backup and can be used by the PLC program by calling the corresponding SFC system function.

- ◆ Click **PLC Date and Time** in the preference menu.
- ◆ Press **ALT + P, P**.

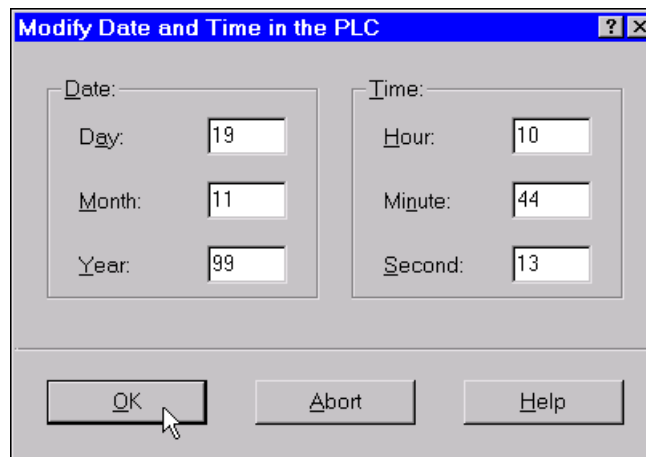


Figure 13-18 PLC Date and Time dialog box

- ◆ Enter the date and time in the text field to set the internal PLC clock.

Confirm with the **OK** button and the new date and time is transferred to the internal CPU clock of the S7-300/400 PLC connected on-line with the PC.

13.4.3 Address Display S5 Conform (Preferences Menu - S7 Hardware Configuration)

S5 / S7 for Windows offers the ability to display the Input and Output addresses of modules in the **Module Rack** shown in the S7 Hardware Configuration window workplace in an S5 format.



-  ◆ Click **Address Display S5 Conform** in the preference menu.
-  ◆ Press **ALT + P, A**.

S5 I / O Addresses		S7 I / O Addresses	
<input checked="" type="checkbox"/> Address Display S5 Conform		<input type="checkbox"/> Address Display S5 Conform	
Input	Output	Input	Output
PY 128 .. 135	PY 128 .. 131	IB 256 .. 263	QB 256 .. 259
IB 0 .. 1	—	IB 0 .. 1	—
—	QB 0 .. 1	—	QB 0 .. 1
PY 208 .. 223	PY 208	IB 336 .. 351	QB 336
PY 224 .. 227	—	IB 352 .. 355	—
—	PY 240 .. 247	—	QB 368 .. 375

Figure 13-19 S5 / S7 Input / Output Address format

13.5 Windows Menu (S7 Hardware Configuration)

The **Windows** menu is divided into two (2) sections. The first section gives you commands to manage the windows opened under *S7 for Windows*. The second section lists all the open windows. The active window is marked. Depending on the arrangement of the open windows you may only see one window. All the other windows are in the background.

-  ◆ Click **Window** in the menu bar.
-  ◆ Press **ALT+ W**.

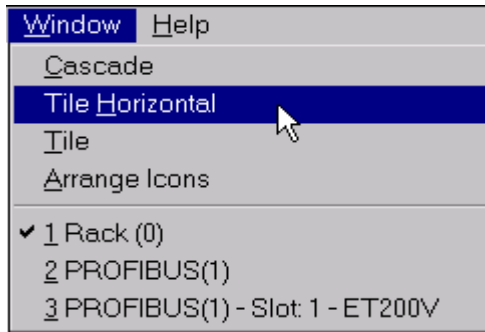



Figure 13-20 Windows menu (S7 Hardware Configuration)

13.5.1 Cascade (Windows Menu - S7 Hardware Configuration)

The **Cascade** command causes the open windows to resize and overlap so that each title bar is visible in the S7 Hardware Configuration window.


 ◆ Click **Cascade** in the Window menu.

 ◆ Press **ALT + W, C**.

13.5.2 Tile Horizontal (Windows Menu - S7 Hardware Configuration)


The **Tile Horizontal** command arranges the open windows in the S7 Hardware Configuration window in smaller sizes to fit under each other in the basic window workplace.


 ◆ Click **Tile Horizontal** in the window menu.

 ◆ Press **ALT + W, H**.

13.5.3 Tile (Windows Menu - S7 Hardware Configuration)

The **Tile** command arranges the open windows in the S7 Hardware Configuration window in smaller sizes to fit next to each other on the basic window workplace.

 ◆ Click **Tile** in the window menu.

 ◆ Press **ALT + W, T**.

13.5.4 Arrange Icons (Windows Menu - S7 Hardware Configuration)

When you minimize a window in the S7 Hardware Configuration window, it becomes an icon. You can move these icons around in the S7 Hardware Configuration window workplace by dragging them with the mouse. If you have several icons in the basic window you can arrange them so that they are evenly spaced and do not overlap.

 ◆ Click **Arrange Icons** in the window menu.

 ◆ Press **ALT + W, A**.

13.6 Help Menu (S7 Hardware Configuration)

S7 hardware configuration online **Help** is an easy way to look up information about a task you are performing, a feature you would like to know more about, or a command you want to use.

S7 hardware configuration help is available whenever you see a help button, or use help from the menu bar or the help icon in the tool bar.

Activating the help button in a dialog box gives you specific information about the tasks you can perform with that dialog box. Background information about the configuration parameter is also provided.

The help command from the menu bar allows you to select general help topics.

◆ Click **Help** in the menu bar.

◆ Press **ALT + H**.

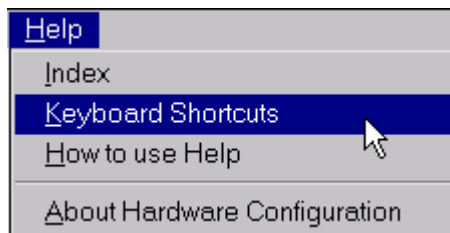


Figure 13-21 Help menu, S7 Hardware Configuration

13.6.1 Help Index (Help Menu - S7 Hardware Configuration)

The **Index** command from the help menu gives you a list of all help topics for S7 hardware configuration.

◆ Click **Index** in the help menu.

◆ Press **ALT + H, I**.

13.6.2 Keyboard Shortcuts (Help Menu - S7 Hardware Configuration)

To operate the S7 hardware configuration program without a mouse many keyboard shortcuts are integrated for ease of operation. The command **Keyboard Shortcuts** displays a list of the function keys used in the S7 hardware configuration program.


◆ Click **Keyboard Shortcuts** in the help menu.

◆ Press **ALT + H, K**.

13.6.3 How to use Help (Help Menu - S7 Hardware Configuration)

This command opens the **How to use Help** file that displays instructions on how to use the Windows help files.


 ◆ Click **How to use Help** in the help menu.

 ◆ Press **ALT + H, H**.

13.6.4 About Hardware Configuration (Help Menu - S7 Hardware Configuration)

The **About Hardware Configuration** opens a display field to provide you information such as serial number, version, copyright, etc.

 ◆ Click **About Hardware Configuration** in the help menu.

 ◆ Press **ALT + H, A**.

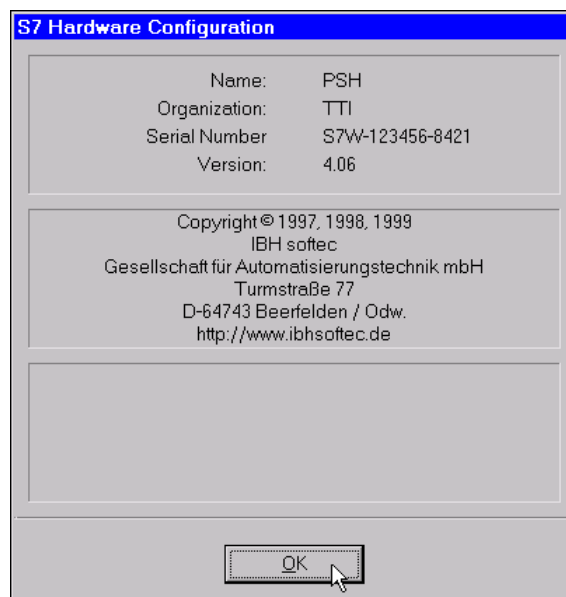


Figure 13-22 About S7 Hardware Configuration display field

13.7 S7 Hardware Configuration Example

As an example an S7 PLC with the CPU 416-2 DP (Profibus) should be configured.

The configuration in this example is done prior to the PLC programming. The generation of the configuration is used to start a new project.

1. Start the *S5 / S7 for Windows* software and execute the command **New** from the **File** menu (see chapter 3.2.1). The workplace of the PC Block List is cleared.
2. Execute the command **Save As** from the **File** menu (see chapter 3.2.4).
3. The dialog box **Save As** is opened.

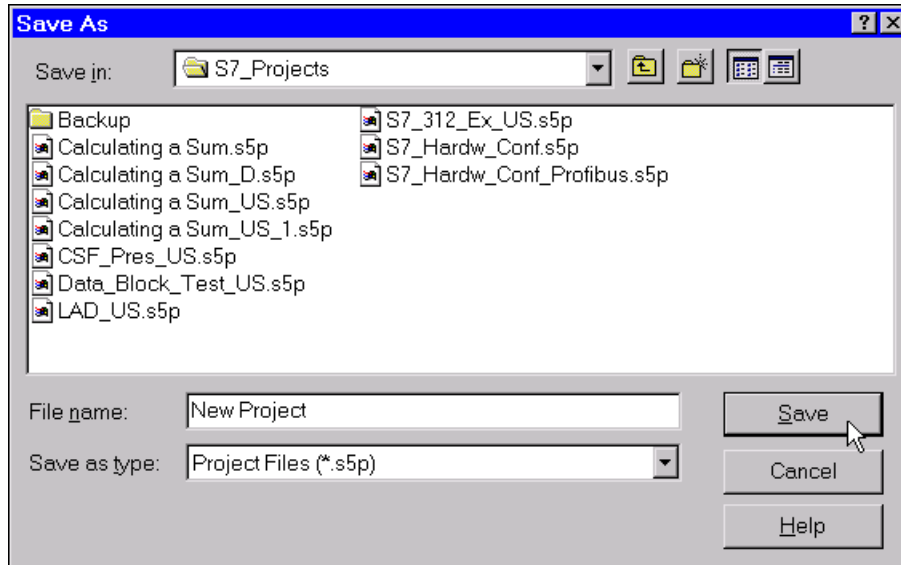


Figure 13-23 Save As dialog box

4. As the project name **"New Project"** was selected. Enter the name in the text field **"File name:"** and confirm with the **Save** button.
5. Two information boxes are opened to inform you that *S7 for Windows* is creating files that will become a part of the project. The file name and the path are indicated. Confirm the information with the **Yes** button.

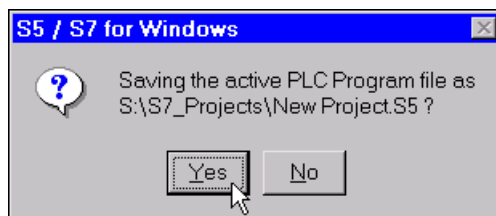


Figure 13-24 Information, saving the PLC program

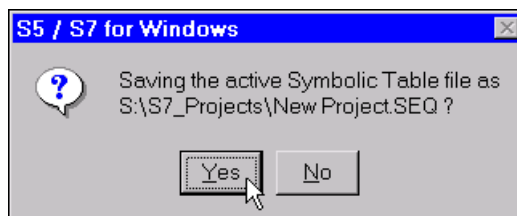


Figure 13-25 Information, saving the Symbolic Table

6. You may use the dialog box **Project Files** to check the files that belong to a project (see chapter 3.2.5).
7. Use the command **Open S7 Hardware Configuration** from the **Options** menu to open the **S7 Hardware Configuration** window.

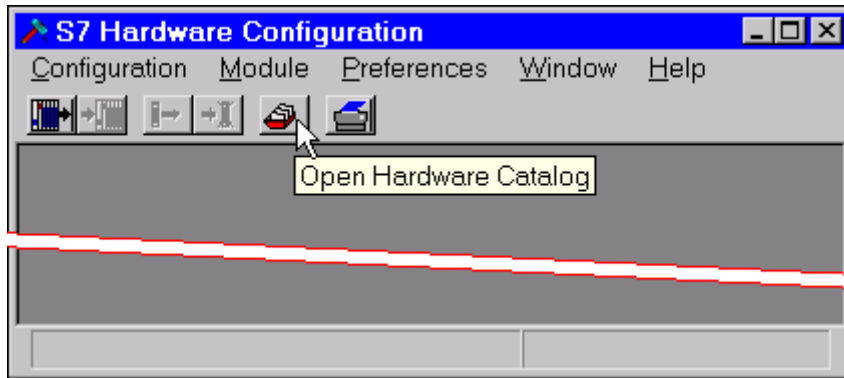


Figure 13-26 S7 Hardware Configuration window (empty)

8. Click the **Open Hardware Catalog** icon or execute the command **Open Hardware Catalog** from the Configuration menu. The catalog to select S7-300/400 hardware modules is opened.

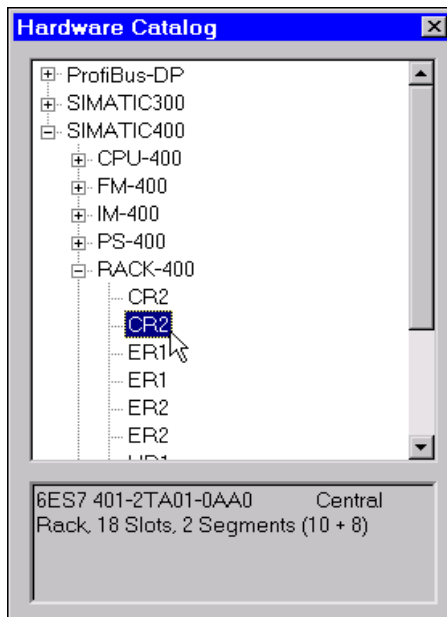


Figure 13-27 Hardware Catalog, S7-400 Central (Module) Rack selected (marked)

9. Double click the S7-400 Central Rack **CR2**.
10. An eighteen (18) slot rack, to hold the S7-400 modules, is inserted into the S7 Hardware Configuration workplace window. The rack identification is displayed in the title bar of the rack window (see figure 12-28).

Note:

In the S7-300/400 Hardware Catalog several modules are listed more than once. These are modules that have the same name but different revision numbers or different option numbers. Make sure that the module you select has the identical part identification number (shown in the information field below the catalog) as the hardware module you are using in the S7-300/400 PLC.

11. Mark the first **Slot** in the in the **Central Rack** to place the **Power Supply Module**.

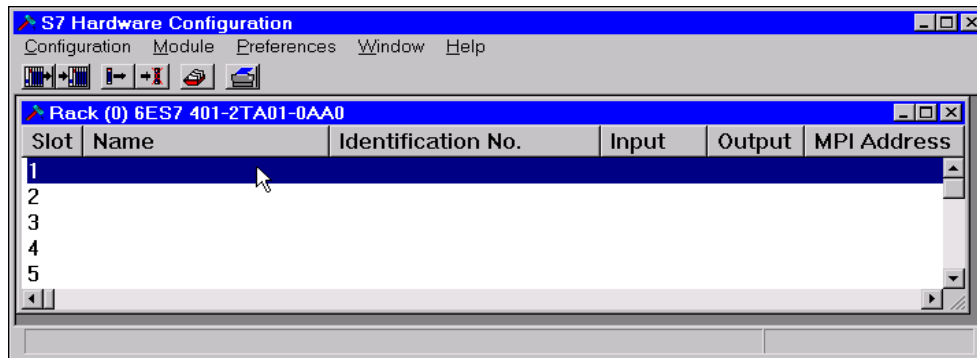


Figure 13-28 S7 Hardware Configuration window showing the Central Rack **CR1** (rack number 0)

- Double click the S7-400 Power Supply **PS407 10A**. The module is placed into the rack slot 1. Due to the width of the module slot number 2 is also occupied. You must mark the slot number 3 to insert the CPU.

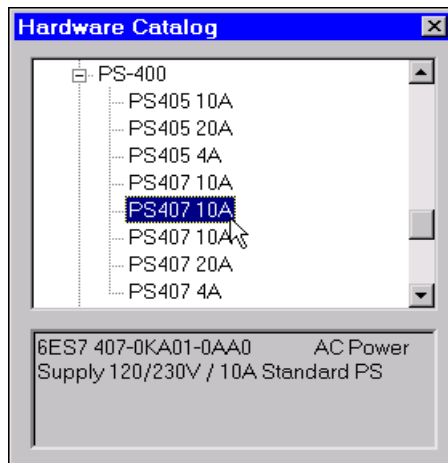


Figure 13-29 Hardware Catalog, S7-400 AC Power Supply selected (marked)

- Double click the S7-400 CPU 416-2 DP. Make sure that the slot 3 is marked in the rack and select the CPU with the correct identification number. The hardware catalog currently lists six (6) different versions of the CPU 416-2 DP. The module is placed into the rack slot 3. Due to the width of the module the slot number 4 is also occupied. You must mark the slot number 5 to insert additional hardware modules.

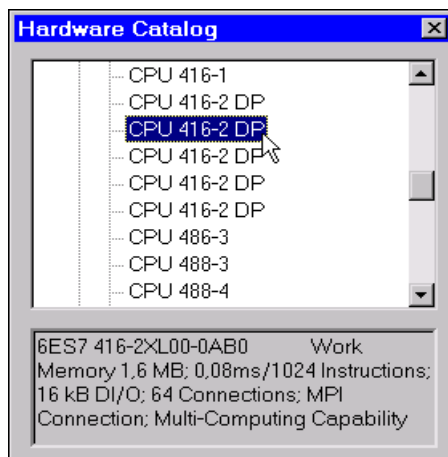


Figure 13-30 Hardware Catalog, CPU 416-2 DB selected (marked)

14. Insert additional modules from the hardware catalog into the rack by double clicking the module in the hardware catalog to build up a PLC configuration.

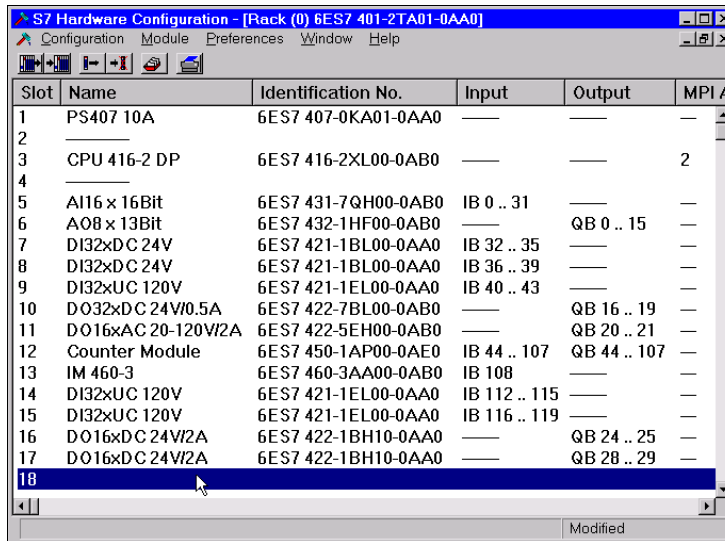


Figure 13-31 S7-400 Hardware Configuration Rack (0), example

15. To configure the Profibus it is wise to reduce the **"Rack Window"** to an icon to provide more room on the workplace. Click the icon in the right upper corner of the **"Rack Window"** to reduce the window to an icon.



16. The Command **New Profibus** in the **Configuration** menu opens the **"Profibus (1) Window"**.

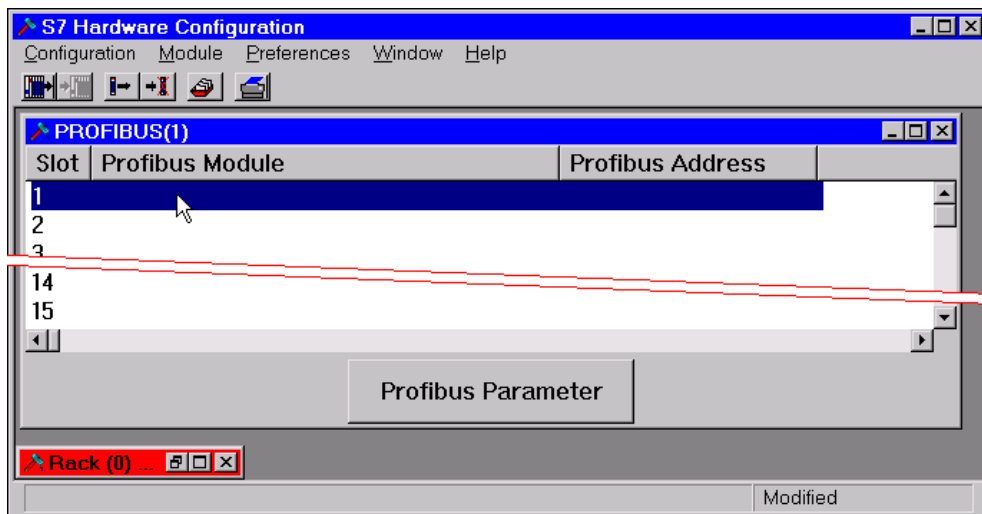


Figure 13-32 Profibus Window

17. After marking slot 1 in the Profibus window double click DB-Gateway in the hardware catalog (Profibus section). The DB-Gateway module is inserted the slot 1 of the Profibus window.

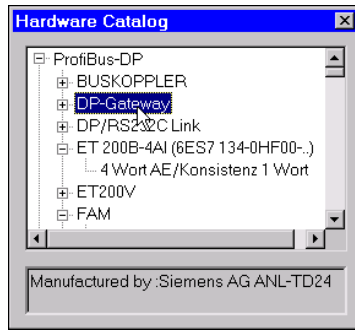


Figure 13-33 Hardware Catalog, DB-Gateway selected (marked)

18. Double click the slot 1 in the Profibus window showing the **DB-Gateway** with the **Profibus address 1**. The window **Profibus (1) – Slot: 1 - DB-Gateway** is opened and ready to accept **DB-Gateway** Profibus modules.

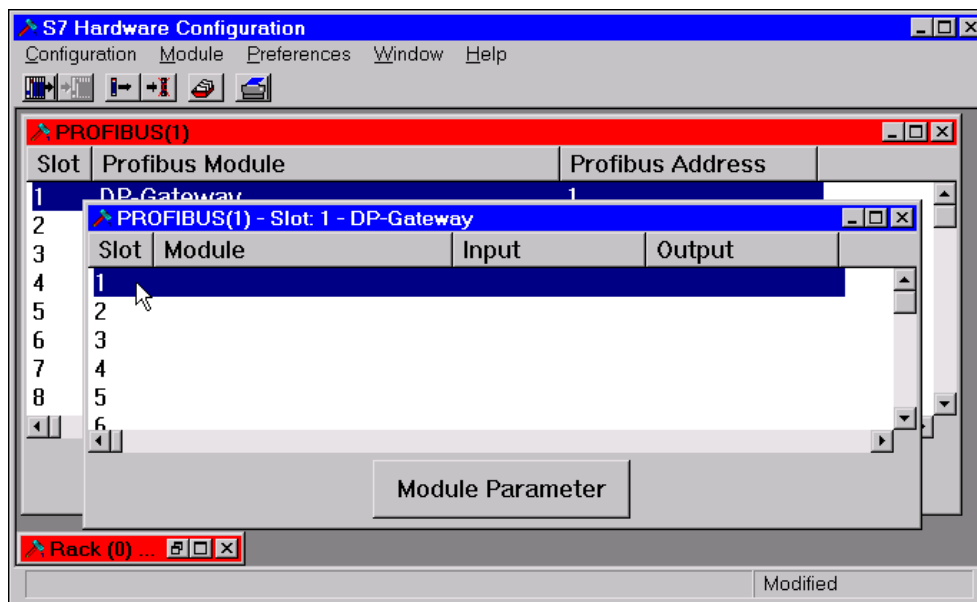


Figure 13-34 Profibus – Slot:1 Window

19. After marking the slot 1 in the **Profibus (1) – Slot: 1 - DB-Gateway** window, you may double click the modules listed in the hardware catalog beneath the DB-Gateway (Profibus section). The I/O modules are inserted in the slots of the **DB-Gateway** module.

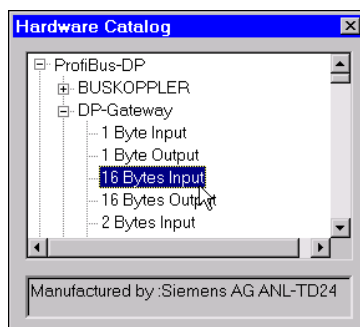


Figure 13-35 Hardware catalog, I/O module for the DB-Gateway base module selected.

20. Figure 12-36 shows an example of I/O modules entered in the DB-Gateway base module (**Profibus (1) – Slot: 1 - DB-Gateway** window).

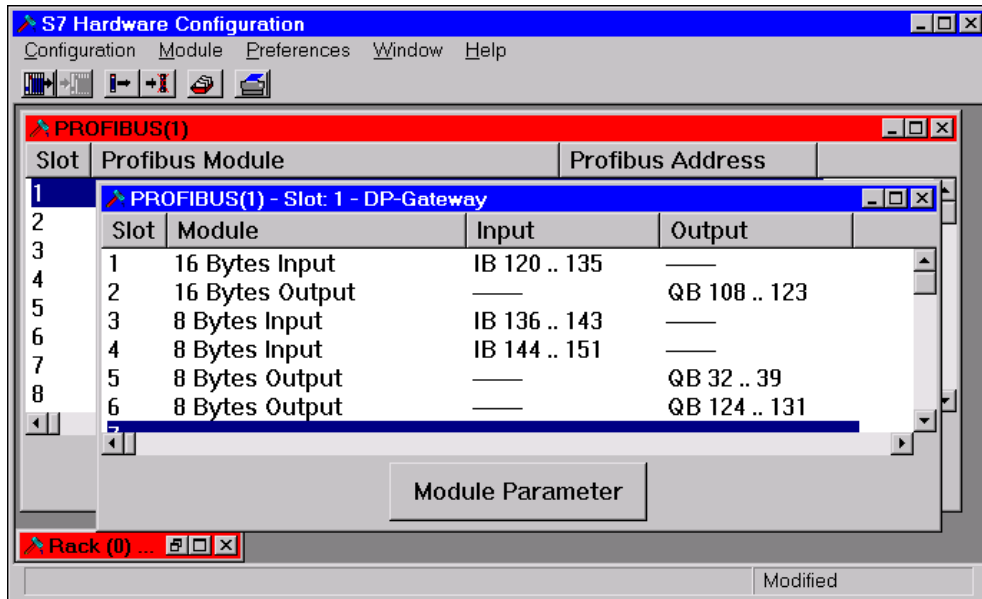


Figure 13-36 I/O modules entered in the DB-Gateway base module

21. You may enter additional base modules into the Profibus (see figure 12-32). This could be additional **DB-Gateway** module or any other base module from the hardware catalog.

Note:

Information about the Profibus base module and the modules to be connected with this base module comes from the GSD files supplied by the manufacturer of the Profibus components.

22. The button **Profibus Parameter** (see figure 12-32) opens a dialog box listing the parameter. The **Profibus Parameter** dialog box has a vertical scroll bar to display the parameter list which is often very large. All parameter are preset. For a modification mark a parameter and activate the **Modify** button or just double click the parameter.

Modify

The dialog box **Modify Parameter** is opened.

Depending on the type of parameter the dialog box may give you a choice of parameters to select from or you may have to enter a value. The limits and the dimension of the parameter are displaced.

The valid parameter is shown (value or marked choice). The integrated help may be called by activating the help button to give you some background information on the parameter

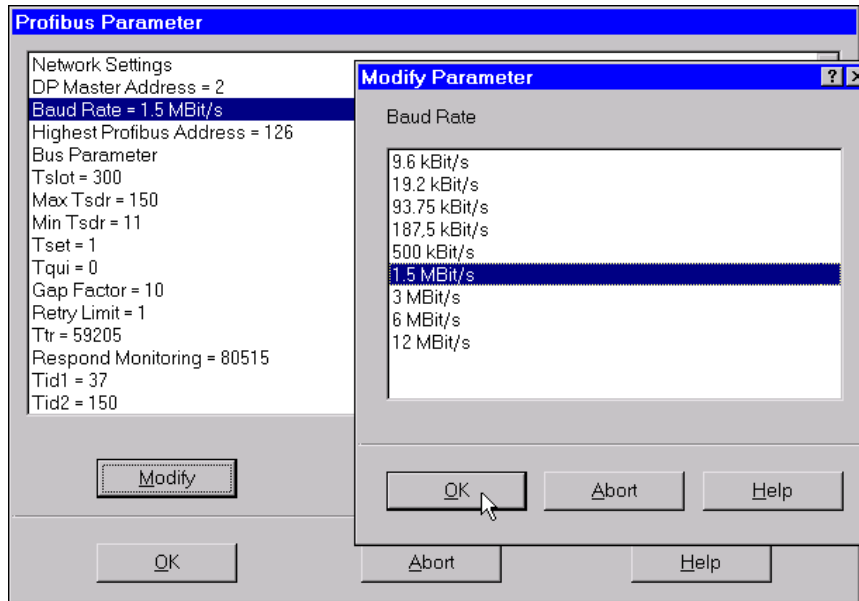


Figure 13-37 Profibus parameter dialog box with the modify parameter dialog box opened.

23. The button **Module Parameter** (see figure 13-36) opens a dialog box listing the parameter.

All parameter are preset.

For a modification mark a parameter and activate the **Modify** button or just double click the parameter. The dialog box **Modify Parameter** is opened.



Depending on the type of parameter the dialog box may give you a choice of parameters to select from or you may have to enter a value. The limits and the dimension of the parameter are displayed. The valid parameter is shown (value or marked choice).

The integrated help may be called by activating the help button to give you some background information on the parameter.

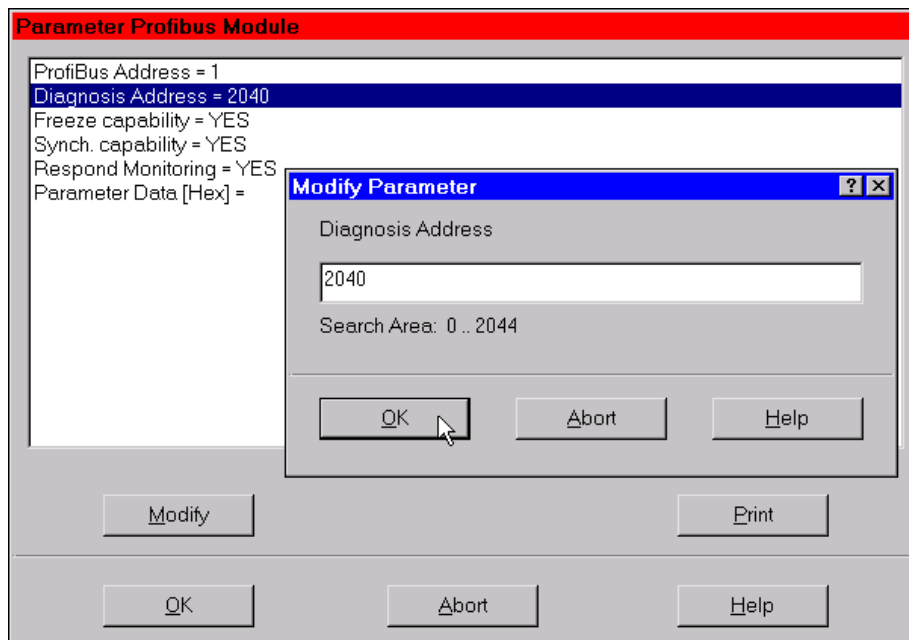


Figure 13-38 Parameter Profibus Module dialog box with the opened modify parameter dialog box.

In this way you can configure the S7-300/400 hardware corresponding with your project and you can set the parameter of the individual modules accordingly.

After configuring the hardware completely you can save the configuration by executing the **Save Configuration** command from the **Configuration** menu (see chapter 13.2.1).

Now you can close the S7 Hardware Configuration (**Exit** command from the **Configuration** menu - see chapter 13.2.13). In the open **PC Block List** window the System Data Blocks (SDBnn) generated with the S7 Hardware Configuration are listed.

S7 Name	S5 Name	Format	Length	Last Modification	Comment
SDB 0		S7	438	20.12.1999 11:38:15	
SDB 1		S7	342	20.12.1999 11:38:15	
SDB 3		S7	86	20.12.1999 11:38:15	
SDB 4		S7	160	20.12.1999 11:38:15	
SDB 100		S7	534	20.12.1999 11:38:15	

Figure 13-39 PC Block List displaying System Data Blocks generated with the S7 Hardware Configuration

14 Integrated S5 Simulation PLC

S5 for Windows includes an **Integrated Simulation PLC**. Special features are added to allow you to easily test PLC programs. No additional hardware is needed.

- **S5 Simulation PLC Specification**

Step® 5 instructions up to the SIEMENS SIMATIC® PLC 115U (CPU 944) without system commands.

PLC memory only limited by the PC main memory.

1024 Inputs and 1024 Outputs.

128 Peripheral Bytes.

2048 Flags.

128 Timer

128 Counters.

256 of each OB, PB, FB, FX, DB, DX, SB.

Block status presentation in Function Logic, Ladder Logic, Statement List or Step Sequence programming.

Signal Set and Reset directly within the status display.

Single step program execution down to single instruction lines.

Transfer of peripheral bytes to and from hardware ports (addresses).

DDE - Interface.

14.1 Integrated S5 Simulation PLC Window

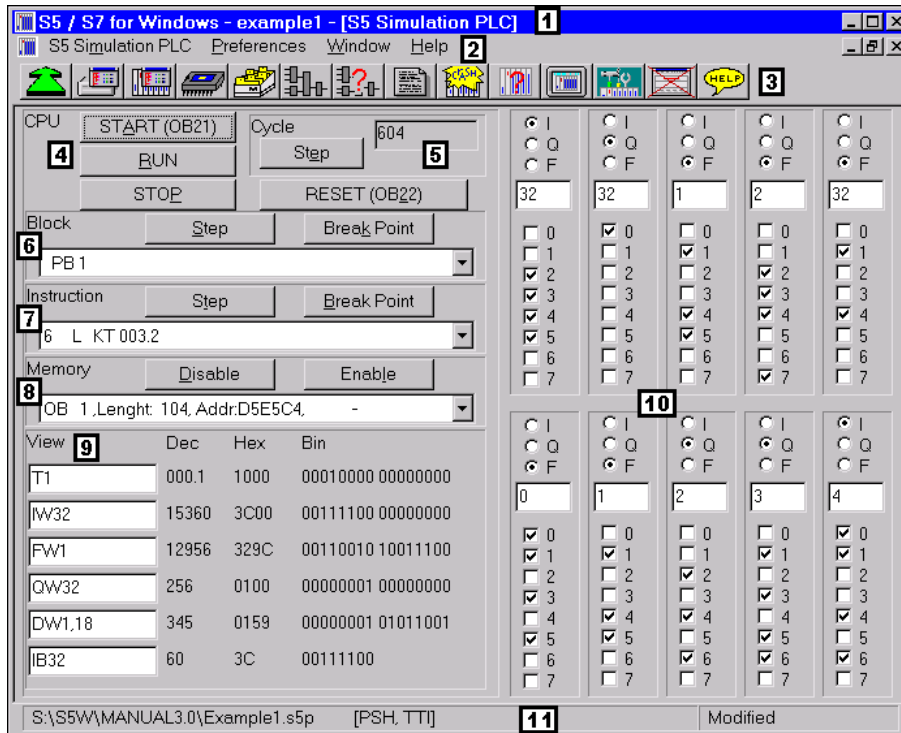
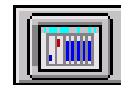


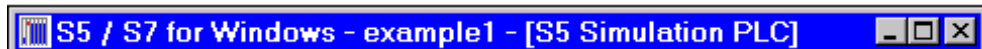
Figure 14-1 S5 Simulation PLC Window

- ◆ To open the S5 Simulation PLC Window click the **S5 Simulation PLC** icon in the tool bar or click **S5 Simulation PLC** in the windows menu.



- ◆ Press **ALT + W, M**.

1 Title Bar – S5 Simulation PLC -



The Title bar displays *S5 / S7 for Windows*, the name of the open project (Example1), and the name of the window (S5 Simulation PLC).

2 Menu Bar – S5 Simulation PLC -



The menu bar contains a list of menus. You can open a menu by clicking the name of the menu or by pressing the **ALT** key and then the underlined character from the menu name.

3 Tool Bar I – S5 Simulation PLC -

The tool bar provides instant access to frequently used *S5 / S7 for Windows* commands. This tool bar is the same for all *S5 / S7 for Windows* application windows. Click an icon with the mouse and the command is executed. With the keyboard you can reach these functions via the window menu and/or the function keys. For more details about the tool bar icons see chapter 3.1.

4 CPU Field – S5 Simulation PLC -

Four (4) buttons are provided to display and control the start and stop of the integrated simulation PLC.

- **START (OB 21)**

Activating this button will start the simulation PLC. The organization block (OB 21) is executed first (only once) and then the actual PLC program (OB 1).

- **RUN**

Activating this button will start the simulation PLC. The execution starts with the instruction where the PLC program was interrupted.

- **STOP**

Activating this button will stop the simulation PLC. The execution of the PLC program is interrupted immediately.

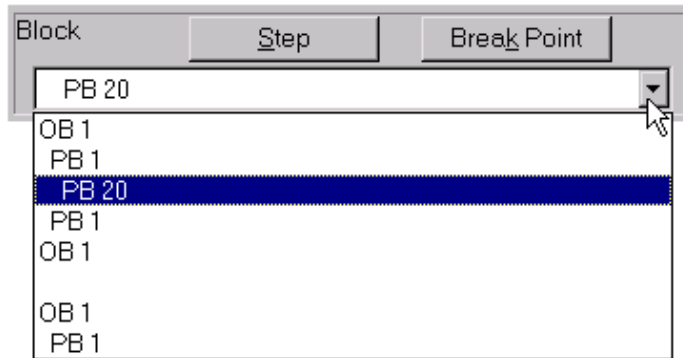
- **RESET (OB 22)**

Activating this button will reset the simulation PLC. The organization block (OB 22) is executed first (only once) when the simulation PLC is started (START (OB 21) or RUN).

5 Cycle Field – S5 Simulation PLC -

A display box is provided to indicate the number of executed cycles of the simulation PLC. With the **Step** button you can execute one (1) complete PLC program cycle.

6 Block List – S5 Simulation PLC –



The executed PLC program blocks are displayed in the pull down list.

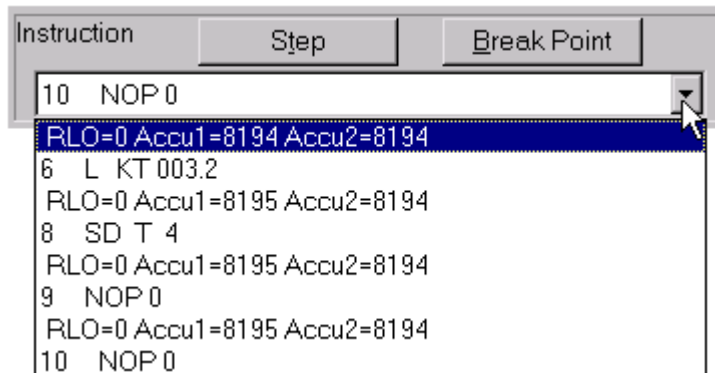
- **Step**

A button is provided so you can execute the PLC program in single steps, one (1) PLC program block after another. The pull down list displays the executed PLC blocks. The next block to be executed is displayed with a blue background.

- **Break Point**

A button is provided to set a break point at a certain PLC program block (the program is interrupted before the block is executed). To set a break point, mark the block and click the break point button. The break point is indicated in the pull down list by **BPT:** in front of the block. Marking the corresponding line and clicking the break point button again releases the breakpoint.

7 Instruction List – S5 Simulation PLC -



In the Instruction pull down list, the executed PLC program instructions (statement list presentation) are displayed.

- **Step**

A button is provided to execute single instruction step by step. The pull down list displays the executed instructions. The next instruction to be executed is displayed with a blue background. The result of the logical operation (RLO) and the contents of the accumulators are displayed.

- **Break Point**

A button is provided to set a break point at a certain PLC instruction (the program is interrupted before the instruction is executed). To set a break point, mark the instruction and click the break point button. The breakpoint is released by clicking the break point button again.

8 Memory List – S5 Simulation PLC –

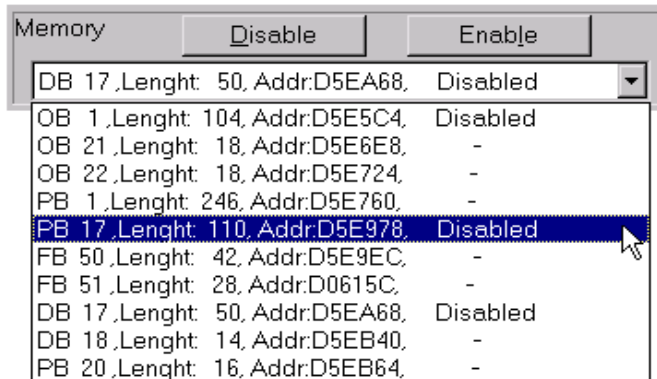
The pull down list displays the blocks available for execution in the simulation PLC. The block length (in Kbytes) and the memory segment address (for internal use only) are also displayed.

- **Disable**

A button is provided to lockout blocks from execution. To lockout a block, mark the block in the pull down list and click the disable button. When executing the PLC program the simulation PLC ignores the disabled block. Several blocks may be disabled. A disabled block has the word **Disabled** in the block name line.

- **Enable**

A button is provided to enable the execution of a previously disabled block. To enable a block, mark the block in the pull down list and click the enable button.



9 View Field – S5 Simulation PLC -

View	Dec	Hex	Bin
T1	000.1	1000	00010000 00000000
IW32	15360	3C00	00111100 00000000
FW1	12956	329C	00110010 10011100
QW32	256	0100	00000001 00000000
DW1,18	345	0159	00000001 01011001
IB32	60	3C	00111100

Six (6) fields are provided to display variables. The value of the variable (operand) entered in the name field is displayed in **Decimal**, **Hex**, and **Binary** form. The decimal value of timers and counters displayed are the decimal decoded values. The value shown in the Hex and Bin fields are the momentary time or counter values.

If you want to display more than six (6) values simultaneously you should use a picture block (BBxx). For more details see chapter 3.3.1.

10 Input, Output, Flag Field – S5 Simulation PLC -

<input checked="" type="radio"/> I	<input type="radio"/> I	<input type="radio"/> I
<input type="radio"/> Q	<input type="radio"/> Q	<input checked="" type="radio"/> Q
<input type="radio"/> F	<input checked="" type="radio"/> F	<input type="radio"/> F
<input type="text" value="3"/>	<input type="text" value="1"/>	<input type="text" value="2"/>
<input checked="" type="checkbox"/> 0	<input type="checkbox"/> 0	<input type="checkbox"/> 0
<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 1
<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 2
<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
<input type="checkbox"/> 4	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> 4
<input checked="" type="checkbox"/> 5	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 5
<input type="checkbox"/> 6	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 6
<input type="checkbox"/> 7	<input type="checkbox"/> 7	<input type="checkbox"/> 7

Ten (10) fields to define input, output, and flag bytes are provided. To define a byte, enter the desired byte number in the text field. An I for an input byte, a Q for an output byte, or an F for a flag byte must be entered in front of the byte number. The PLC program will put a mark in the corresponding bit position if the bit is a logical one (high). You may set (or reset) a bit by clicking the corresponding bit position.

Note:

The simulation PLC supports **Forcing**. A set input, output, or flag remains in the set position until the program overwrites it or is reset manually.

11 Status Bar – S5 Simulation PLC -

S:\S5W\MANUAL3.0\Example1.s5p	[PSH, TTI]	Modified
-------------------------------	------------	----------

The status bar displays the name and the path of the PLC program executed on the simulation PLC, the progress of a selected action, or information about the icon the mouse pointer is positioned on.

A list of the instructions set of the integrated simulation PLC can be found in the appendix of this manual.

14.2 S5 Simulation PLC Menu – S5 Simulation PLC -

The commands from the **Simulation PLC** menu allow you to change the value of process variables. A command to close the integrated simulation PLC window is also provided.

 ◆ Click **Simulation PLC** in the menu bar.

 ◆ Press **ALT + P**.

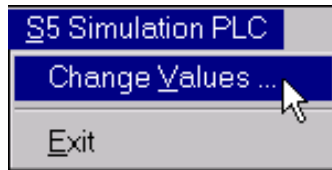




Figure 14-2 Simulation PLC menu

14.2.1 Change Value (S5 Simulation PLC Menu)

The **Change Value** command is used to modify and display process variables. A dialog box will be opened. The content of the selected variable is displayed in the value text field.

 ◆ Click **Change Value** in the simulation PLC menu.

 ◆ Press **ALT + S, V**.

The **Change Value** command opens a dialog box to enter a process variable. The value of the process variable displayed may be changed.

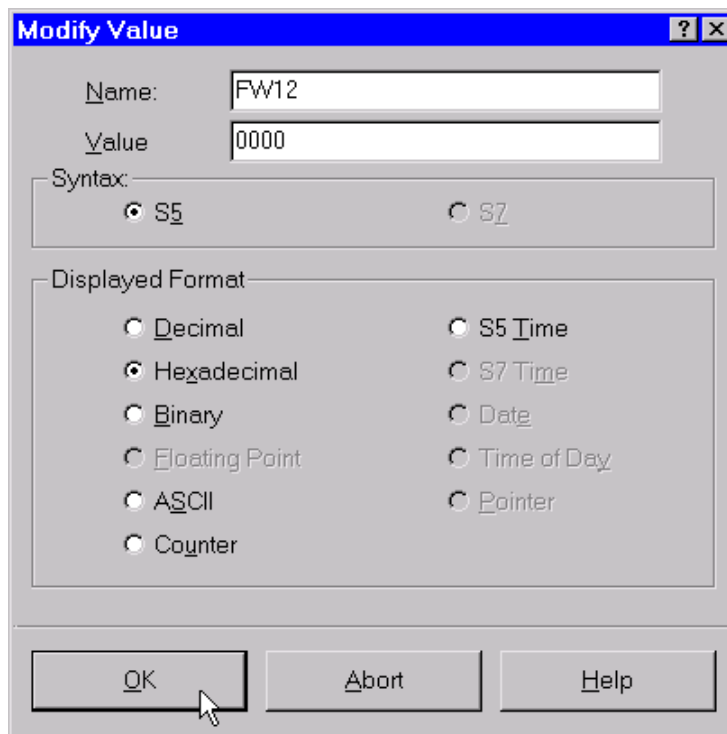


Figure 14-3 Change Value dialog box

The value of the process variable (operand) entered in the name field is displayed in the text field. To modify the value enter the new value in the text field.

● Name



Enter the name of a variable (operand) you want to display or modify.

- Value

Value	0000
-------	------

The value of the previously marked variable (operand) or the variable entered in the name field is displayed in the text field. To modify the value enter the new value in the text field. The value may be displayed and entered in **different** forms.

- S5 Name Format to Display or Change Values

Name Format	Explanation	Example
Cn	Counter	C5
DLn , dbn or Xdbn	Data Word (left byte)	DL3,X12 = DL3 of DX12
DRn , dbn or Xdbn	Data Word (right byte)	DR3,X12 = DR3 of DX12
DWn , dbn or Xdbn	Data or Extended DX	DW3,12 = DW3 of DB12
Fn or FBn	Flag (Byte)	F5 or FB67 or F15.6
FWn	(Word)	FW45
In or IBn	Input (Byte)	I1 or IB3 or I47.1
IWn	(Word)	IW123
PWn	(Word)	PW128
PYn or PBn	Peripheral (Byte)	PY34 or PB32
Qn or QBn	Output (Byte)	Q11 or QB14 or Q32.2
QWn	(Word)	QW17
Sn	Extended	S1.5
SWn	Extended	SW23
SYn	Extended	SY5
Tn	Timer	T1

Table 14-1 S5 Name Format to Display or Change Values


- S5 Values (Example)


Name	Dec	Hex	Bin	ASCII	Time	Counter	Floating Point	Comment
FB 50	84	54	01010100	" T "				84 decimal
T 25					123.1			KT 123.1
C 33						234		KC 234
FD 55							2E+06	2 * 10 ⁶

Table 14-2 S5 Values (Example)

14.2.2 Exit (S5 Simulation PLC Menu)

With the **Exit** command, from the simulation PLC menu, you can close the simulation PLC window.

 ◆ Click **Exit** in the simulation PLC menu.

 ◆ Press **ALT + S, E**.

14.3 Preferences Menu – S5 Simulation PLC -

The commands, from the **Preferences** menu, allow you to set the simulation PLC execution time. There is also a command to instruct the simulation PLC to ignore all unknown commands. You can also save the current settings of the simulation PLC.

 ◆ Click **Preferences** in the menu bar.

 ◆ Press **ALT + P**.

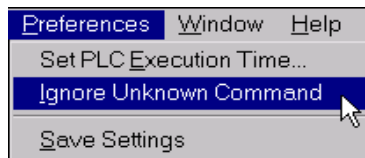



Figure 14-4 Preferences menu

14.3.1 Set PLC Execution Time (Preferences Menu)

The simulation PLC execution time is set in msec. The execution time is defined as the time from the beginning of one PLC program cycle to the beginning of the next PLC program cycle. With a set cycle time, the inputs and outputs are always handled in the same time sequence.

The execution time required depends on the cycle time (length) of the PLC program. With the simulation PLC, the set time is a compromise between the reaction time of your PC to inputs (key strokes) and a fast PLC execution time. Therefore, to set the execution time is dependant on the speed of your PC and the length of the PLC program.

 ◆ Click **Set PLC Execution Time** in the setup menu.

 ◆ Press **ALT + P, E**.

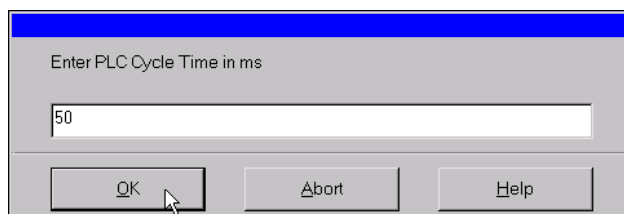




Figure 14-5 Set PLC Execution Time dialog box

14.3.2 Ignore Unknown Commands (Preferences Menu)

This command allows the simulation PLC to ignore commands (PLC instruction) that the simulation PLC is unable to execute (system commands). This command enables the execution of PLC programs written for Simatic® S5 PLC's above the 115 U.

 ◆ Click **Ignore Unknown Commands** in the setup menu.

 ◆ Press **ALT + P, I**.


The selected function is marked with a .

14.3.3 Save Settings (Preferences Menu)

The adjustments made with the commands from the setup menu, the settings of the view field, and the settings of input, output and flag field are normally temporary settings. As soon as the simulation PLC window is closed the default settings will be activated again.

With the **Save Settings** command the current settings of the commands from the setup menu, the settings of the view field, and the settings of input, output and flag field are saved in the project file and are available when you open the project again.

 ◆ Click **Save Settings** in the setup menu.

 ◆ Press **ALT + P, S**.

The current settings are saved.

14.4 Window Menu – S5 Simulation PLC -

The **Window** menu from the simulation PLC window is identical with the window menu from the PC block list window. For more details see chapter 3.5.

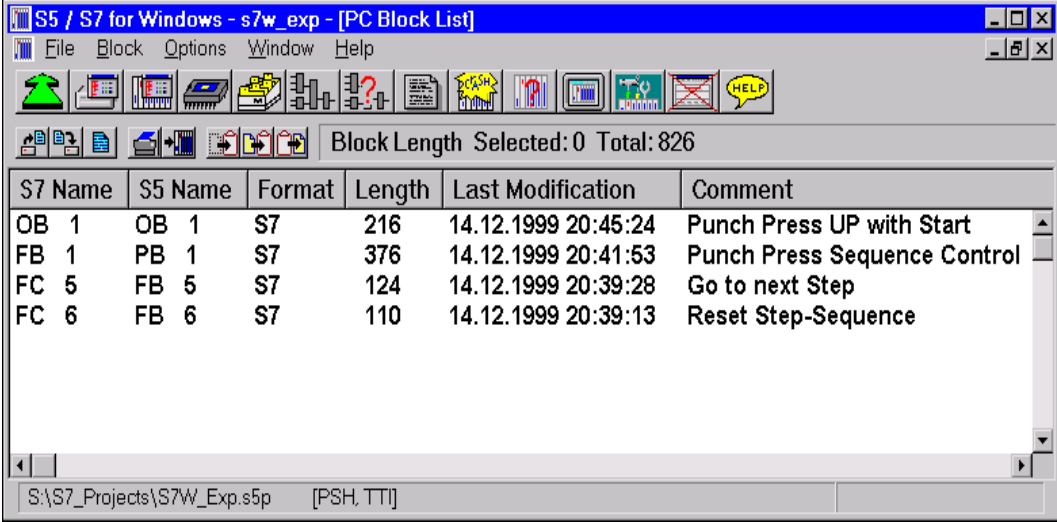
14.5 Help Menu – S5 Simulation PLC -

The **Help** menu from the simulation PLC window is identical with the Help menu from the PC Block List window. For more details see chapter 3.6.

1 Exporting an *S7 for Windows* PLC Program

This example shows how to transfer a PLC Program from *S7 for Windows* to the Siemens S7 Programming System.

The example PLC program **S7W_EXP** has been generated with the *S7 for Windows* programming system that includes a **Symbolic Table**.



The screenshot shows a software window titled "S5 / S7 for Windows - s7w_exp - [PC Block List]". The window contains a menu bar (File, Block, Options, Window, Help) and a toolbar with various icons. Below the toolbar is a status bar that reads "Block Length Selected: 0 Total: 826". The main area of the window is a table with the following data:

S7 Name	S5 Name	Format	Length	Last Modification	Comment
OB 1	OB 1	S7	216	14.12.1999 20:45:24	Punch Press UP with Start
FB 1	PB 1	S7	376	14.12.1999 20:41:53	Punch Press Sequence Control
FC 5	FB 5	S7	124	14.12.1999 20:39:28	Go to next Step
FC 6	FB 6	S7	110	14.12.1999 20:39:13	Reset Step-Sequence

At the bottom of the window, the file path "S:\S7_Projects\S7W_Exp.s5p" and the text "[PSH, TTI]" are visible.

Figure A - 1 Example PLC program **S7W_EXP**

Make sure that the PLC Program generated with *S7 for Windows* can run on the destination S7-300/400 PLC.

The symbolic table and the actual S7-300/400 PLC program are transferred to a floppy disk by using the **File, Export** command.

Exporting an S7-300/400 user PLC program

- ◆ Click **Export** in the **File** menu from the PLC Block List window (see chapter 3.2.7.2).
- ◆ Press **ALT + F, I**.

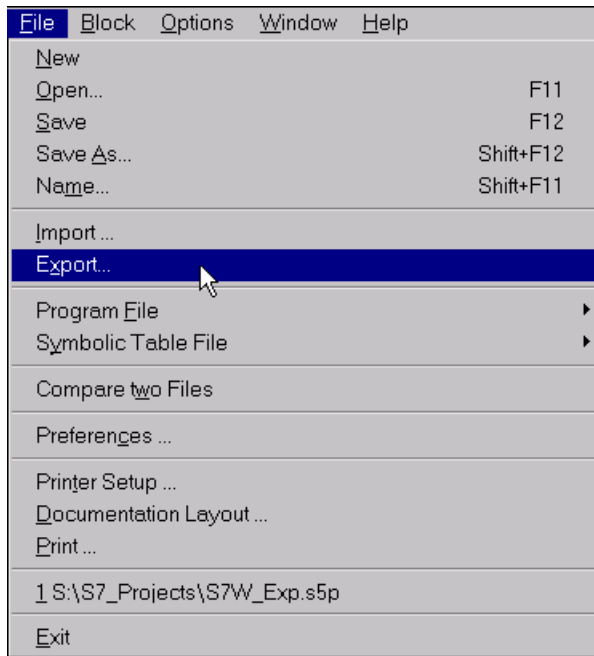


Figure A - 2 Exporting an S7-300/400 user PLC program

The **Export** command opens the **Save As** dialog box.

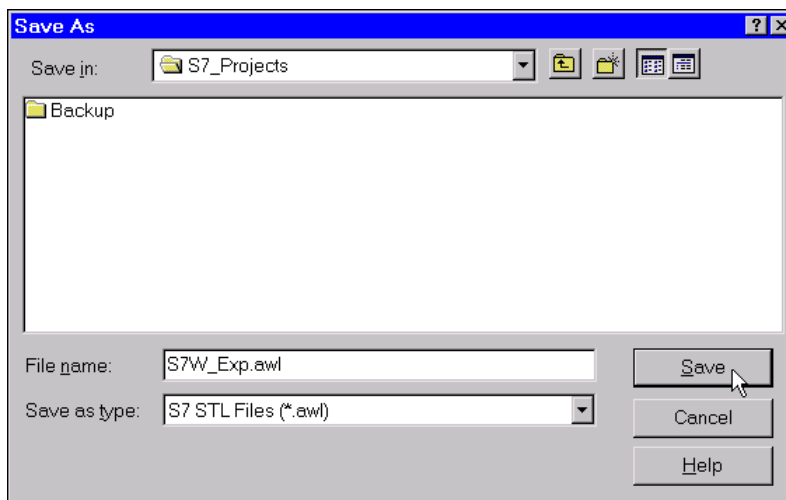


Figure A - 3 Export (Save As) dialog box

Enter the **File name (S7W_EXP)** and make sure the File Type (Save as type) **S7 STL File (*.awl)** is selected. When activating the **Save** button, the PLC program file (**S7W_EXP.awl**) and the symbolic table file (**S7W_EXP.seq**) are saved on disk.

During the save action the PLC program is converted into a file format that can be inserted into an existing S7 project opened with the Siemens S7 software.

1.1 Generating the S7 Project S7W-S7

Start the Siemens S7 software on your PC (Programming Unit) in the usual way. The screenshots for the example are made with the Siemens S7 software version 5.0. If you are using a different Siemens S7 software version, slight changes in method of operating the S7 software may occur. Also the pictures may vary slightly.

◆ Click **New** in the **File** menu of the SIMATIC® Manager

◆ Press **ALT + F, I**.

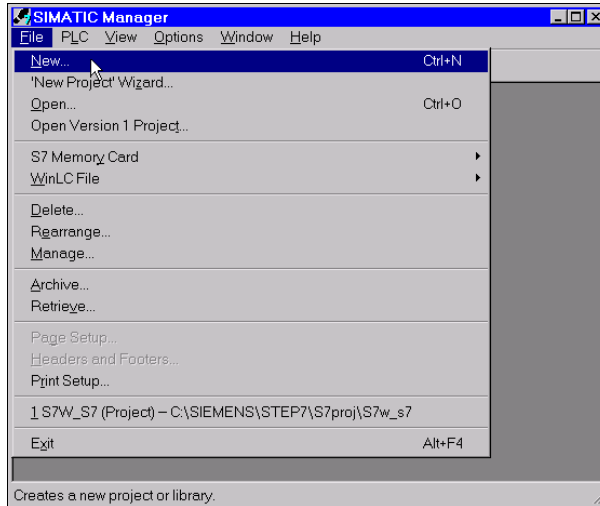


Figure A - 4 File menu (SIMATIC® Manager)

A dialog box to name the new project is opened.

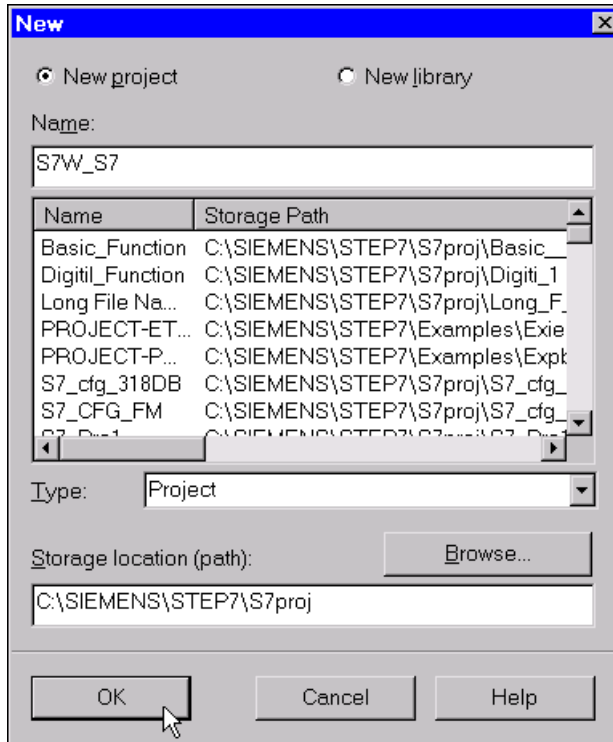


Figure A - 5 **New** dialog box

The new project may have the name S7W_S7 (or any other name). Confirm with the **OK** button.

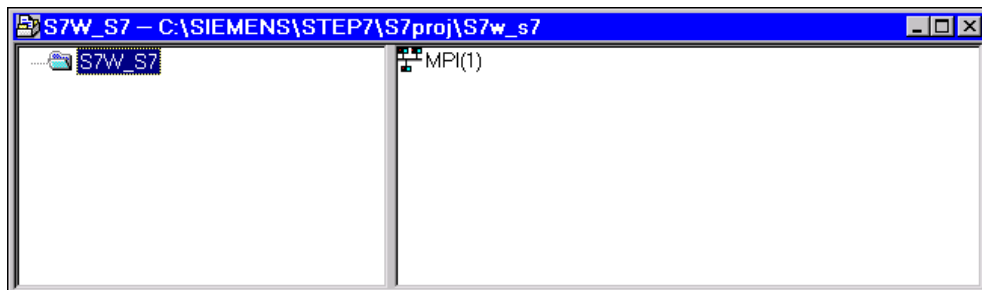




Figure A - 6 The new project "**S7W_S7**"

-  ◆ Mark the "**S7W_S7**" icon, pull-down the **Insert** menu and click the command **1 S7-Program**.
-  ◆ Use the **ARROW** and the **TAB** keys to mark the "**S7W_S7**" icon.
- ◆ Press **ALT + I, P, 1**.

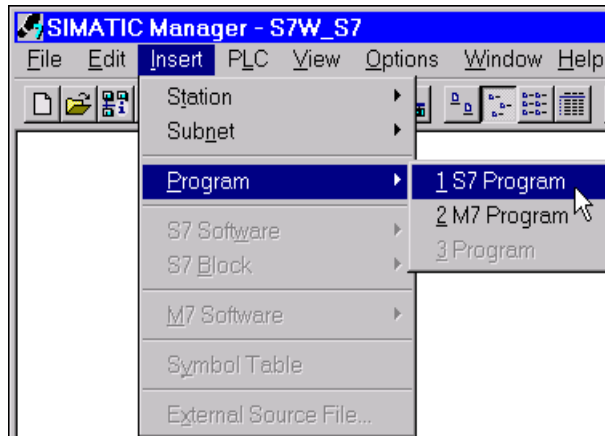


Figure A - 7 Insert menu

The folder S7-Program (1) is inserted in the project window.

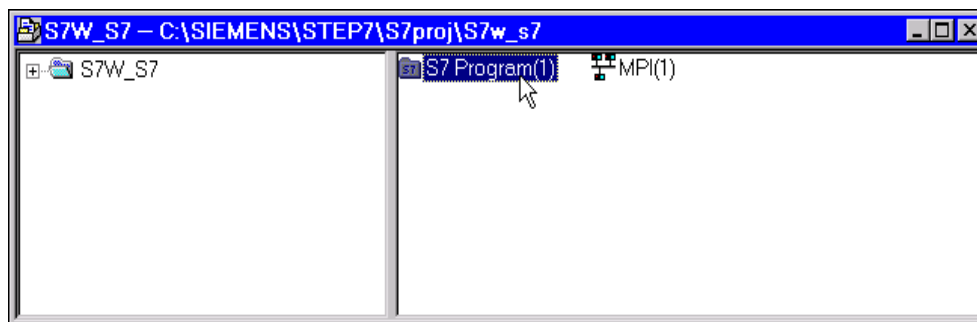


Figure A - 8 The inserted folder S7-Program (1)

- ◆ Double click the icon **S7-Program (1)**
- ◆ Mark the **S7-Program (1)** icon and confirm with the **ENTER** key

The folders Source Files, Symbols, and Blocks are set-up (figure A – 9).

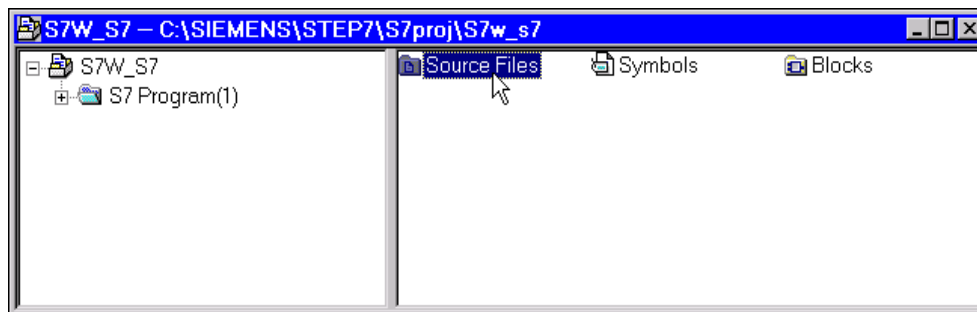


Figure A - 9 Project with the folders Source Files, Symbols, and Blocks

- ◆ Mark the **Source Files** icon, pull-down the **Insert** menu and click the command **External Source File**.
- ◆ Use the **ARROW** and the **TAB** keys to mark the **Source Files** icon.
- ◆ Press **ALT + I, X**.

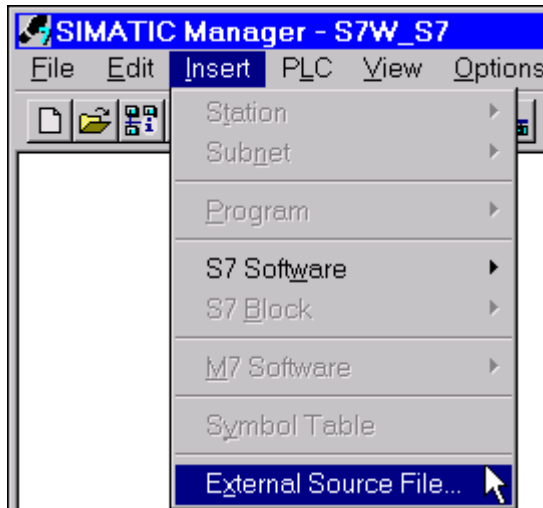


Figure A - 10 Insert menu, External Source File command

The dialog box Insert External Source File (figure A – 11) is opened. Use the pull-down boxes and buttons to select the Source File that you want to insert into the project. The example is using the file **S7W_S7.AWL**. Any other file exported with *S7 for Windows* may also be selected.

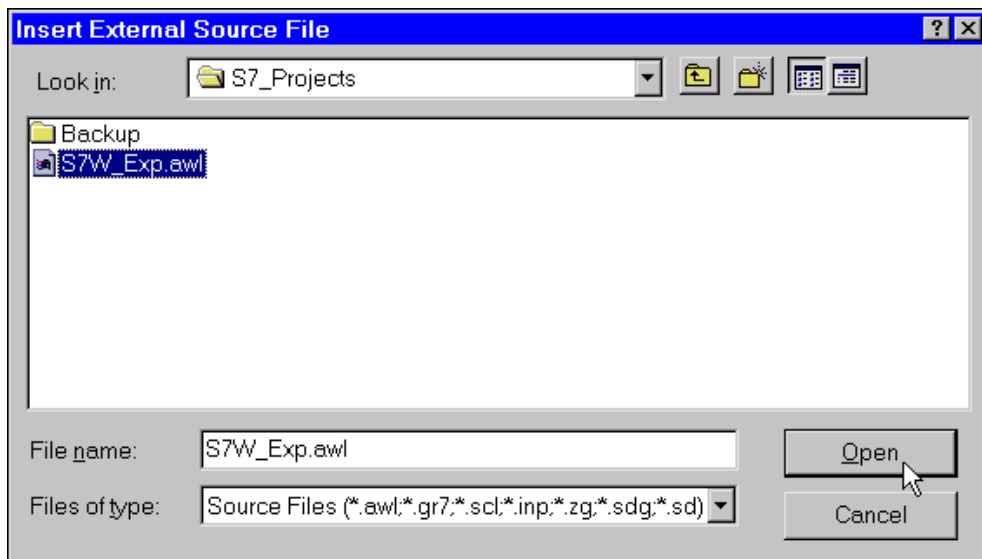


Figure A - 11 Insert External Source File dialog box

Confirm the selection with the **Open** button.

The inserted Source File is now listed in the project folder (figure A – 12).

- ◆ Double click the icon **Source File** in the project folder.
- ◆ Mark the **Source File** icon and confirm with the **ENTER** key

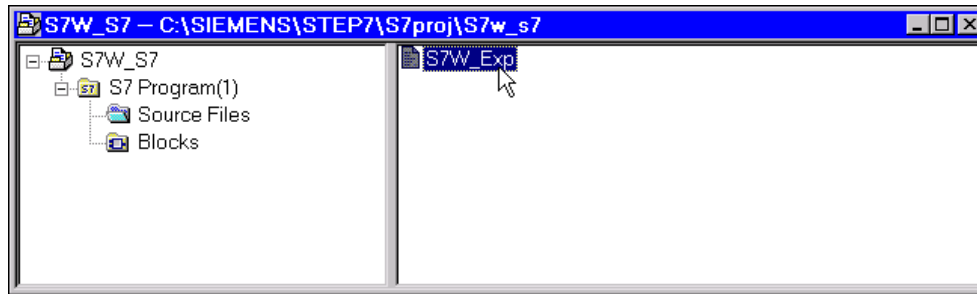


Figure A - 12 The folder Source Files with the source **S7W_Exp**

The **Source File** can be edited and must be compiled prior to transferring it to the PLC.

The compiler has to be called from the **Source** editor.

- ◆ Double click the icon **S7W_Exp** in the project folder.
- ◆ Mark the **S7W_Exp** icon and confirm with the **ENTER** key

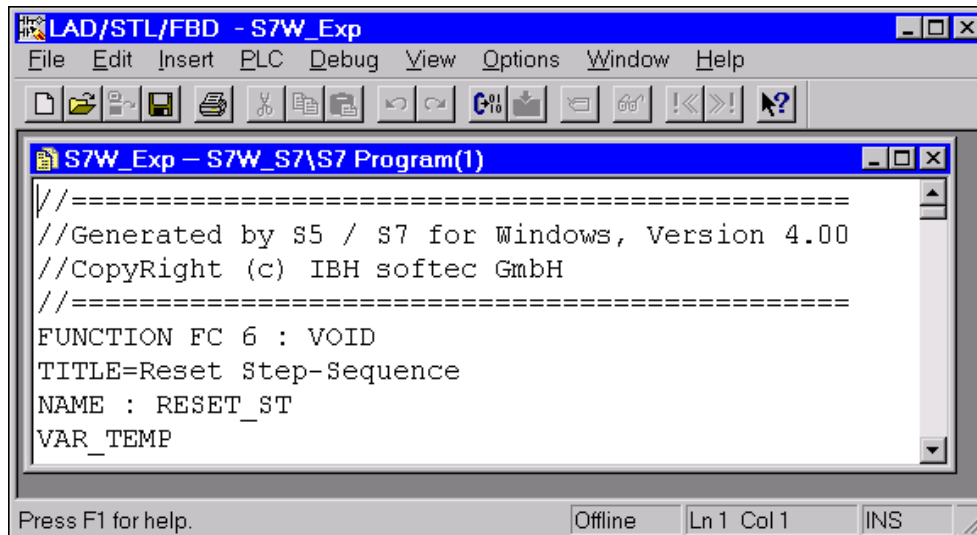


Figure A - 13 Source text editor

The compile process for the source text is initiated with the **Compile** command from the File menu of the **Source Text Editor** window.

- ◆ Click **New** in the **File** menu of the **Source Text Editor** window
- ◆ Press **ALT + F, I**.

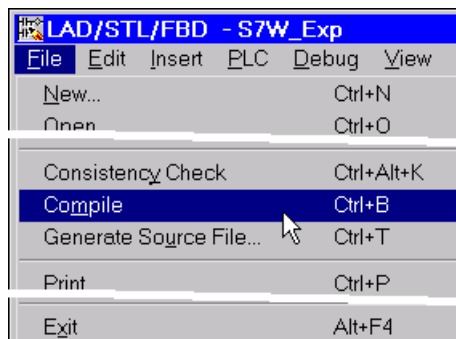


Figure A - 14 The **Compile** command from the File menu of the **Source Text Editor** window

The completion of the compile function is indicated. Any errors and warnings are displayed.

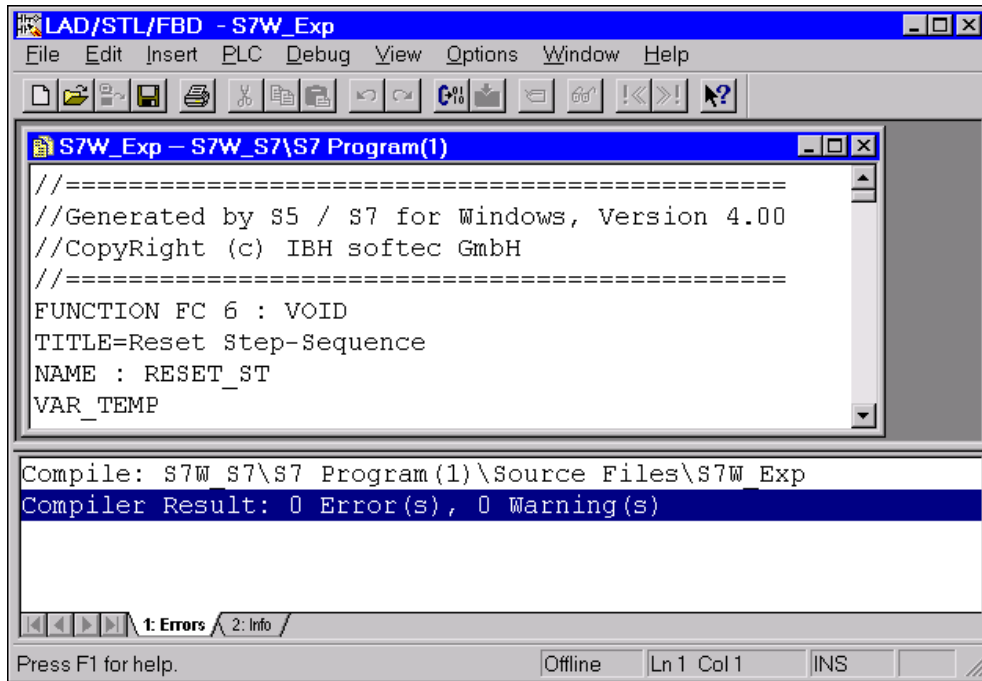


Figure A - 15 Compile function complete

After compiling the source text you may close the **Source Text Editor** window.

If you now mark the icon of the **Block folder**, in the left part of the project window, the Blocks of the S7W_EXP PLC Program are listed in the right portion of the project window.

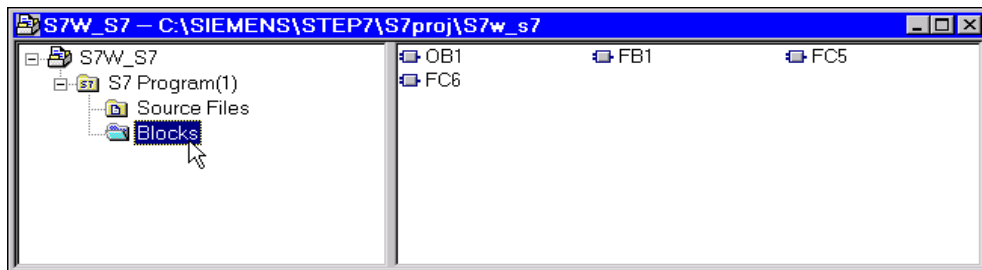


Figure A - 16 Project S7W-S7 with the imported PLC blocks

The importation of the actual PLC program code is completed. To complete the program importation, the symbolic table must also be imported.

1.2 Importing a Symbolic Table into an existing Project

To import the **Symbolic Table** mark the icon of the Siemens **S7-Program (1)** in the left part of the project window. The icons for the folders **Source Files**, **Symbols**, and **Blocks** are displayed in the right part of the project window.

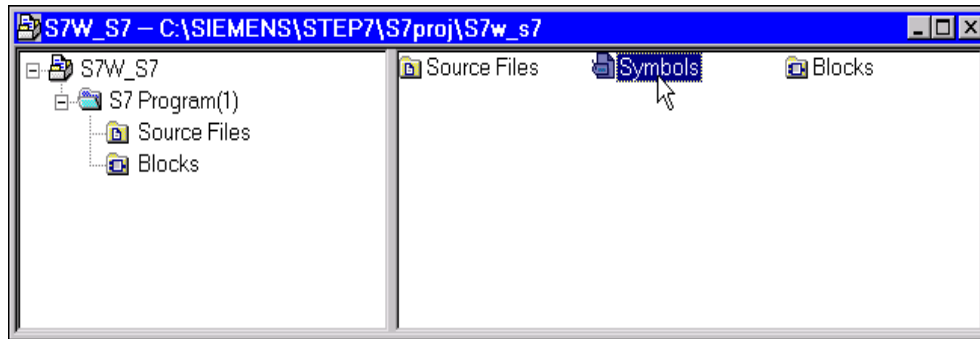


Figure A - 17 Select Symbol to import the Symbolic Table file

- ◆ Double click the icon **Symbols** in the project folder.
- ◆ Mark the **Symbols** icon and confirm with the **ENTER** key

The **Symbolic Editor** window is opened. The importation of a symbolic table is initiated with the **Import** command from the **Symbolic Table** menu in the **Symbolic Editor** window.

The example is importing the Symbolic Table from the **S7W_S7**. Any other Symbolic Table exported with *S7 for Windows* may also be imported.

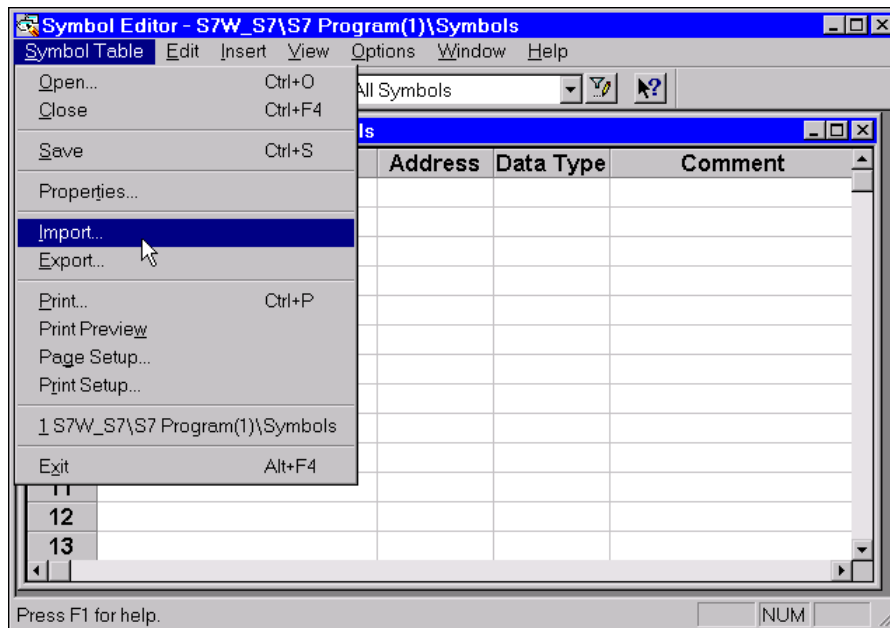


Figure A - 18 Symbol Editor window

- ◆ Click **Import** in the **Symbolic Table** menu of the **Symbolic Editor** window
- ◆ Press **ALT + S, I**.

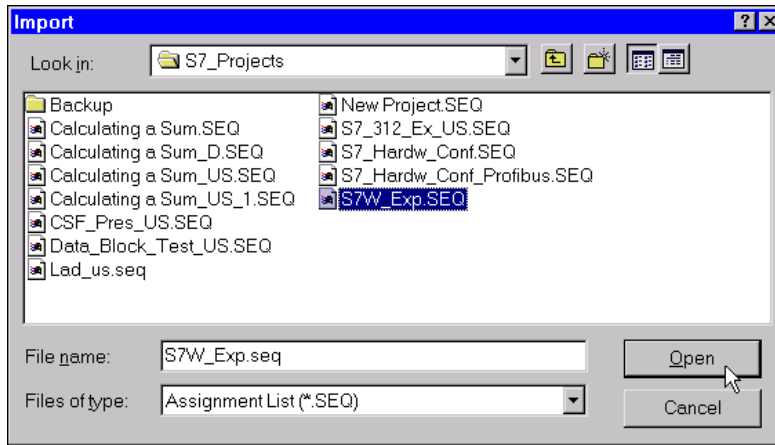


Figure A - 19 Import Symbolic Table file dialog box

Use the pull-down boxes and buttons to select the Symbolic Table File you want to import into the symbolic table editor. The example uses the file **S7W_S7.SEQ**. Any other file exported with *S7 for Windows* may also be selected.

The **Symbolic Table** is imported and displayed in the **Symbolic Editor**.

	Symbol	Address	Data Type	Comment
1	ROTATE	Q 0.0	BOOL	Rotate Punch Press Table
2	DOWN	Q 0.1	BOOL	Punch Press Downward
3	UP	Q 0.2	BOOL	Punch Press Upward
4	UP-1	Q 0.3	BOOL	Punch Press Upward
5	DOWN-1	Q 0.4	BOOL	Punch Press Downward
6	INDIC	Q 0.5	BOOL	Indicator Lampe
7	POS-T	I 0.0	BOOL	Position Punch Press Table
8	BOTTOM	I 0.1	BOOL	Punch Press at Bottom
9	TOP	I 0.2	BOOL	Punch Press at Top
10	S-RESET	M 0.0	BOOL	Go to Step 1 (Reset)
11	STEP	MW 0	WORD	Step from Step-Sequence
12	S-UP	M 1.0	BOOL	Step 1 : Punch Press Upward
13	S-ROTATE	M 1.1	BOOL	Step 2 : Rotate Punch Press Table 90°

Figure A - 20 Imported Symbolic Table

With the command **Save** from the Symbolic Table menu of the Symbolic Editor window you may now complete the importation of a complete PLC program.

The imported project is now ready for any other modification or can be transferred directly into an S7-300/400 PLC.

2 Dynamic Data Exchange (DDE)

S5 / S7 for Windows supports the **Dynamic Data Exchange (DDE)** to exchange data between *S5 / S7 for Windows* and other windows applications. With DDE you can exchange data between the integrated S5 Simulation PLC, an online hardware PLC, the *S5 / S7 for Windows* software PLC, *PLC in a PC*, and any other windows applications.

S5 / S7 for Windows uses the DDE **Hot Link**. Data is only transferred when there has been a change in the data. Several DDE channels may be opened. It is wise to keep the number of open DDE channels as low as possible. An excess of open DDE channels will drastically reduce the performance of the PC.

The *S5 / S7 for Windows* software PLC, *PLC in a PC*, provides a special DDE Manager to exchange data directly with other windows applications without going through *S5 / S7 for Windows*.

If DDE is used with an online hardware PLC, the data exchange is done via the serial port of the PC and a converter cable (*S5 for Windows* – current loop converter; *S7 for Windows* – MPI converter cable).

2.1 DDE Access

S5 / S7 for Windows is only used as a bridge to exchange data between the PLC and the other windows application. The windows application must use the application name **S5W**. The topic name for the Integrated simulation PLC is **SPS-IF** and for an external PLC **E-SPS-IF**.

The command **DDERequest** is used to receive data and the command **DDEPoke** is used to send data to the PLC. The DDE is started with **DDEInitiate** and the DDE channel is closed with **DDETerminate**.

To initialize a DDE access you have to start *S5 / S7 for Windows*. The DDE server interface is automatically activated.

- **S7 for Windows**

Name format of the data to be exchanged between a PLC and any other windows application (using *S7 for Windows* as a bridge).

PLC Data Name	DLL Data Name	Data Type	Example
Cn	Zn	Counter	Z5
DWn, dbn	DWn, dbn	Data Word	DW3,12 = DW3 of DB12
MBn or Fn.n	MBn or Mn.n	Memory bit (Byte)	MB67 or M15.6
MWn	MWn	(Word)	MW45
IBn or In.n	En or En.n	Input (Byte)	EB3 or E47.1

S7 for Windows DDE name format (continued)

PLC Data Name	DLL Data Name	Data Type	Example
IWn	EWn	(Word)	EW123
QBn or Qn.n	ABn or An.n	Output (Byte)	AB14 or A32.2
QWn	AWn	(Word)	AW17
Tn	Tn	Timer	T1

Table A 2-1 *S7 for Windows* DDE name format

- ***S5 for Windows***

Name format of the data to be exchanged between a PLC and any other windows application (using *S5 for Windows* as a bridge).

PLC Data Name	DLL Data Name	Data Type	Example
?n (PLC only)	?n (PLC only)	absolute address	?4711 (external PLC only)
Cn	Zn	Counter	Z5
DLn, dbn or Xdbn	DLn, dbn or Xdbn		DL3,X12 = DL3 of DX12
DRn, dbn or Xdbn	DRn, dbn or Xdbn		DR3,X12 = DR3 of DX12
DWn, dbn or Xdbn	DWn, dbn or Xdbn	Data or Extended DX	DW3,12 = DW3 of DB12
FY(B)n or Fn.n	MBn or Mn.n	Flag (Byte)	M5 or MB67 or M15.6
FWn	MWn	(Word)	MW45
IBn or In.n	EBn or En.n	Input (Byte)	E1 or EB3 or E47.1
IWn	EWn	(Word)	EW123
PWn	PWn	(Word)	PW128
PYn or PBn	PYn or PBn	Peripheral (Byte)	PY34 or PB32
QBn or Qn.n	ABn or An.n	Output (Byte)	A11 or AB14 or A32.2
QWn	AWn	(Word)	AW17
Sn.n	Sn.n	Extended (Bit)	S1.5 (external PLC only)
SWn	SWn	Extended (Word)	SW23 (external PLC only)
SYn	SYn	Extended (Byte)	SY5 (external PLC only)
Tn	Tn	Timer	T1

Table A 2-2 *S5 for Windows* DDE name format

3 S5 Simulation PLC Commands

3.1 Basic Operations

Operation	Parameter
-----------	-----------

Binary logic operations

A	I	0.0	to
A	Q	0.0	to
A	F	0.0	to
A	D	0.0	to
A	T	0.0	to
A	C	0.0	to
AN	I	0.0	to
AN	Q	0.0	to
AN	F	0.0	to
AN	D	0.0	to
AN	T	0.0	to
AN	C	0.0	to
O	I	0.0	to
O	Q	0.0	to
O	F	0.0	to

Compare operations

!	F	
>	F	
	F	

Set / Reset operations

S	I	0.0	to
S	Q	0.0	to
S	F	0.0	to

Basic Operations; Set / Reset operations (continued)

Operation	Parameter		
S	D	0.0	to
R	I	0.0	to
R	Q	0.0	to

Operation	Parameter
-----------	-----------

O	D	0.0	to
O	T	0.0	to
O	C	0.0	to
ON	I	0.0	to
ON	Q	0.0	to
ON	F	0.0	to
ON	D	0.0	to
ON	T	0.0	to
ON	C	0.0	to
)			
A(
O(
O			

>	F	
	F	
<	F	

R	F	0.0	to
R	D	0.0	to
=	I	0.0	to

Operation	Parameter		
=	Q	0.0	to
=	F	0.0	to
=	D	0.0	to

Basic Operations (continued)

Operation	Parameter
-----------	-----------

Operation	Parameter
-----------	-----------

Load operations

L	IB	0	to
L	IW	0	to
L	QB	0	to
L	QW	0	to
L	FY	0	to
L	FW	0	to
L	DL	0	to
L	DR	0	to
L	DW	0	to
L	T	0	to
L	C	0	to
L	PY	0 to 127, 128 to 255	

L	PW	0 to 127, 128 to 254	
LC	T	0	to
LC	C	0	to
L	KB	0	to
L	KS	2 alpha num. charact.	
L	KM	Bit pattern (16 Bit)	
L	KH	0	to
L	KF	0	to
L	KY	0	to 255, all
L	KT	0.0	to
L	KC	0	to

Timer and Counter operations

SP	T	0	to
SE	T	0	to
SD	T	0	to
SS	T	0	to
SF	T	0	to

R	T	0	to
S	C	0	to
R	C	0	to
CU	C	0	to
CD	C	0	to

Transfer operations

T	IB	0	to
T	IW	0	to
T	QB	0	to
T	QW	0	to
T	FY	0	to
T	FW	0	to

T	DR	0	to
T	DL	0	to
T	DW	0	to
T	PY	0 to 127, 128 to 255	
T	PW	0 to 126, 128 to 254	

Block operations

JU	PB	0	to
JU	FB	0	to
JU	SB	0	to
JU	OB	0	to
JC	PB	0	to
JC	FB	0	to
JC	SB	0	to
JC	OB	0	to

C	DB	0	to
BE			
C			
BEU			
BA	FX	0	to
BEC	FX	0	to
AX	DX	0	to

Arithmetic operations

+	
---	--

-	
---	--

Miscellaneous operations

NOP	0	
NOP	1	
STP		

BLD		
STS		

Basic Operations (continued)

Operation	Parameter
-----------	-----------

Operation	Parameter
-----------	-----------

Digital logic operations

QW	
OW	

XOW	

Timer and Counter operations

FR T	0 to
FR C	0 to
FR =	Formal operand
SP =	Formal operand
SD =	Formal operand

SEC =	Formal operand
SSU =	Formal operand
SFD =	Formal operand
RD =	Formal operand

Load and Transfer operations

L =	Formal operand
LC =	Formal operand

LW =	Formal operand
T =	Formal operand

3.2 Supplementary Operations

Operation	Parameter
-----------	-----------

Operation	Parameter
-----------	-----------

Digital logic operations

A =	Formal operand
AN =	Formal operand

O =	Formal operand
ON =	Formal operand

Bit test operations

TB T	0 to
TB C	0 to
TB D	0 to
TB BS	0 to

TBN T	0 to
TBN C	0 to
TBN D	0 to

Conversion operation

CFW	
-----	--

CSW	
-----	--

Shift operations

SLW	0 to
-----	------

SRW	0 to
-----	------

Set / Reset operations

SU T	0 to
SU C	0 to
SU D	0 to
RU T	0 to
RU C	0 to

RU D	0 to
S =	Formal operand
RB =	Formal operand
= =	Formal operand
RD =	

Supplementary Operations (continued)

Operation	Parameter
-----------	-----------

Operation	Parameter
-----------	-----------

Jump operations

JU =	Symbolic address
JC =	Symbolic address
JZ =	Symbolic address
JN =	Symbolic address

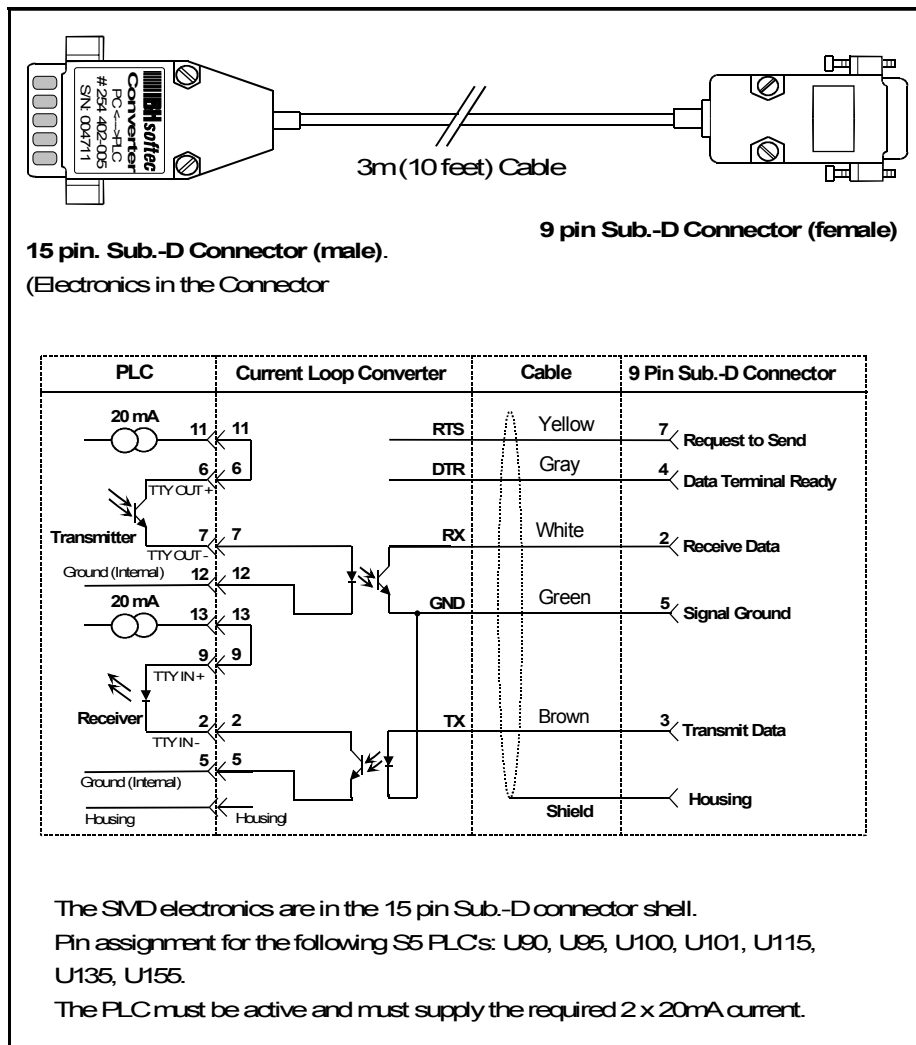
JP =	Symbolic address
JM =	Symbolic address
JO =	Symbolic address
JOS =	Symbolic address

Miscellaneous operations

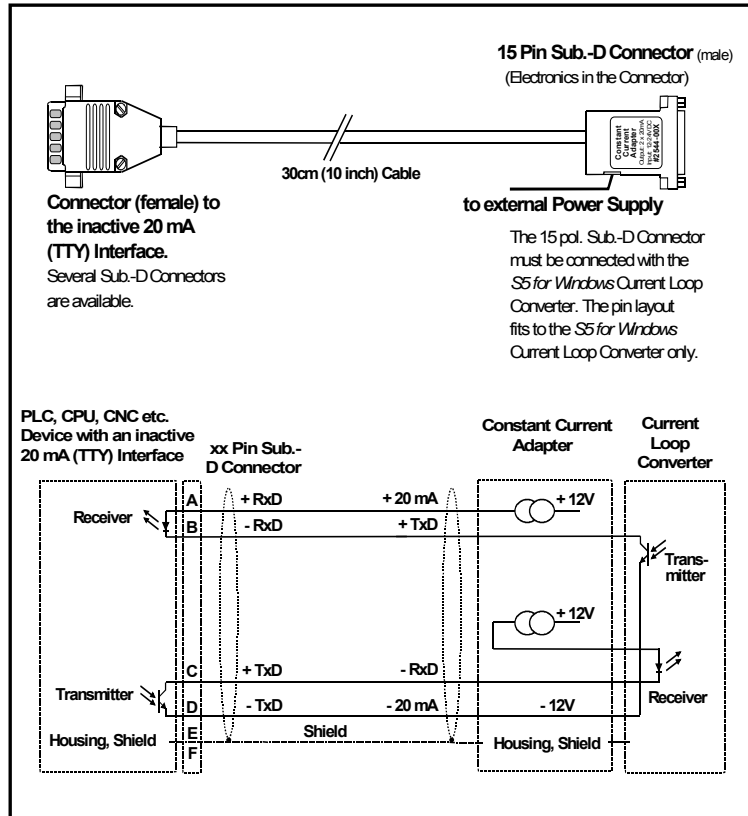
D	0	to
I	0	to
DO =	Formal operand	
DO DW	0	to

DO FW	0	to
G DB	3	to
GX DX	1	to
DI		

4 S5 Current Loop Converter



5 S5 Constant Current Adapter



Available Constant Current Adapter:

Type 1 Pin assignment for PLC S5-U80, -U85, -U100, -U101, -U115, -U135, -U155

15 Pin Sub-D Connector (female). Pin assignment: A—9 B—2 C—6 D—7 E—1 F—8

Type 2 Pin assignment for CNC 800 Series

25 Pin Sub-D Connector (male). Pin assignment: A—13 B—14 C—10 D—19 E,F—1

Type 3 Pin assignment for SPS U150

25 Pin Sub-D Connector (female). Pin assignment: A—21 B—20 C—19 D—18 E,F—Housing

Type 4 Pin assignment emulates the TTY (20 mA) Interface of the following programming devices:

PG 670, PG 675, PG 685, PG 635, PG 750 (PG connector emulator)

25 Pin Sub-D Connector (female). Pin assignment: A—22 B—10 C—8 D—21 E,F—25

Type X Customer Sub-D Connector pin assignment.

The connector and the pin assignment must be specified by the customer.

6 Null Modem Cable

Sub.-D Connector			Sub.-D Connector		
Female			Female		
9 Pin	25 Pin		9 Pin	25 Pin	
1	-----	----- Not Connected -----	1	-----	
2	3	-----	3	2	
3	2	-----	2	3	
4	20	-----	6	6	
5	7	-----	5	7	
6	6	-----	4	20	
7	4	-----	8	5	
8	5	-----	7	4	
9	-----	----- Not Connected -----	9	-----	
Shell	Shell	----- Shield -----	Shell	Shell	



PLC in a PC a Software PLC

The **SoftPLC** executes a program in the same manner as a hardware PLC. The advantage of executing a PLC program this way is, that the PLC status can be displayed in real time without any recompile activities. Since the **Soft PLC** behaves like a original Simatic® PLC, the programmin tools S7 for Windows and Step®7 can be used. Online connections can be established serial, via Ethernet, via Profibus DP and directly on the same PC. Even for project engineering and diagnostics of the Profi(bus DP S7 for Windows or the original Step®7 tool can be used. The complete program of a S7-PLC including Profibus DP configuration can be transferred to the **SoftPLC**.

	Windows NT 4.x/2000/XP			
	Compatible to Step®5		Compatible to Step®7	
	PLC S5-943	PLC S5-945	PLC S7-315®	PLC S7-416®
Load Memory	----	----	256 kByte	adjustable
Work Memory	48 kByte	720 kByte	256 kByte	adjustable
Memory bit	2 048	2 048	16 384	131 072
S-flags	32 768	32 768	----	----
Timer	256	256	256	512
Counter	256	256	256	512
Digital I/O	1024	1024	1024	32 768
Analog I/O	256	256	64	2048
Processing time *)				
Pentium III 600	190 µs	190 µs	100 µs	100 µs
Pentium IV 1,1 GHz	80 µs	80 µs	50 µs	50 µs
Pentium IV 2,6 GHz	55 µs	55 µs	28 µs	28 µs

*)Time setting 50% PLC Time, 50% Windows-Time, 1024 mixed instructions, (50% binary, 50% digital)