ACCON

Progress in Programming

Manual

ACCON-PG 2.0

The comfortable software for STEP®5 programming in STL, LAD and CSF, working with your original Siemens STEP®5 files.

DELTALOGIC

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Chapter 1:

Installation

Overview

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1.1 General informations

You cannot make a backup copy of the original installation disk of the full version of ACCON-PG. You can perform a certain number of installations (the number of paid licenses, plus reserve installations for working on a laptop) from the copy-protected installation disk.

Therefore, you cannot uninstall an installation manually (by deleting the files and the directory) but you have to use the installation program for uninstalling. Uninstalling manually will destroy the installation.

You can move an installation into another directory on the same drive. An installation which has been copied to another drive does not run. You have to uninstall ACCON-PG on the old drive, and install it on the new drive.

During installation, a subdirectory named »ACCON« will be created automatically in the main directory (root) of the destination drive. This directory must not be renamed or removed.

1.2 System requirements

ACCON-PG requires:

- a true IBM compatible personal computer with 80286 processor or higher
- a hard disk with at least 5 MB free
- a disk drive
- 2 MB RAM for the standard version (running with a DOS extender), or
- 640 KB RAM for the overlay version
- MS-DOS version 3.3 or higher
- a monochrome or color video adapter
- a Microsoft-compatible mouse (optional)

1.3 Installing ACCON-PG

To install ACCON-PG on your hard disk:

Insert the copy of your program disk into drive A: (resp. B:). Make this drive active and call the installation program »INSTALL.COM« from this drive. Follow the instructions on the screen. The destination directory will be created automatically, and the necessary files will be copied to the destination drive.

Description of the various files:

PG.EXE	the program file using DOS extender technology.
PGO.EXE	the overlay version which requires less working memory but runs slower due to loading parts of the program from disk at run-time.
FILEFIX.EXE	utility for repairing the index of a symbols file (when the user deleted the index by mistake), must be located in the program directory.
PG.DLL	Initialization library, must be located in the program directory.
PG-HELP.*	Help texts, error messages etc. These must be located in the program directory, too.
*.PD	Printer definition files.
EPTYPE.*	Configuration files for the ACCON-EPROMer containing descriptions of EPROM modules. These must be located in the program directory, too.
DEFAULF?.INI	Standard footer files, must be located in the program directory.
PG.TBT	File required for using extended video modes, must be located in the program directory..

1.4 System configuration

ACCON-PG creates resp. uses an additional file at run-time in which the current program settings are stored. This file is named "PG.INI" and is searched for in the program directory per default. You can change the directory where ACCON-PG searches for this file by assigning a value to the environment variable "ACCON". E.g. you can make ACCON-PG look for the file "PG.INI" in the directory "EXAMPLE" by issuing the DOS command

```
SET ACCON=D:\EXAMPLE ↵.
```

You can insert a line like this in your "AUTOEXEC.BAT" file, of course. This setting will then be valid as soon as you start your computer.

ACCON-PG first searches for the file "PG.INI" in the path given by the environment variable "ACCON", then in the program directory, and finally in all the paths contained in the environment variable "PATH".

To be able to start ACCON-PG from any directory, you should add the ACCON-PG program directory to the list of program paths stored in the environment variable "PATH" either directly, or in the "AUTOEXEC.BAT" file. The corresponding line looks like this:

```
SET PATH=C:\DOS;C:\ACCON ↵.
```

The program ACCON-PG has now been installed and configured. You can start it using the command

```
PG ↵.
```

1.5 The "CONFIG.SYS" file

As ACCON-PG is a DOS extender application, you will perhaps have to modify your "CONFIG.SYS" file. You will have to do this only if you have installed the device driver "EMM386.EXE" of MS-DOS version 5.0 or earlier with the option "NOEMS". You should then replace this option by "FRAME=NONE". An example of such a "CONFIG.SYS" file is given below. The specific entries may vary from one PC to another, depending on the (memory) configuration. If you do not know the meaning of a command, consult your DOS manual.

```
DOS=HIGH,UMB
DEVICE=C:\WIN31\HIMEM.SYS
DEVICE=C:\WIN31\EMM386.EXE FRAME=NONE
COUNTRY=001,850,C:\DOS\COUNTRY.SYS
BUFFERS=10
FILES=40
STACKS=0,0
DEVICEHIGH=C:\WIN31\RAMDRIVE.SYS 2048 512 256 /E
SHELL=C:\DOS\COMMAND.COM c:\DOS\ /P /E:1024
```

1.6 Filenames

During an ACCON-PG session, you will create files of various types:

*.S5D	program files. A STEP5 program consists of blocks.
*.DT	symbols file in ACCON-PG's proprietary DT format (a data base).
*.NX	the index file for the DT file with the same name. If you damage or delete the index file by mistake, you must repair resp. recreate it using the utility "FILEFIX.EXE" delivered with ACCON-PG.
*.@DT	and
*.@NX	backup copies of the symbols file (data base) preserving the state of the data base before the last saving operation.
*.QVL	and
*.NXQ	reference list for the program file with the same name.
*.SEQ	symbols file in the Siemens SEQ format (more or less an ASCII text file).
*.INI	footer files (except for the configuration file »PG.INI«).
*.ST	file containing a status scan table for the operations »Status/ Force Variables« resp. »Force Outputs«. The file »PG.ST« always contains the most recently used scan table.

Chapter 2:

User Interface

Overview

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2.1 The user interface of ACCON-PG

ACCON-PG has a modern SAA-compliant user interface so you do not have to learn complex commands. The SAA (Systems Applications Architecture) standard is used with almost all modern software and enables the user to communicate with any program in a uniform way.

You do not have to enter and edit commands using a special syntax, but you can select a command from a pull-down menu, and modify settings using dialog boxes. The commands can be selected using either the mouse, or the keyboard. In ACCON-PG, the whole editing process as well as the dialog between the user and the application (user entries and system messages) takes place in windows.

If your computer is equipped with a mouse, you can select every command using the mouse. If the mouse is active, you can move the mouse cursor (displayed as a block cursor) on the screen by moving the mouse on the mouse pad. To start an action with the mouse, you have to locate the cursor on the corresponding position, and click with the left mouse button.

2.2 Starting ACCON-PG

ACCON-PG can be started at the DOS command prompt with the command

PG ↵.

ACCON-PG will now be loaded and displays the starting resp. main screen as shown in the following screen shot.

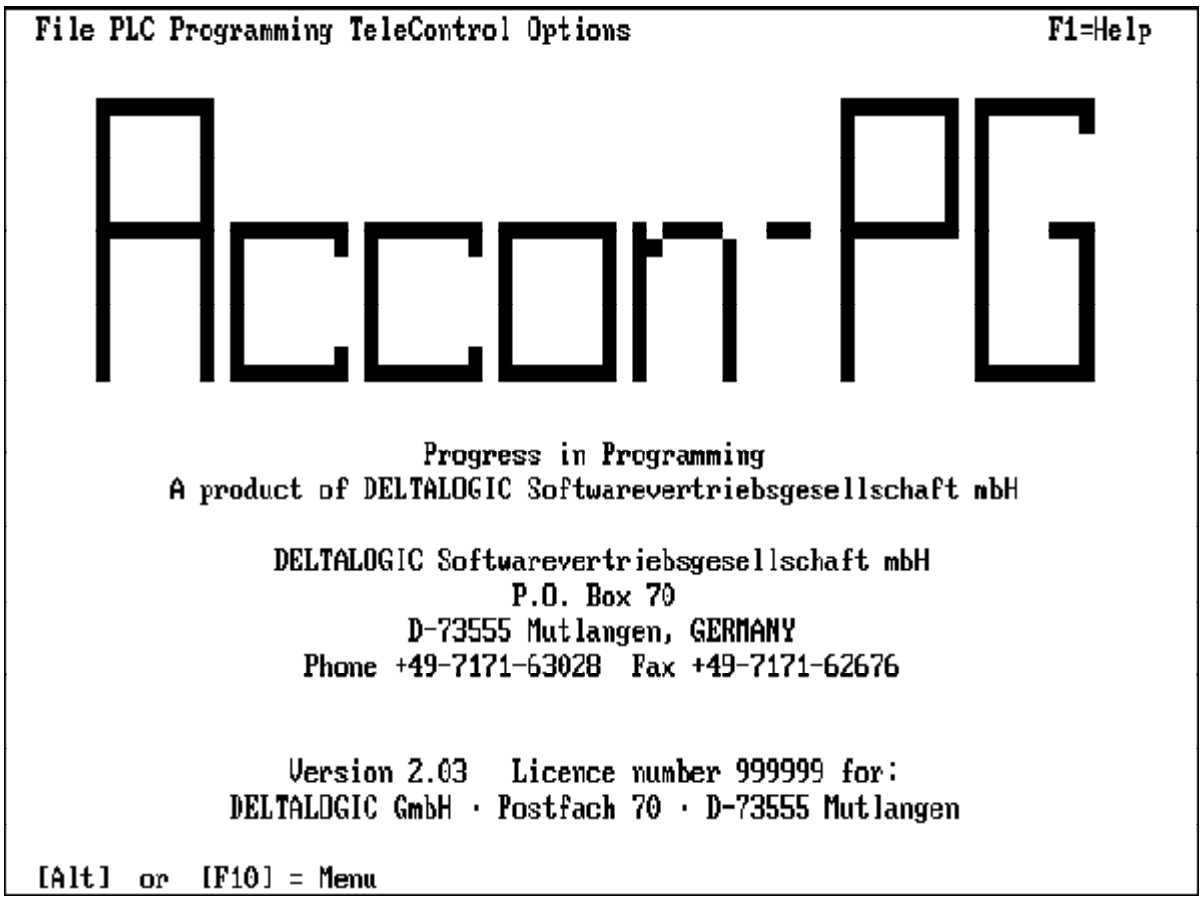

Fig. 2-1: Starting screen of ACCON-PG

In this main screen, you can select all commands and submenus of ACCON-PG.

2.3 User-interface elements of ACCON-PG

At the top border of the screen, you find the menu bar containing the titles of the menus.

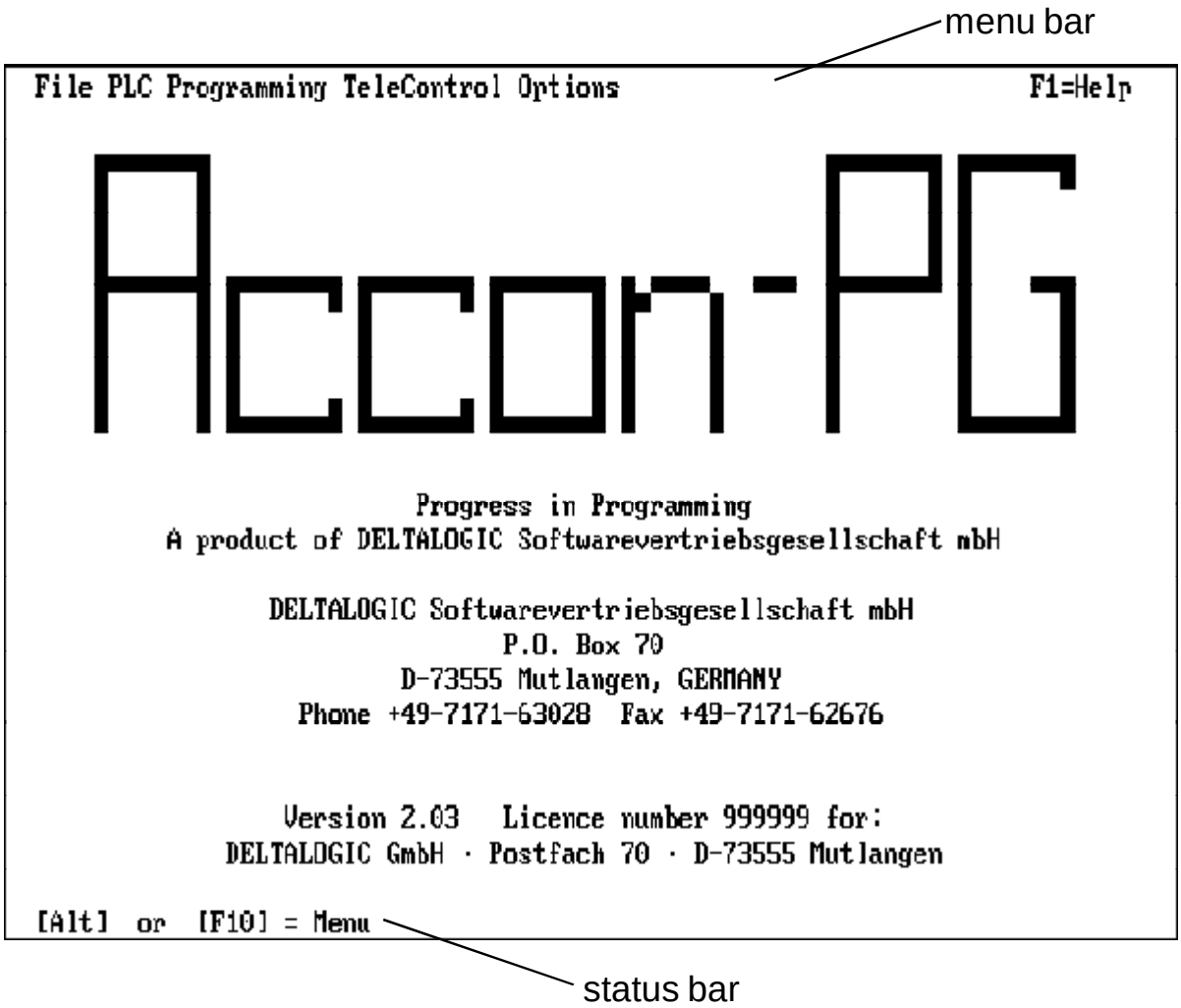

Fig. 2-2: User-interface elements of ACCON-PG

The "Help" menu is located at the right end of the menu bar. At the bottom border of the screen, the status bar is displayed. It shows information on the current status of ACCON-PG. The area in between is the working area in which you can edit blocks. Some screen elements are marked in fig. 2-2.

2.4 Leaving ACCON-PG

You can exit ACCON-PG to DOS using the menu command "File"/"Exit" in the main screen. You can do this using either the mouse (see chapter 2.8), or the keyboard command Alt + F4. Such a keyboard command is also called a hot key.

Note: You have to hold down Alt while pressing F4.

The hot key Alt + F4 is used in many application for exiting the program.

Before leaving the program, the current program settings and the name of the S5D file being last edited are stored in the file "PG.INI". After leaving ACCON-PG, you can start another program or restart ACCON-PG from the DOS command prompt.

2.5 The menu system of ACCON-PG

All commands of ACCON-PG are called via pull-down menus. The various commands are grouped so that related commands are contained in one menu.

The following figure shows the different components of a menu:

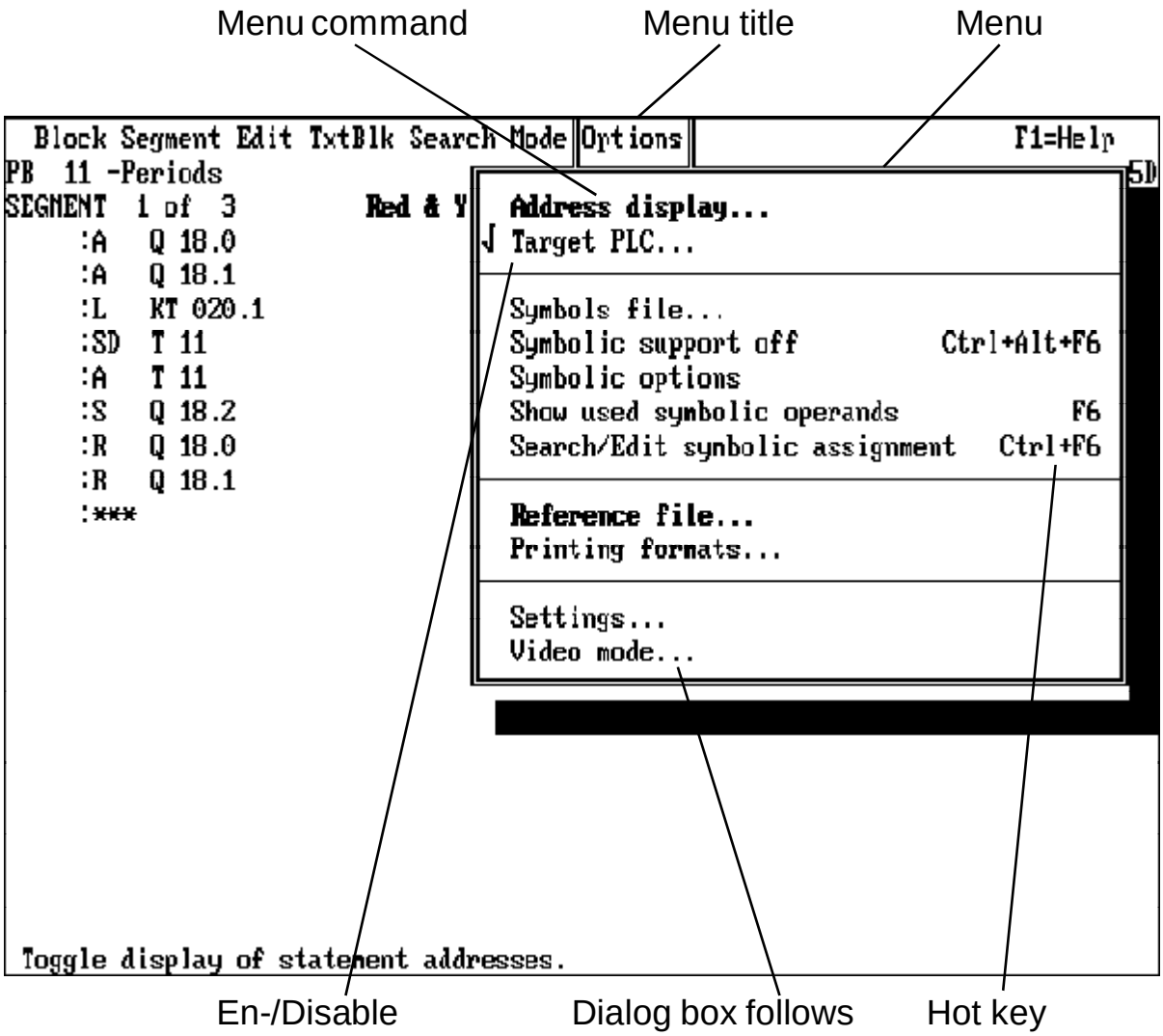

Fig. 2-3: Components of a menu

The menu bar contains the titles of the various menus. A menu is opened (pulled down) by selecting the corresponding menu title with the mouse or the keyboard. The open menu displays the commands that can be selected. The commands can be marked, e.g.

- A tick before a menu command means that this function is currently enabled/active. You can disable the function and remove the tick by re-selecting the menu command.
- The name(s) of one or more keys after a menu command designates the hot key for quickly activating the command without having to open the menu first.
- Three dots after a menu command mean that selecting this command causes a dialog box to appear in which you can make further entries.

Only a subset of the menu commands is currently needed at a certain point during program execution. A menu command is displayed in gray letters ("grayed") if it is currently impossible to select this command. E.g. you cannot select any of the block operations if there is no selected block in the directory.

You can perform the following kinds of actions by activating a menu command:

- change the state of a control-button, e.g. symbolic support on/off,
- open a dialog box, e.g. for selecting a file to be loaded,
- display another menu, e.g. the STL editor,
- execute a function, e.g. delete a line of text.

2.6 Using the mouse

The menu system of ACCON-PG can be handled very comfortably using the mouse. A mouse cursor is displayed as a block on the screen. You can move the cursor on the screen by moving the mouse on the pad. Whenever you move the mouse on the pad, the mouse cursor will be moved accordingly on the screen. So, you can point with the mouse cursor to a certain position on the screen. You can also start actions by using the left or the right mouse button. The middle button of your mouse (if it exists at all) is not used with ACCON-PG.

You can use the mouse in the following ways:

- pointing with the mouse cursor to a certain position on the screen,
- clicking, i.e. pressing and releasing a mouse button to perform a selection or an action. In the following, clicking with the left mouse button is designated by the symbol , and clicking with the right mouse button .

  You can, e.g., select a file in a file-selection dialog box by clicking with the left mouse button, or you can select and at the same time execute a menu command by clicking on the command in the menu.
- Double-clicking, i.e. two clicks within a short period of time, can be used for executing an action implied with the object the mouse cursor is located on. In the following, double-clicking with the left mouse button is designated by the symbol , and double-clicking with the right mouse button .

  If you e.g. double-click (with the left mouse button) on a file name in a file-selection dialog box, this file will be loaded into the editor.

2.7 Using the keyboard for selecting and executing a menu command

A pull-down menu will be opened when you select the corresponding menu title. Selecting one of the various menu commands causes an action to be performed or a dialog box to be opened. The menu is surrounded by a frame and shadowed, so it stands out against the background. Menu commands within a menu which are functionally related are grouped visually by separating lines.

The SAA standard not only specifies the appearance of the user interface of a program, but also the way in which to interact with the program. Selecting a menu, or a menu command within a menu can be done using the mouse as well as using the keyboard. The only things you cannot do using the mouse, are e.g. entering digits or letters into an input field, editing a block etc. These actions must be performed using the keyboard.

2.7.1 Selecting a menu command with the hot keys

A hot key is a key or a combination of keys that can be used to immediately execute a menu command without having to open the menu first. Hot keys exist for the menu commands that are used most often. The corresponding key or key combination is shown in the menu right after the corresponding menu command.

Example: The hot key for leaving ACCON-PG is [Alt] + [F4].

Using the hot keys is the most efficient way of interacting with ACCON-PG via the keyboard.

2.7.2 Selecting a menu command with the highlighted characters

One of the characters in each of the following items appear highlighted as they are displayed on the screen: menu commands, push buttons, radio buttons, data input fields, and check boxes. This also applies to the titles of the menus, with the restriction that highlighted characters appear only when the ŸAlt□ key is pressed.

A menu is opened by pressing and holding down the ŸAlt□ key while hitting the key with the highlighted letter.

One of the menu commands listed in an open menu can be invoked by hitting the key with the highlighted letter.

Example: To open the menu "Options", press [Alt] + [O].

To abort the selection, press [Esc].

2.7.3 Selecting a menu command with the cursor keys

To be able to select a menu item (i.e., a menu command) with the cursor keys, the menu bar must first be activated by pressing the function key [F10] or one of the two [Alt] keys. The title of the leftmost menu in the bar will then be marked by a selection bar, i.e. it will be displayed inverse or in another color (depending on the video adapter installed in your computer).

You can move the selection bar using the cursor keys [←] or [→]. After positioning the bar on the desired menu, the menu is opened with one of the cursor keys [↑] or [↓] . Use these keys again to select the desired item of this menu. Confirm your choice with the [↵] key.

Again, the [Esc] key aborts the selection of a menu item.

2.8 Using the mouse for selecting and executing a menu command

When using the mouse with ACCON-PG, you can make use of the two interaction techniques "Press and Hold" and "Press and Release".

"Press and Hold" means: position the mouse cursor on the title of the desired menu, press the left mouse button and hold it down. The menu will be opened. Hold down the left mouse button while moving the mouse cursor downwards until it is positioned on the desired item of the menu. The command will be executed as soon as you release the mouse button.

You can abort the selection by releasing the left mouse button when the mouse cursor is somewhere outside the menu.

"Press and Release" means: position the mouse cursor on the title of the desired menu and click with the left mouse button. The menu will be opened, and the selection bar is located on the first item of the menu. Move the mouse cursor downwards until it is positioned on the desired item of the menu. The command will be executed as soon as the mouse button is clicked again.

You can abort the selection by clicking with the left mouse button when the mouse cursor is somewhere outside the menu.

2.9 The components of a dialog box

Beside the menus, the most important elements of the ACCON-PG user interface are dialog boxes. They are used for information exchange with the user who can enter data needed by ACCON-PG for its further work. Dialog boxes can contain the following components (each type of component can appear more than one time): push buttons, check boxes, radio buttons, input fields and list boxes.

You can activate such a component using either the mouse or the keyboard. Immediately after the box has been opened, the top left element in the box is activated. The blinking cursor shows you which element is currently activated.

The Tab key takes you to the next element of the dialog box. The key combination Shift + Tab takes you to the previous element.

You can access each element directly (in any order) by clicking on it with the mouse. An element is selected by .

The various elements of a dialog box will be explained below.

E.g. this box appears when you select the "Open" command in the "File" menu.

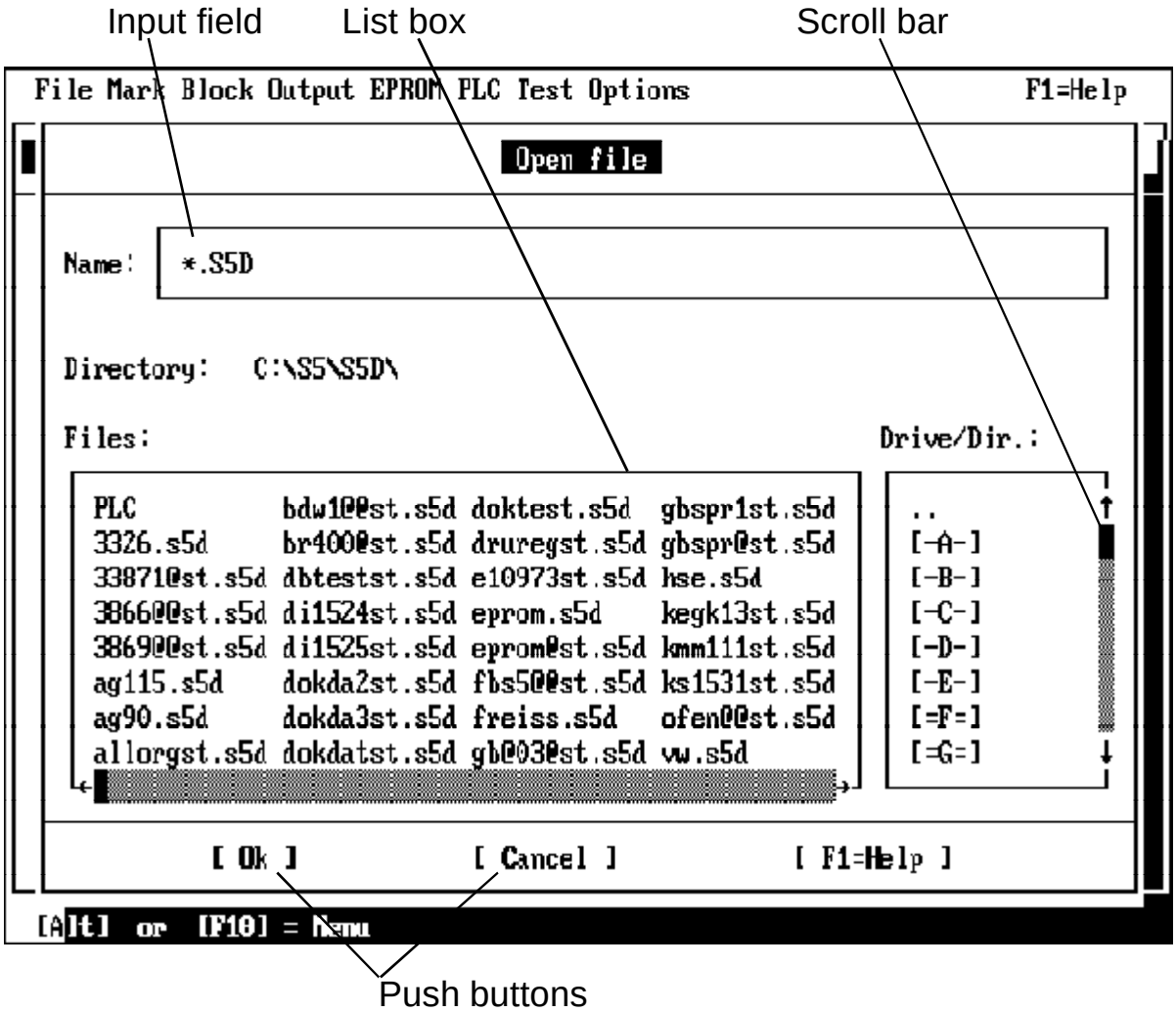

Fig. 2-4: Dialog box »Open file«

2.9.1 Input fields

Input fields are needed when numbers and/or text must be specified for the further processing of the application. The dialog box "Select file" in fig. 2-4 contains an input field in which you can enter the name of the file to work with.

In some input fields, the entry made by the user is checked for correctness and/or consistency. E.g., if you are expected to enter a number, only digits can be entered.

When an input field is active, a text cursor is displayed in it; so you can edit more comfortably.

2.9.2 List boxes

List boxes are used in a dialog box for presenting existing data for selection in a list or table. When a list box is activated, the active element is marked by a selection bar.

⌨ When using the keyboard, you can select the object to work with 🖱. You start working with that object by a 🖱.

Example: The dialog box "Open file" in fig. 2-4 contains two list boxes. The right list box contains the directories, floppy and hard disk drives installed in your system. With a 🖱 on the letter of a drive, the contents of that drive will be displayed in the left list box "Files:". In this box, you can now load the desired file by 🖱 again.

2.9.3 The scroll bars

It is often the case that not all elements of a list (or a table) can be displayed simultaneously in a list box because there are too many of them. In this case, you can imagine the list box to be a window in which a part of the list is visible. You can move this window around in the list box in order to inspect the whole list. This is called "scrolling".

To be able to scroll (move around) the contents of the list box (in vertical or horizontal direction), there are corresponding scroll bars.

When using the keyboard, you can scroll the list box with the cursor keys [↑], [↓], [←] and [→] automatically, if the box cannot display the whole content of the list at one time.

When using the mouse, the list box (resp. its contents) is scrolled by on one of the arrows at the ends of the scroll bar.

The scroll cursor in the scroll bar shows your current position in the list box. If all elements of the list can be displayed simultaneously, the scroll cursor cannot be moved.

Example: You can see a horizontal scroll bar in the list box "Files:" in the dialog box "Select file" in fig. 2-4, and a vertical scroll bar in the list box "Drives/Dir.:".

2.9.4 Push buttons

You can compare push buttons to control switches which can be used to confirm the entries made in a dialog box, to abort making entries or to get contextual help on an input field. The push buttons are always located in the bottom line of the dialog box.

Push buttons are displayed as text between square brackets ("[...]"); one character of the text is marked (high-lighted) for selecting the button with the keyboard.

The dialog box »Select file« in fig. 2-4 e.g. contains the push button "[Ok]" for confirming a dialog, the push button "[Cancel]" for aborting the dialog (entries will be ignored in this case) and the push button "[F1=Help]" for accessing contextual help.

When cancelling a dialog with the "[Cancel]" push button, all entries made in the dialog box will be ignored. If the dialog is confirmed using the "[Ok]" button, all entries are made valid. and the dialog box is closed.

When using the keyboard, you can first select the desired push button with the keys [Tab] resp. [Shift] + [Tab]. Then, you can start the corresponding command with the [↵] key.

When using the mouse, click on the desired push-button.

The [Esc] key corresponds with the hot key for the push button "[Cancel]", the [↵] key will always perform the selected action.

2.9.5 Check boxes

Check boxes are used for en-/disabling certain functions/options of the application. Check boxes are shown with "[ ]" brackets. If an "X" is displayed within the brackets (i.e. the check box is ticked), the corresponding function/ option is currently enabled. If the check box is empty (ticked off) however, the corresponding function/option is disabled.

When using the keyboard, a check box can be selected using the keys [Tab] resp. [Shift] + [Tab], and is ticked resp. ticked off using the [Spacebar] . You can also tick a check box (on or off) by pressing [Alt] together with the key corresponding to the high-lighted character of the check box.

When using the mouse, you can tick a check box (on or off) by after positioning the mouse cursor on the check box.

The following fig. 2-5 shows the dialog box "Settings". The upper part of the box contains several check boxes.

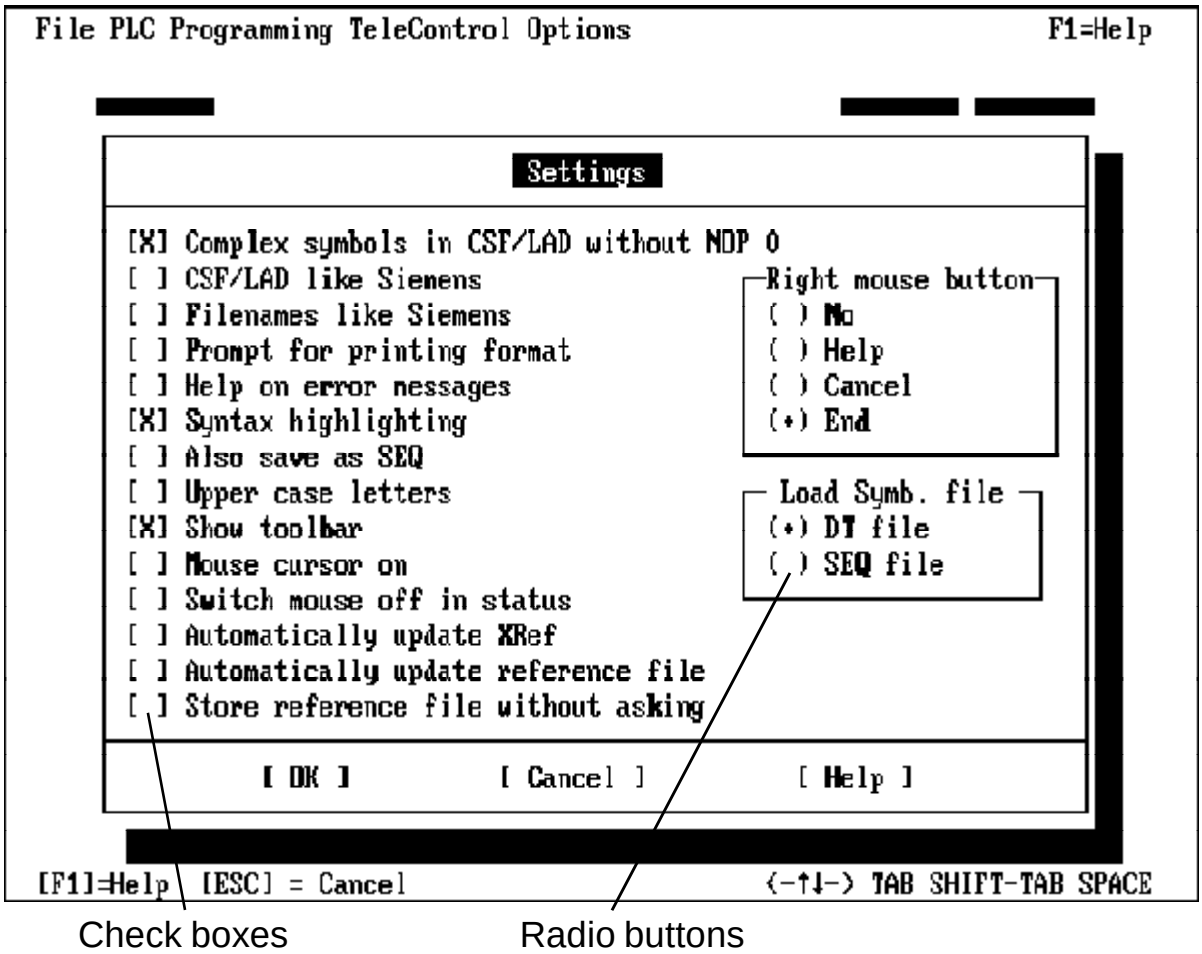

Fig. 2-5: Dialog box "Settings"

2.9.6 Radio buttons

A radio button is a group of buttons offering a mutually exclusive choice, i.e. only one button can be (and must be) on at any one time. The buttons are visually joined together by a frame. Each button consists of field with "( )" parentheses and a text field. The button which is currently switched on is marked by a bullet "(•)" between its parentheses.

When using the keyboard, you can turn on the next resp. the previous button of the group with the cursor keys [↑] and [↓], or with the [Spacebar]. You can switch on any of the buttons directly by pressing [Alt] plus the key corresponding to the high-lighted character of the button's text.

When using the mouse, you can turn on any of the buttons directly by after positioning the mouse cursor on the desired button.

The dialog box "Settings" in fig. 2-5 shows the radio button "Right mouse button".

2.10 The help system of ACCON-PG

ACCON-PG provides you with an extensive and detailled help system. You can always get specific help information concerning your current situation and the status of ACCON-PG. To get this contextual help, press F1.

When pressing F1 directly in the main screen of ACCON-PG, the menu "Help" will be opened. You can now access information on the current project, or the current meaning of the function keys.

2.10.1 Help on menu commands

You can get a help text on any of the menu commands.

To get this help information, the corresponding menu has to be opened and the marking bar must be positioned on the command you want help on. Press F1 to open the help window with information on the marked menu command. When pressing F1 again in the help window, you will get help on how to use the help system.

2.10.2 Help on elements of dialog boxes

You can get a help text on any of the elements of a dialog box.

To get this help information, the corresponding dialog box has to be opened and then the element you want help on must be selected. Press F1 to open the help window with information on the marked element.

2.10.3 Contextual help

In the graphic programming modes LAD and CSF, you can access contextual help during editing by pressing Ctrl + F1. E.g., when the text cursor is located on the input of a LAD or CSF symbol, you can press Ctrl + F1 to get information on how to activate this input.

Example: The help window shown in fig. 2-6 will be displayed when positioning the cursor on a timer and pressing Ctrl + F1.

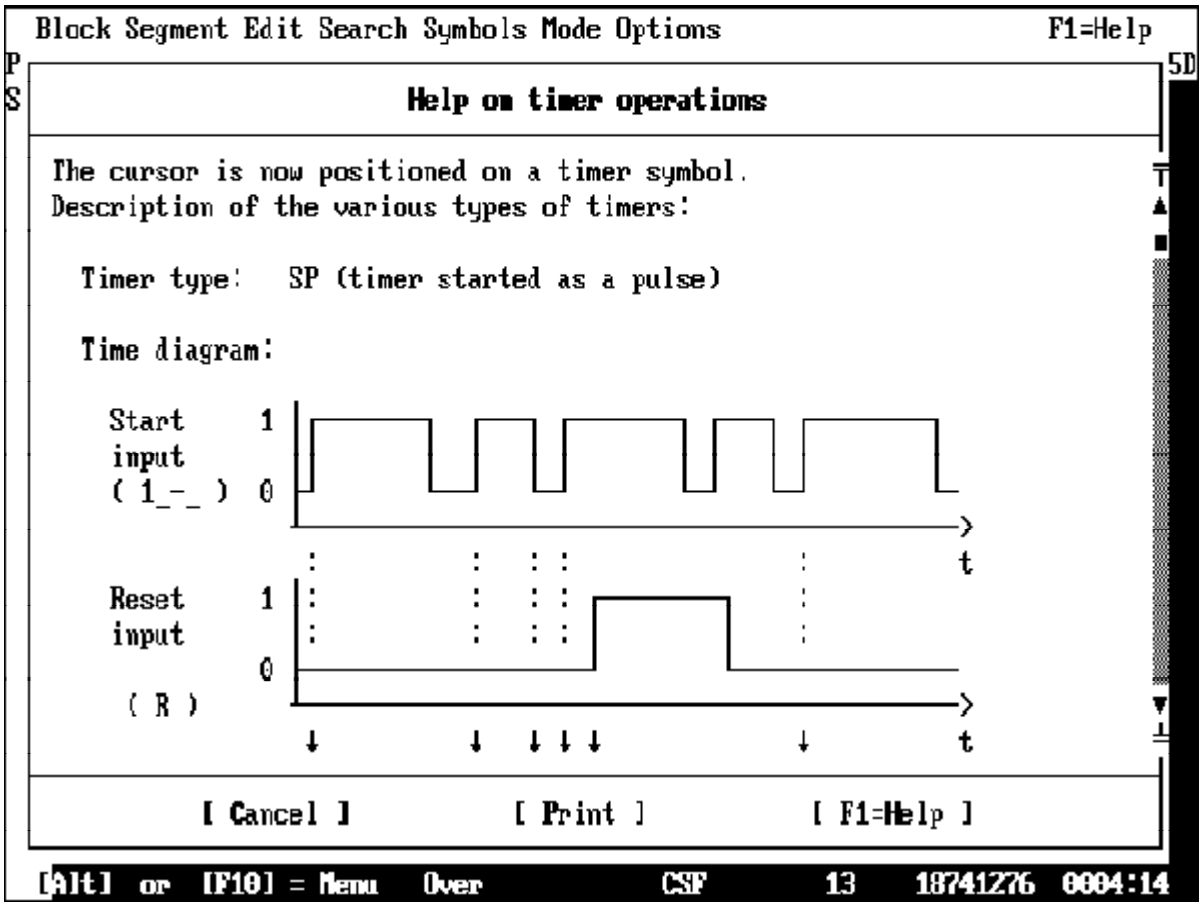

Fig. 2-6: Help text on symbol »Timer«

In the STL editor, Ctrl + F1 gives you a description of the command in the current line. The PLCs on which the command can be executed and its execution time are listed.

```
 Block Segment Edit TxtBlk Search Mode Options                    F1=Help
PB  10                                                            TSST.S5D
SEGMENT
     :A
     :L
     :SD
     :A
     :S
     :S
     :BE

          Help on operation: "A T"  (AND Timer)

          Description:
            AND operation: Scan a timer for signal state  "1"

          See also: "Binary operations"

          Availability:
            On all PLCs, in all blocks

          Modifies:
            RLO  - yes
            CC 0 - no
            CC 1 - no
            OV   - no
            OS   - no

          Relevant PLC features:

               [ Cancel ]        [ Print ]        [ F1=Help ]

 [Alt]  or  [F10] = Menu   Over          STL        7    18741276  0010:07
```

Fig. 2-7: Contextual help in STL

Chapter 3:

Program Representation

Overview

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3.4 The Control System Flowchart (CSF) 3-7

3.1 The representation modes

Automation projects can be realized using programmable logic controllers (PLCs). The user has to formulate the automation task as a set of control programs, i.e. sequences of commands specifying how the automation plant is to be controlled by the PLC. The result will be a open-loop control program or a closed-loop control program. The PLC can execute the control program only if it designed and written in a specific programming language. For SIMATIC S5 controllers, the corresponding language is STEP 5.

There are three different modes of representing and editing STEP 5 programs in ACCON-PG:

1. the STatement List STL
2. the LAdder Diagram LAD
3. the Control System Flowchart CSF

Each one of these representation modes has some unique features. Therefore, a program block written in STL can sometimes not be represented in CSF or LAD mode. The graphic representation modes are not 100 % compatible to each other, too. However, a program written in CSF or in LAD can always be translated to STL.

3.2 The Statement List (STL)

When programming in STL, the control task is specified as a list of statements. Each statement is listed in a line of its own and contains one single command. Each command is represented by a mnemonic (abbreviation) and consists of the following parts:

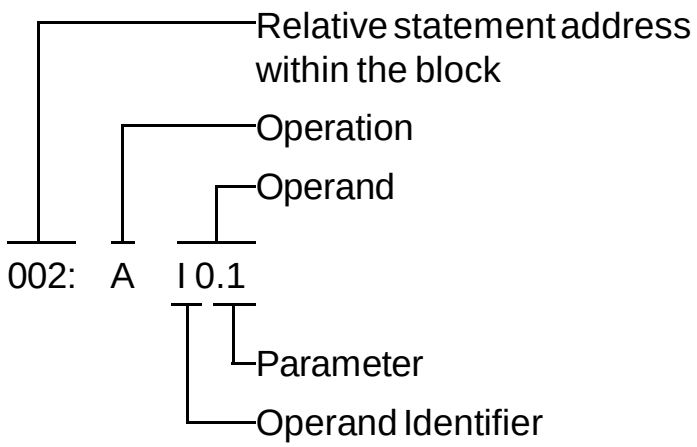

Fig. 3-1: An STL statement

The operation tells the PLC which operation is to be carried out with the operand. The parameter designates the address of an operand.

The following figure shows the way in which ACCON-PG represents a STL program.

```
  Block Segment Edit TxtBlk Search Mode Options                    F1=Help
PR  11 -Periods                                          File: LIGHTSST.S5D
SEGMENT  3 of  3        Start Red Period                 LIB=
0024      :A   Q 18.1                          Yellow light ?
0026      :AN  Q 18.0                          Red light off ?
002B      :L   KT 020.1                        Load time value for red period
002C      :SD  T 13                            Set time value
002E      :A   T 13                            Yellow period running out ?
0030      :R   Q 18.1                          Turn yellow light off
0032      :S   Q 18.0                          Set red light on
0034      :BE

* [Alt]  or  [F10] = Menu   Ins            STL        8    17673884  0017:07
```

Fig. 3-2: The statement list

3.3 The Ladder Diagram (LAD)

The ladder diagram is a graphics-oriented representation of a control task based on the symbols of the circuit diagram. Rungs are arranged horizontally and not vertically, due to requirements imposed by the need to represent them on a screen rather than on a sheet. Operands must be assigned to the symbols.

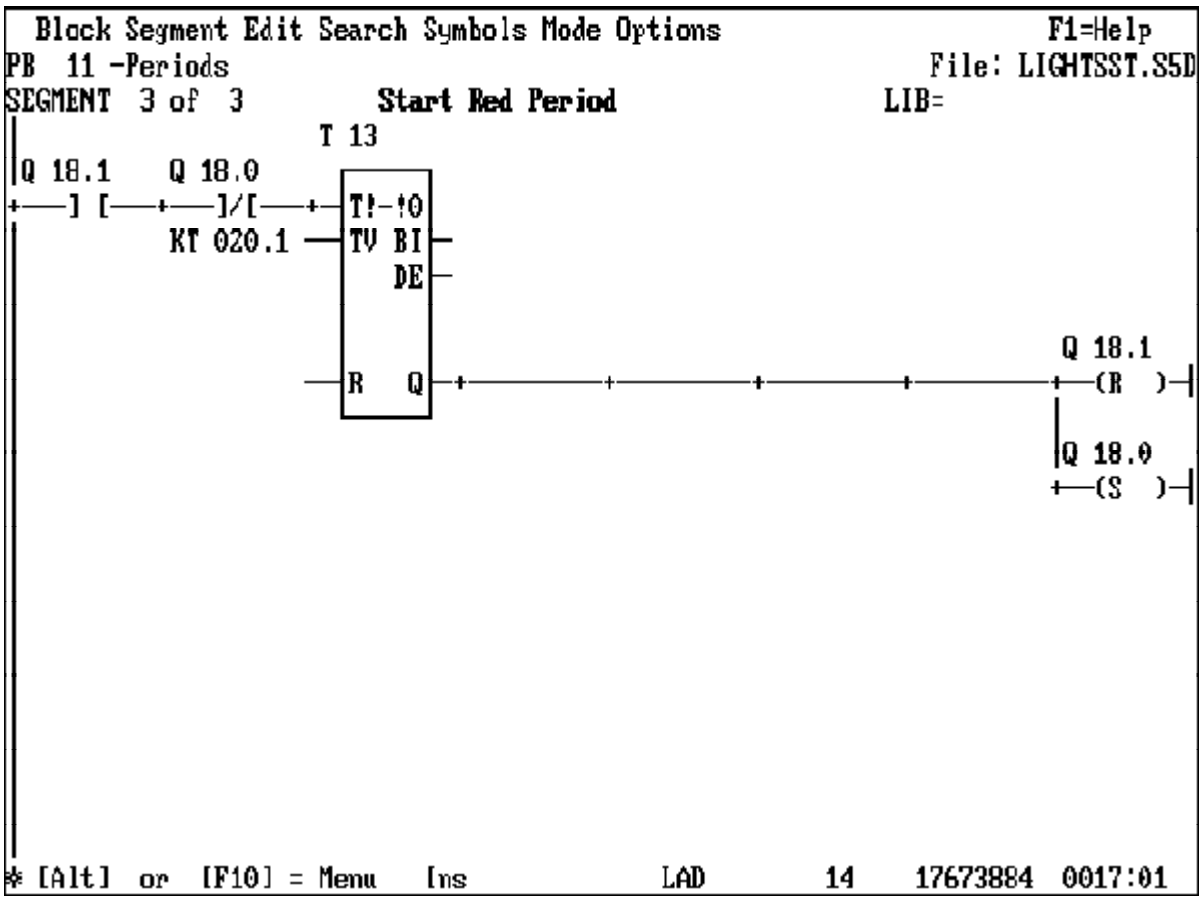

Fig. 3-3: The Ladder Diagram

In ACCON-PG, the number of complex symbols per segment is not limited to one and the number of lines per rung (output) is not limited to 16.

3.4 The Control System Flowchart (CSF)

The Control System Flowchart is another graphics-oriented method of representing control tasks. It makes use of symbols taken from circuit engineering. A CSF symbol represents a function in rectangular box containing a special character designating the type of the function. The inputs of the symbol must appear at its left side, the outputs at the right side. Operands must be assigned to both inputs and outputs.

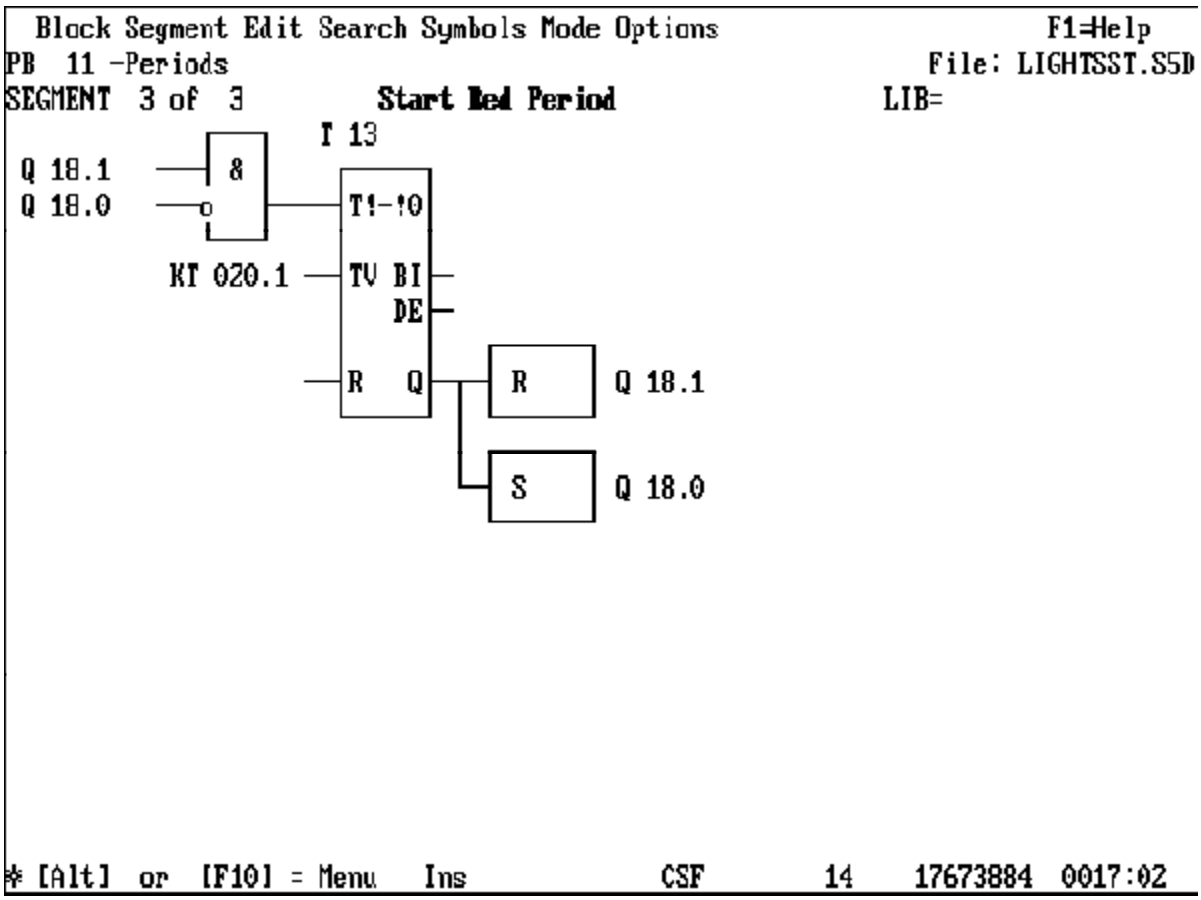

Fig. 3-4: The Control System Flowchart

In ACCON-PG, the number of lines per segment is not limited to 50.

Chapter 4:

Programming in STEP 5

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4.1 The components of a control statement

A control program running on a PLC consists of a sequence of control statements. A control statement contains one command. A command consists of the operation code and the operand section. The operand section consists of the operand identifier, the data format designation (optional) and the parameter.

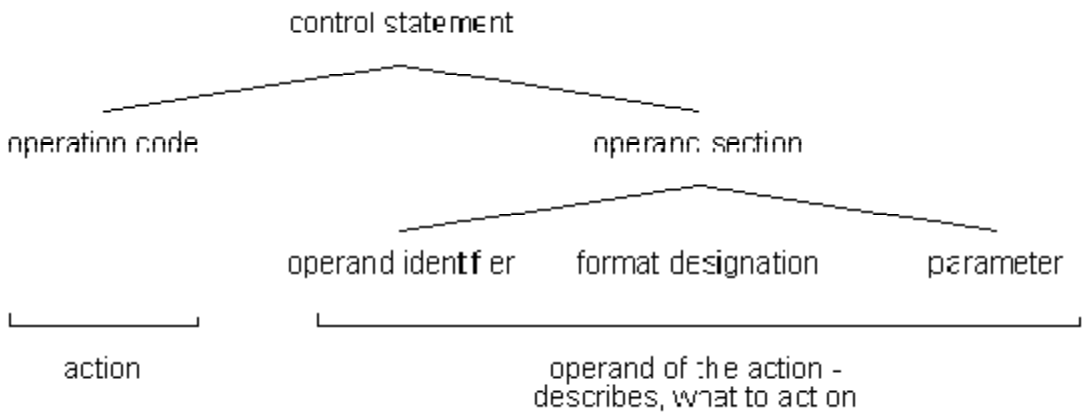

Fig. 4-1: The components of a control statement

In the STEP 5 programming language, the following types of commands are available:

- commands concerning program organization and
- commands for signal processing.

The commands for signal processing can be subdivided into:

- bit operations and
- word operations.

4.2 The logical operations of a PLC

The basic logical operations of a PLC are AND, OR and NOT.

All the other logical operations used in control programs can be derived from these basic operations. These logical elements scan the signal states of their inputs and gate them. The result of the operation is assigned to the output of the element.

The result of the logic operation (RLO) can be described in terms of a truth table. A truth table lists all combinations of possible signal states of the inputs (also called operands), and tells you the RLO for each combination. The RLO can be "0" or "1" (or FALSE / TRUE, if you prefer this), because we use binary logic.

In the following subsections, we are going to examine the basic logical operations mentioned above.

4.2.1 AND operation

The AND operation (shown as a CSF symbol in the below figure) gives an RLO of "1", if and only if the signal states of all inputs are "1". (We assume that all inputs are not negated; negated inputs are not considered before subsection 4.2.3.)

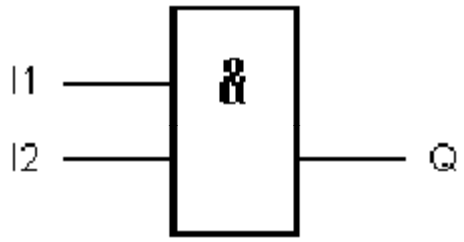

Fig. 4-2: The AND symbol

The following truth table illustrates the AND operation:

I1	I2	Q
0	0	0
0	1	0
1	0	0
1	1	1

Table 4-1: Truth table of the AND operation.

Note: In a graphical representation of a logical operation, we assume that all inputs appear at the left side of the symbol, and all outputs appear at the right side. The signal flow goes from the left to the right.

4.2.2 OR operation

The OR operation (shown as a CSF symbol in the below figure) gives an RLO of "1", if and only if at least one of the inputs has a signal state of "1". (We presume that all inputs are not negated; negated inputs are not considered before subsection 4.2.3.) An OR symbol is represented by a rectangular box and the symbol for "greater than or equal to 1" within the box.

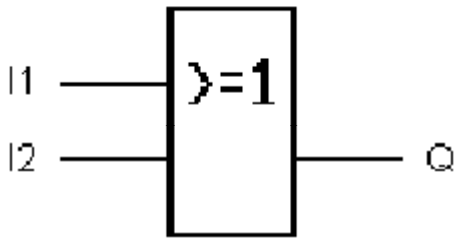

Fig. 4-3: The OR symbol

The following truth table illustrates the OR operation:

I1	I2	Q
0	0	0
0	1	1
1	0	1
1	1	1

Table 4-2: Truth table of the OR operation.

4.2.3 NOT operation

The NOT operation negates ("inverts") the signal state of an input. The inversion is represented with a circle at the input. In the example shown in fig. 4-4, the signal state of the output Q is "0", if and only if the signal state of input I1 is "1".

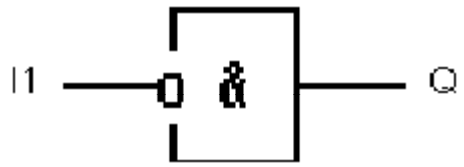

Fig. 4-4: The NOT operation resp. negated input

4.3 Extending the binary logical operations

In this section, the remaining logical operations used in various PLC programs are described.

4.3.1 Parenthesized expressions

Binary expressions containing AND or OR operations can be nested using parentheses. This means, that the output signal states of all statements within the parentheses are taken as inputs for the AND resp. OR operation embracing the parentheses. You can nest parenthesized expressions, but the nesting depth is limited.

Other operations than AND resp. OR cannot be parenthesized.

4.3.2 Set / Reset operations

There are two ways of storing the RLO outside the PLC processor; this can be either dynamic or static. The first (dynamic) method is using an assignment operation ("="); the assignment operation is executed in each program cycle. The second (static) method is using Set / Reset operations (flip-flops). A flip-flop can store binary signals; the state of a flip-flop can be modified only by a Set or a Reset operation, but it is still valid in subsequent program cycles.

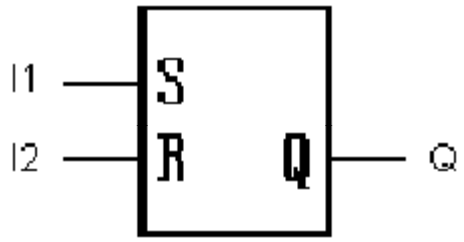

Fig. 4-5: The R/S flip-flop

A flip-flop retains its state even if both inputs are "0". The Set input ("S") serves for setting the flip-flop (output Q has signal state "1"); the Reset input ("R") serves for resetting the flip-flop (output Q has signal state "0").

There are two types of R/S flip-flops:

- R/S flip-flops with Set priority, and
- R/S flip-flops with Reset priority.

These types treat conflicting input states (Set and Reset activated simultaneously: who will win?) differently. A R/S flip-flop with Set priority is set to "1", if both the Set input and the Reset input are "1". A R/S flip-flop with Reset priority is set to "0", if both the Set input and the Reset input are "1".

The following truth table illustrates the R/S flip-flop.

old Q1 value	I1	I2	new Q1 value
0	0	0	0 (old value)
1	0	0	1 (old value)
0	1 (set)	0	1
1	0	1 (reset)	0
1	1	1 (reset priority)	0
0	1 (set priority)	1	1

Table 4-3: Truth table of the R/S flip-flop.

4.3.3 Timers

Timers are used in PLC programming for activating and stopping certain tasks at a specified time or controlling the duration of a process.

There are several types of timers which have their own specific behaviour. They can either a generate a pulse or delay actions.

The following five types of timers can be used in PLC programs:

Pulse timers:

- Pulse (SP) and
- Extended pulse (SE).

Delay timers:

- ON delay (SD),
- latching ON delay (SS) and
- OFF delay (SF).

The time value of a timer must be set before starting the timer. You can scan the current (digital or binary) time value (a 16 bit word) at any time.

4.3.3.1 Start a pulse timer (SP)

The timer in fig. 4-6 is started by a change in the signal state of input I1 from "0" to "1". The output Q3 is "1" as long as the timer is running. This duration is specified with input I2 (TV, timer value). If I1 is reset to "0" during this time, Q3 will also be reset immediately.

The timer is reset by activating input I3. As long as the Reset input (R) is "1", the timer cannot be started.

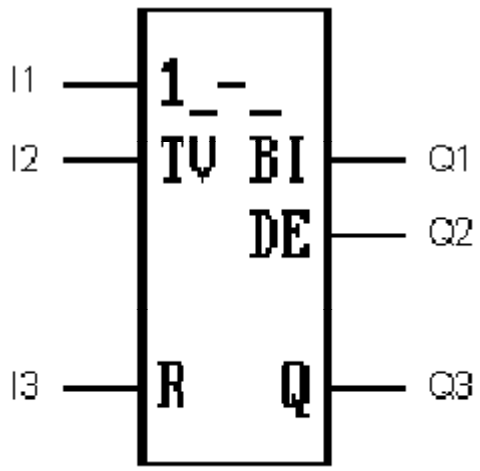

Fig. 4-6: Pulse timer

The time value is specified at the input "TV", together with the time base »KTxxx.y«. The number after the point defines the time base:

0	means:	0,01 s
1	means:	0,1 s
2	means:	1 s
3	means:	10 s

The effective time value is the given number times the time base, in our example: 300 * 0,01 s = 3 seconds.

The outputs »BI« and »DE« make the current time value available for further binary or digital («decimal«) operations.

4.3.3.2 Start an extended pulse timer (SE)

The timer in fig. 4-7 is started by a change in the signal state of input I1 from "0" to "1". The output Q3 is "1" as long as the timer is running. This duration is specified with input I2 (TV, timer value). If I1 is reset to "0" during this time, Q3 will not be reset. The output Q3 will not be reset until the specified time has expired or the Reset input I3 is set to "1".

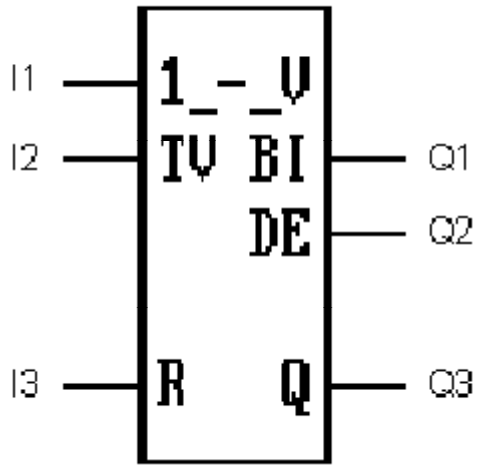

Fig. 4-7: Extended pulse timer (SE)

4.3.3.3 Start an ON delay timer (SD)

The timer in fig. 4-8 is started by a change in the signal state of input I1 from "0" to "1". The output Q3 will not be set until the time specified with input I2 has expired. Furthermore, Q3 will then only be set if input I1 is still "1". If the Reset input I3 is set to "1" within the specified time, the timer is halted and reset while the output stays "0". After the specified time has expired, Q3 is set to and stays "1" until I1 is reset or I3 is set.

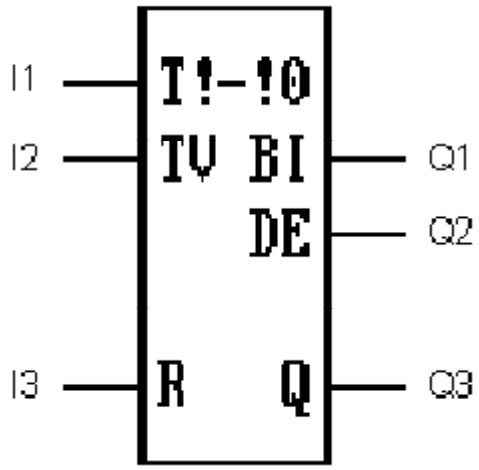

Fig. 4-8: ON delay timer (SD

4.3.3.4 Start a latching ON delay timer (SS)

The timer in fig. 4-9 is started by a change in the signal state of input I1 from "0" to "1". The output Q3 will not be set until the time specified with input I2 has expired (this does not depend on the signal state of I1 at this moment). If the Reset input I3 is set to "1" within the specified time, the timer is halted and reset while the output stays "0". The output will not be reset and the timer will not be restarted until the Reset input is first set and then reset.

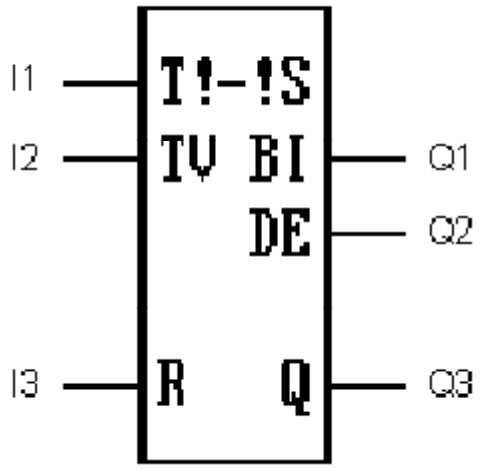

Fig. 4-9: Latching ON delay timer (SS)

4.3.3.5 Start an OFF delay timer (SF)

When the signal state of input I1 changes from "0" to "1", the output Q3 is set immediately. If I1 is reset to "0", the timer is started and makes Q3 stay set until the time specified with input I2 has expired. The timer can be reset at any time by setting the Reset input I3.

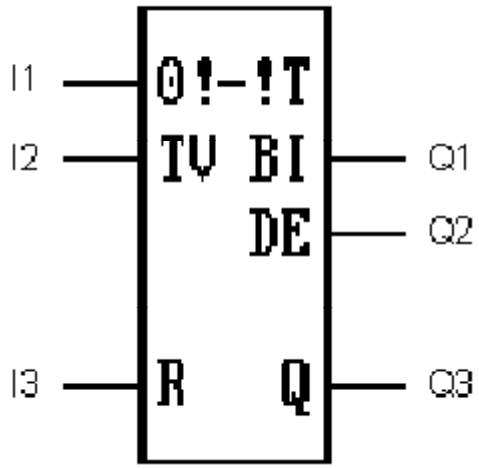

Fig. 4-10: Off delay timer (SF)

4.3.4 Counters

Counters are used for counting objects.

The PLC provides for two types of counters:

- up counters and
- down counters,

which look the same. They share the same symbol that has a Count-up input and a Count-down input.

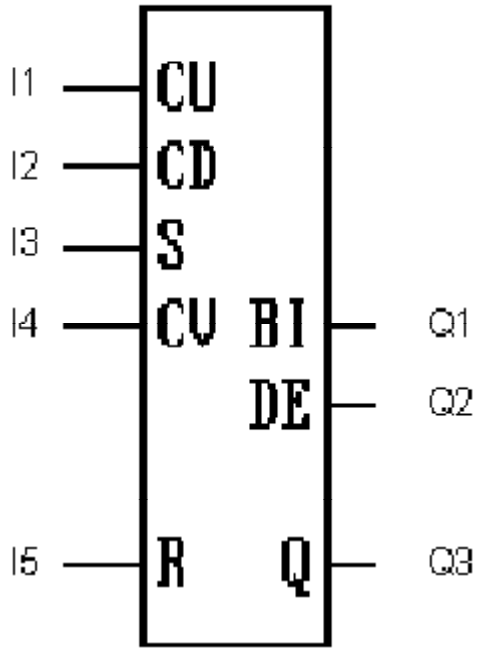

Fig. 4-11: Counter

4.3.4.1 Up Counter (CU)

The counter of fig. 4-11 is incremented when the signal state of input I1 changes from "0" to "1". The counter value will not exceed 999 (a carry flag will not be set). Incrementing a counter with value 999 will have no effect.

4.3.4.2 Down Counter (CD)

The counter of fig. 4-11 is decremented when the signal state of input I2 changes from "0" to "1". The counter value will not become negative (a carry will not be set). Decrementing a counter with value 0 will have no effect.

4.3.4.3 Setting the count (S)

When the signal state of input "S" changes from "0" to "1", the counter is set to the value of the input "CV" (Counter Value, a 16 bit word).

4.3.4.4 Resetting the count (R)

When the signal state of input "R" changes from "0" to "1", the counter is reset to 0. As long as the Reset input is "1", you cannot count up or down and the counter cannot be set.

4.3.4.5 Scanning the counter (BI and DE)

The counter value can be scanned as a binary (BI) or decimal (DE) value. So, you can use the current counter value in the following operations.

4.3.5 Compare operations

Compare operations serve for comparing two digital values stored in accumulators 1 and 2. You have to use load operations to store digital values in the accus.

The length of an operand (byte or word) is specified with the operand, e. g. IB (input byte), IW (input word), QB (output byte), FY (flag byte), FW (flag word), KH (hex constant) etc.

The result of a compare operation is a binary value. Output signal state "1" means the compare operation is fulfilled, "0" means not fulfilled. The binary result is available as the RLO and can be used in further operations. The contents of the accus are not modified by this operation.

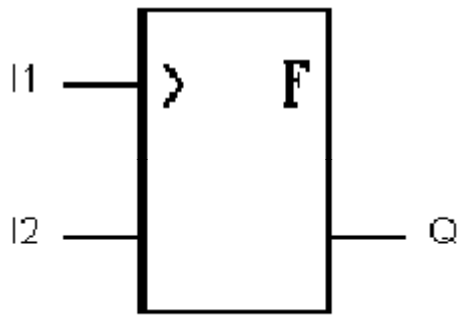

Fig. 4-12: Compare operation

These are the following types of compare operations:

- equal !=
- unequal ><
- greater or equal >=
- greater >
- less or equal <=
- less <

4.4 Accumulators

Accumulators have been mentioned previously. Every computer (or a PLC) has a central processing unit (CPU). In this CPU, there are a few memory units, the so-called registers. The CPU can do calculations only with the contents of these registers. If you want to do calculations with the contents of an arbitrary memory cell, you have to load these into an accu first. The value contained in the accu is overwritten with the result of the calculating operation. This result can either be used in the next operation of the CPU, or it can be stored in a memory cell.

The CPU of a Siemens PLC has up to 4 accus which can be used in operations, e. g. you can compare the contents of accu 1 to the contents of accu 2. A word can be loaded into the accu using a load command. This command copies a value only into the first accu. The value would be overwritten as soon as the next command was executed. Therefore, the operating system of the PLC moves the old value from accu 1 to accu 2. Now, the accus can be used in the next operation. The result of the logical operation (RLO) is always available in accu 1. A logical operation does not modify the contents of accu 2.

The commands described above are sufficient for writing complex control programs. The following tables show all commands you have learned so far. The STL, LAD and CSF representation of each command is given.

	Statement List	Ladder Diagram	Control System Flowchart
AND	:A I 1.2 :A I 1.3 := Q 2.2		
OR	:O I 1.2 :O I 1.3 := Q 2.2		
NOT	:AN I 1.2 := Q 2.2		

Fig. 4-13: Basic operations

	Statement List	Ladder Diagram	Control System Flowchart
Set/Reset Symbols			
Timers			
Counters			

Fig. 4-14: Complex operations

Beyond these operations, there are arithmetic operations (e.g. multiplication, rotation, shift etc.).

4.5 Program organization

Generally, PLC programmers do not need to be concerned about memory organization. However, to clarify the structure of large and complex control tasks, you should divide the program into separate smaller, relatively independent parts (i.e. blocks). The criteria for this division should be the function, structure and purpose of the program parts.

A block can be identified by its type and its number (between 0 and 255).

There are the following STEP 5 block types:

OB = Organization block

PB = Program block

SB = Sequence block

FB, FX = Function block

DB, DX = Data block

At program run-time, an organization block (OB) is called first. This block calls other program blocks (OB, PB, SB, FB, FX) containing program code. These blocks can also call other blocks etc. Within a program block, a data block (DB, DX) can be opened, i. e. all data access operations refer to that block from now on. An opened data block is valid until another data block is opened, or until control is returned to the caller block.

4.5.1 Organization blocks (OB)

The organization blocks make up the interface between the operating system of the PLC and the control program developed by the user. There are two types of organization blocks.

The blocks OB 1 ... OB 39 are used for controlling the program execution, the restart behaviour of the PLC and the behaviour of the PLC when errors occur. You can program these blocks so that they fit for your special purpose.

These OBs are called by the operating system. The OB 1 is especially important as it is called by the operating system cyclically. It is the starting point for the control program.

The blocks OB 40 ... 255 contain special service functions of the operating system. They are called by the control program if required.

4.5.2 Program blocks (PB)

The program blocks are relatively independent parts of the control program. They are the central part of the user program.

4.5.3 Sequence blocks (SB)

Sequence blocks are special program blocks used in sequence control systems which are usually programmed in GRAPH 5. SBs have lost their former meaning in STEP 5.

You can use the sequence blocks as additional program blocks.

4.5.4 Function blocks (FB, FX)

Function blocks contain (often complex) functions needed repeatedly, e. g. digital functions, open-loop or closed-loop control algorithms etc.). Their special features are:

- A function block has a name of up to 8 characters.
- Function blocks can have parameters. The actual parameters are transferred with the block call.
- An extended set of operations is available, compared to other block types.

A function block can be called many times by program blocks and is supplied with new operands ("parametrized") each time it is called. When using the FX blocks, you can use 512 function blocks instead of 256.

For the parameters, you have to define the following:

Names of the parameters (formal operands)

A formal operand has a name (»DECL«) of up to 4 characters. The first character has to be a letter. You can define up to 40 block parameters per function block.

Parameter type

This can be:

- I Input parameter
- Q Output parameter
- D Data
- B Block
- T Timer
- C Counter

Data type

With parameter types I and Q, you can specify one of the following data types:

- BI for bit operands
- BY for byte operands
- W for word operands
- D for double word operands

With parameter type D, you can specify one of the following data types:

- KM for binary patterns
- KH for 4-digit hexadecimal patterns
- KY for 2 bytes, separated by commas
- KS for up to 2 ASCII characters
- KF for fixed-point numbers
- KT for times
- KC for counts
- KG for floating-point numbers

With parameter types B, T and C there is no subdivision into data types.

A function block call consists of:

Call statement

- JU FBx unconditional call (jump) of FB x
- JC FBx conditional call (jump) of FB x (only if RLO=1)
- Parameter list (required only if block parameters have been defined in the FB)

After a call statement has been specified (e.g. JU FB 2), ACCON-PG displays the parameter list consisting of the parameter names separated by colons (":"). The parameters must be replaced by so-called actual parameters when the FB is called so that the FB uses the actual parameters.

Function blocks can be called only if they have already been programmed because ACCON-PG searches for the corresponding name and parameter list of the function block when a FB call is programmed.

Note: The numbers 240 to 255 are reserved for integrated FBs.

4.5.5 Data blocks (DB, DX)

These blocks serve for storing constant and variable data needed by the control program. A data block does not contain any STEP 5 commands. The number of available data blocks is usually 253; when using the DX blocks, this number is 506 (3 DB and 3 DX blocks are reserved). The data can be of one of the following types:

- KM for binary patterns
- KH for 4-digit hexadecimal patterns
- KY for 2 bytes, separated by commas
- KS for up to 2 ASCII characters
- KF for fixed-point numbers
- KT for times
- KC for counts
- KG for floating-point numbers
- C for up to 2 ASCII characters
- A for 2 bytes, separated by commas

The constants of type KS and C are displayed in lines of text (up to 24 characters per line). Thereby, readable text can be stored in data blocks. Subsequent lines in the same format are combined so that lines are created with the maximum length. To be able to display readable text of shorter length in data blocks, there are two identical formats (lines with different formats are not combined).

4.5.6 Comment blocks

These blocks serve for documentation reasons and exist only in files, but not on the PLC. They contain line comments. Comment blocks are designated by the mnemonics OC, PC, SC, FC, FCX, DC and DCX. OCs contain the comments for the OBs; the same relation is valid for PC - PB, SC - SB etc. The block numbers of such a pair of blocks must be the same. Comment blocks cannot be edited directly, but only during editing the corresponding STEP 5 blocks.

A further block type is the documentation block which exists only in files, too. A documentation block has a specific name of up to 8 characters. Documentation blocks are divided into two classes depending on the assignment of the block to STEP 5 blocks.

First, there are blocks containing segment comments of STEP 5 blocks. They have special names which are structured as follows:

XXDO.YYY

XX	the corresponding block type (e. g. PB)
YYY	the number of the corresponding block

Documentation blocks of this kind are created and modified during editing blocks using the STL, LAD or CSF editor.

Furthermore, you can create free documentation blocks without assigning them to STEP 5 blocks. They can contain project notes etc. This kind of block can be created and modified directly from the directory.

4.6 A sample program

The example program of this chapter demonstrates the way in which control programs are created using ACCON-PG. The program is created for the PLC 115U. However, the program should run on any Siemens PLC after renaming the inputs resp. outputs ("rewiring") if necessary.

4.6.1 Problem description

A PLC is to be used for traffic light control. The traffic light is red (i. e., stop!) per default. When a signal is received designating that a car has arrived, the traffic lights should first show both red and yellow (i. e., ready!), and then show green (i. e., go!). Finally, the traffic light should show yellow and then again red (i. e., stop!).

Note: This example refers to German traffic lights. I am sorry for all the foreign users.

The red, yellow and green traffic lights are represented by three outputs of the PLC; the signal for »a car wants to pass through« is mapped onto an input of the PLC. For simplicity, we can imagine this signal to be caused by somebody pressing a button. The duration of each period of the traffic lights is controlled by a timer.

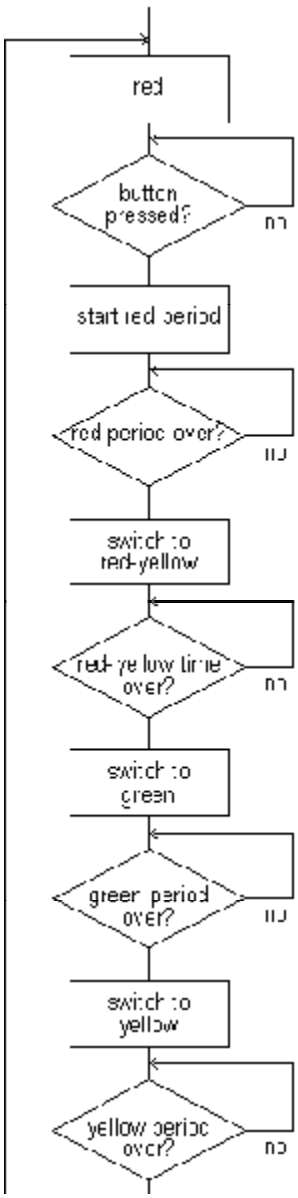

Fig. 4-15: Program flowchart

We select the operands for the input resp. the outputs (this depends on the connected PLC):

Input (button)	:	I 14.0
Red light	:	Q 18.0
Yellow light	:	Q 18.1
Green light	:	Q 18.2

For the time-controlled processing, we use timers.

Timer for Red period	:	T 10
Timer for Red-Yellow period	:	T 11
Timer for Yellow period	:	T 12
Timer for Green period	:	T 13

These timers are started by a rising edge (change of signal state from ‘0’ to ‘1’ at their Start input) and end after the time specified with the TV input.

4.6.2 Outline of the solution

When the signal for "somebody wants to pass through" is detected, a timer is started. The parameter of the timer is the time during which the traffic lights will stay red. After this time has elapsed, the yellow light is switched on in addition to the red light. Again, a timer is started controlling the Red-Yellow period. After this second timer has terminated (i. e. the specified time has expired), the green light is turned on and the other lights are turned off. Similarly, the traffic lights switch over to the Yellow period and back to the Red period.

The crucial point is to recognize when to start the various timers. It seems to be obvious to start the timer for the first Red period when the input signal is detected. However, you should consider the possibility that this signal is not a single rising edge; you could compare this to a button that is pressed

and held down for quite a long time. The result of doing so is not a rising edge at the timer input; the timer is not started again before the button is released again.

We must therefore combine the rising edge with the current state of the traffic lights: only when both the "Want green" signal is set and the red light is on, a flag is set. If the red light is off, the flag is reset. We use the flag F 10.0.

Further, we make use of Set/Reset symbols in the graphic programming modes CSF and LAD, resp. of the commands Set and Reset in STL.

4.6.3 Creating the first block

After starting ACCON-PG, select the desired programming mode (here: CSF) from the menu »Programming«. You will automatically come to the directory. If you had worked with a program file during your last ACCON-PG session, the directory of this file will be listed; otherwise, the directory is empty. Select »New« from the menu »File«. If a file has been in the editor, it will be closed now. The screen looks now as follows:

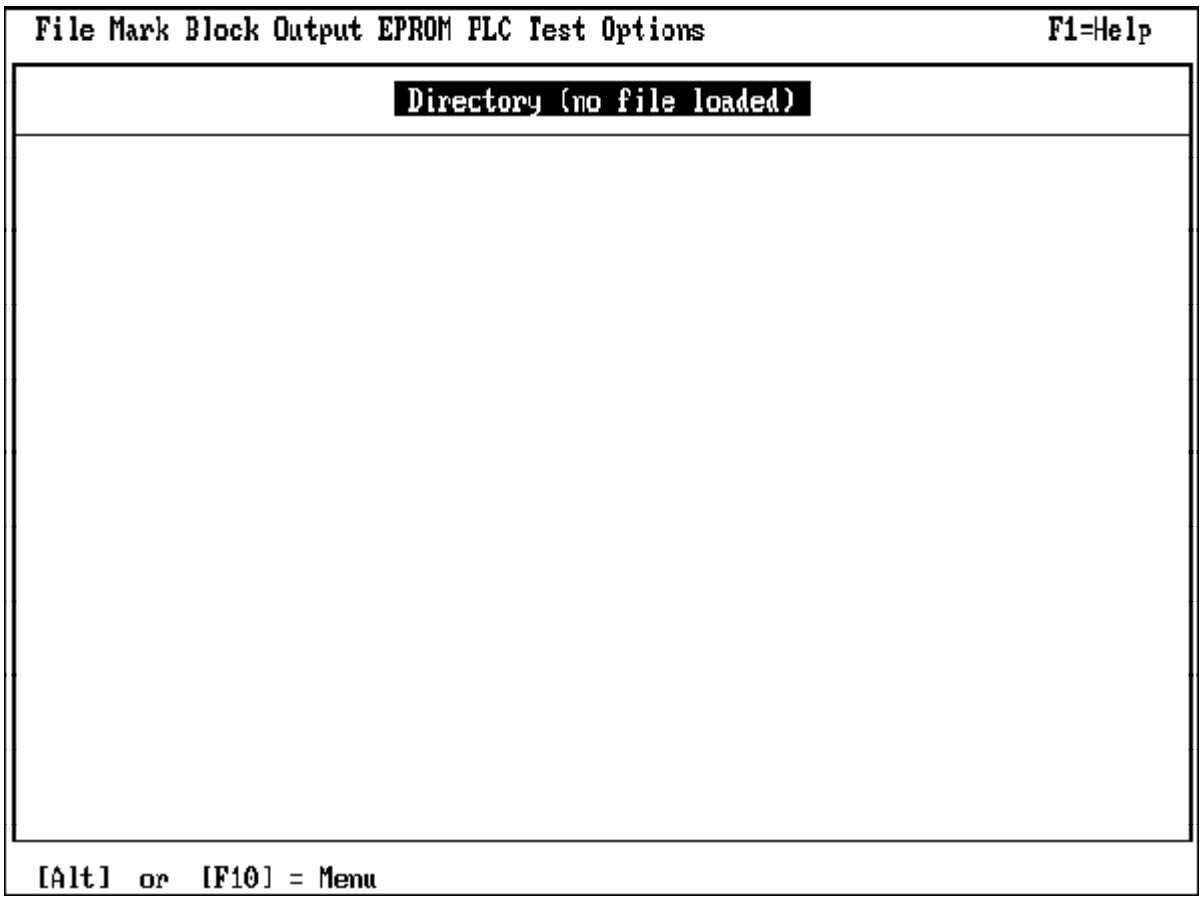

Fig. 4-16: The empty directory

The directory lists all STEP 5 blocks contained in the current program file. The name of the current file is displayed in the title of the directory. In our example, no file is in the editor. The directory allows you to work with blocks. You can transfer blocks (e.g. to the PLC), test blocks, load and edit them etc.

Select »Open« from the »File« menu. A file-selection dialog box appears where you can select resp. enter a filename. Choose the desired drive and directory from the corresponding list boxes. Enter the filename “DEMO.S5D” into the field “Name”. Confirm your selection with “OK”. If the selected file does not yet exist, a corresponding message box appears. Confirm the message with “OK”. The title of the directory is now changed. To create a new

block (the block PB 10), select »New« from the menu »Block«. A dialog box appears where you can enter the name of the block to be created. In our example, enter “PB 10”. After confirming the dialog box, the CSF editor is activated. The screen looks like this:

```
 Block Segment Edit Search Symbols Mode Options                    F1=Help
PB  10                                                  File: LIGHTSST.S5D
SEGMENT  1 of  1                                       LIB=

* [Alt]  or  [F10] = Menu   Over          CSF        1    1B741276  0002:02
```

Fig. 4-17: The CSF editor

In the second line, the name of the current block is displayed at the left, and the name of the current file is displayed at the right side. In the second line, you can see the number of the current segment and the total number of segments in the block. The star (‘¤’) at the left border of the last line appears if the segment has been changed but the changes have not yet been saved.

In the middle, the current representation mode is displayed. The number of lines of the current segment, the amount of available free memory and the current cursor position (line:column) follow.

To create a Set/Reset symbol, open the menu »Symbol« and select the command »Set/Reset«. A dialog box appears for selecting the type of the symbol. Select the symbol for “Reset priority”. After the selection has been made, the symbol is inserted into the segment which now appears on the screen as follows:

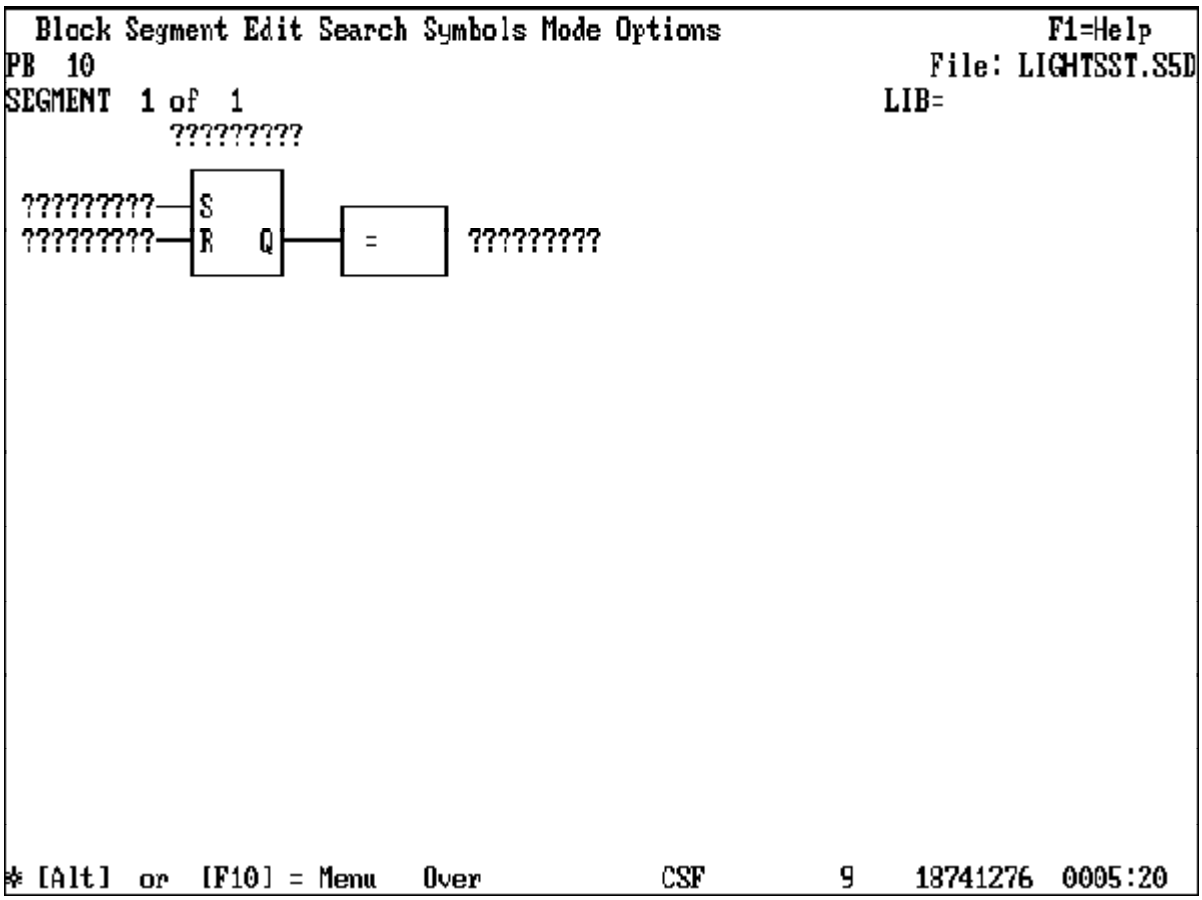

Fig. 4-18: A Set/Reset symbol in CSF

Note: Instead of selecting the symbol via the pull-down menu, you can also press the hot key for the symbol; the hot keys for the specific symbols are displayed directly after the corresponding menu command. In our example, the hot key would be [Ctrl] + [R]. If you are using a mouse, you have another possibility of selecting the symbol: select the menu command »Settings« from the menu »Options«. A dialog box appears for specifying various settings. You should here tick the check box »Show toolbar«. During editing, a double-line toolbar is now displayed. To insert a symbol using the mouse, proceed as follows: locate the cursor at the position within the segment where to insert the symbol, and click with the left mouse button on the desired symbol in the toolbar. The desired symbol will then be inserted. In this chapter, we usually refer to the method using the pull-down menu, however.

The question marks near the symbol stand for an operand that has to be specified. The operands have to be specified before the segment can be stored or left. For the output of the symbol, an assignment symbol is automatically created. As this assignment symbol is superfluous, you can delete it. Locate the cursor one position left to the assignment symbol and press [Del].

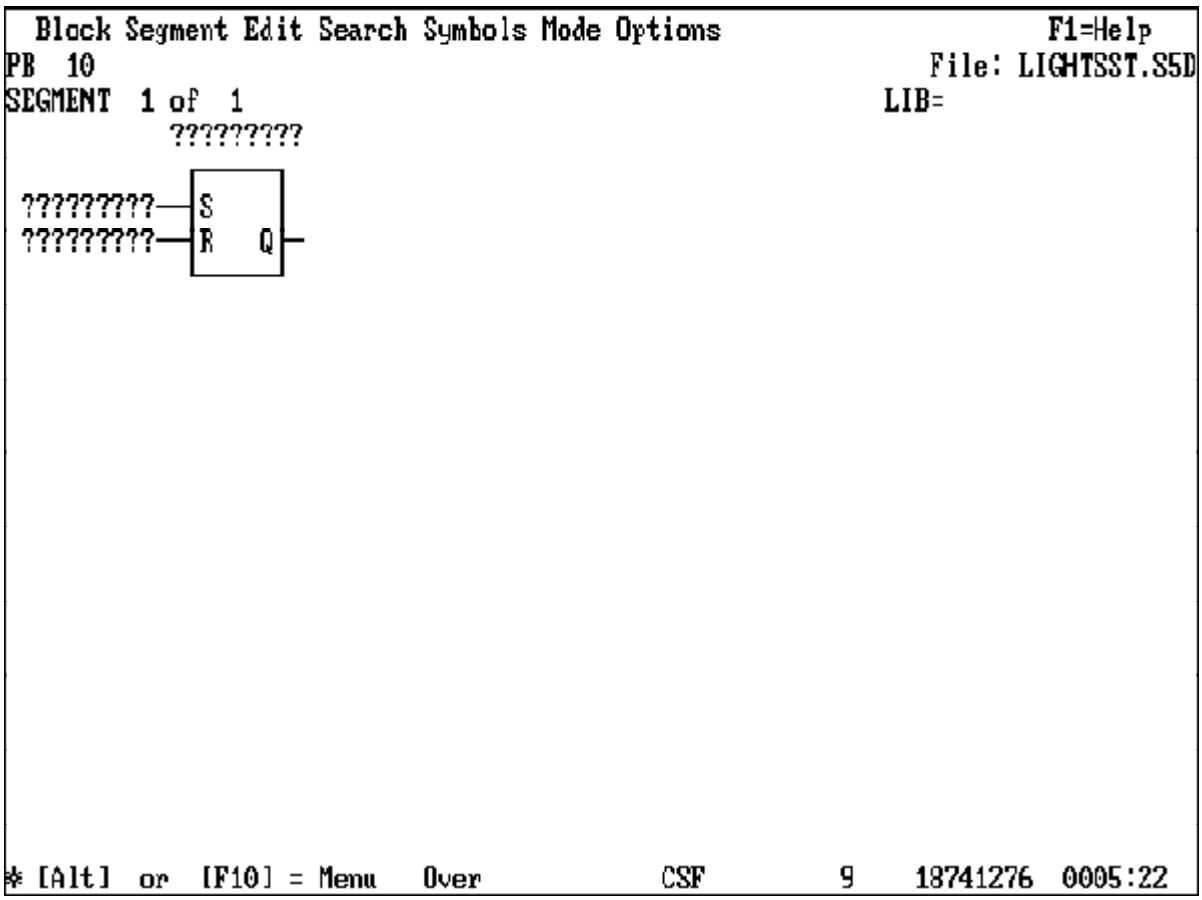

Fig. 4-19: A Set/Reset symbol without output symbol

Now, you should activate the inputs of the symbol. Press [Ctrl] + [Enter] to locate the cursor on the first operand at the left border of the screen. In our example, this is the S input of the S/R symbol. The flag F 10.0 is to be set when the button is pressed and the red traffic light is on. Therefore, we need an AND operation at the S input of the S/R symbol. Select »AND« from the menu »Symbol«. An AND symbol is inserted at the input of the S/R symbol.

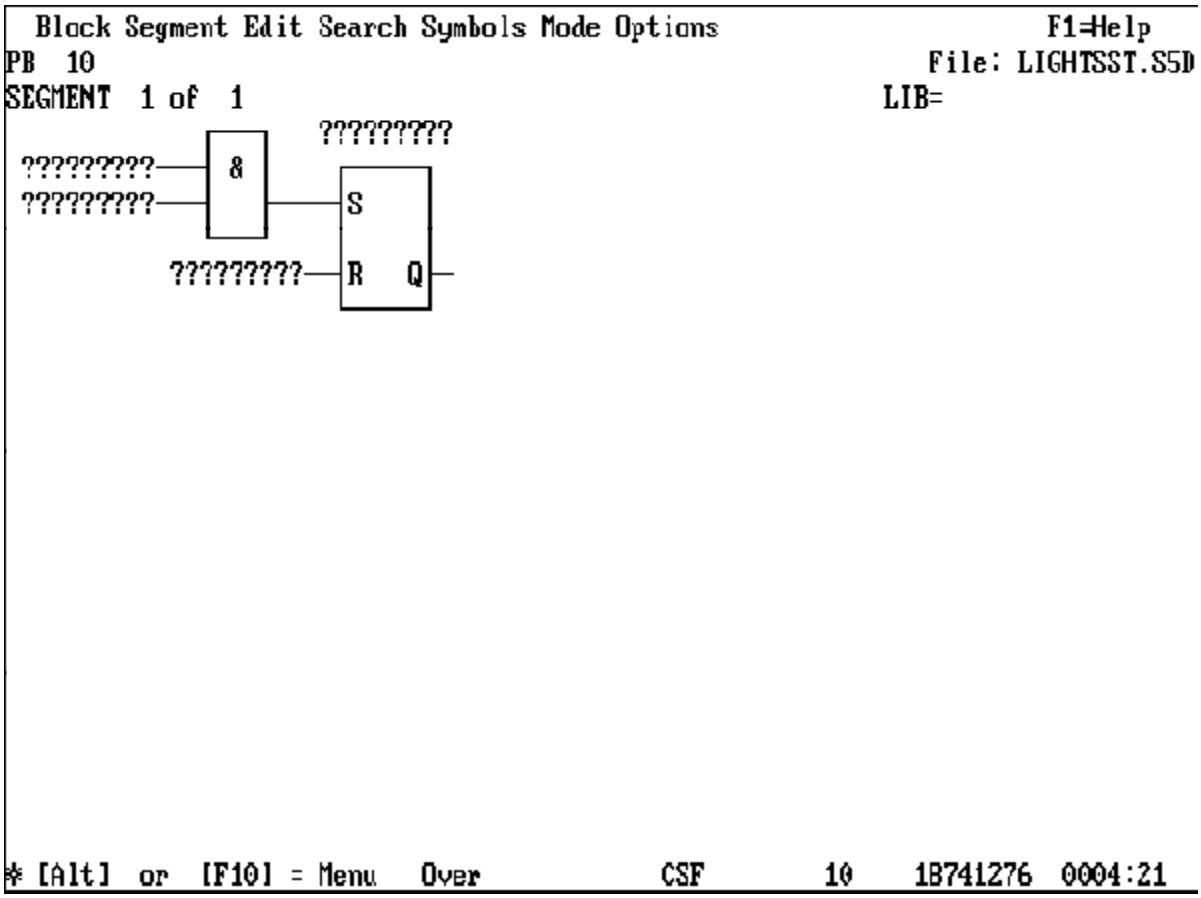

Fig. 4-20: An AND symbol has been inserted

You should now enter the operands of the segment. Press [Ctrl] + [Enter] once again to locate the cursor on the first operand (now this is the above input of the AND symbol). The operands to be ANDed are the input signal bit and the "Red" output bit. Locate the cursor on one of the question marks and enter the name of the operand (I 14.0). Complete your entry with [Enter]. The operand is checked for validity. If the operand has been specified correctly and it is valid, the cursor is located on the next operand to enter (the second input of the AND symbol). Enter the operand for the red traffic light, i. e. Q 18.0. After completing the entry, the cursor is located on the operand field

above the S/R symbol. Here, you enter the operand to be set, in our example the flag F 10.0. After completing the entry, the cursor is located on the operand field for the Reset input.

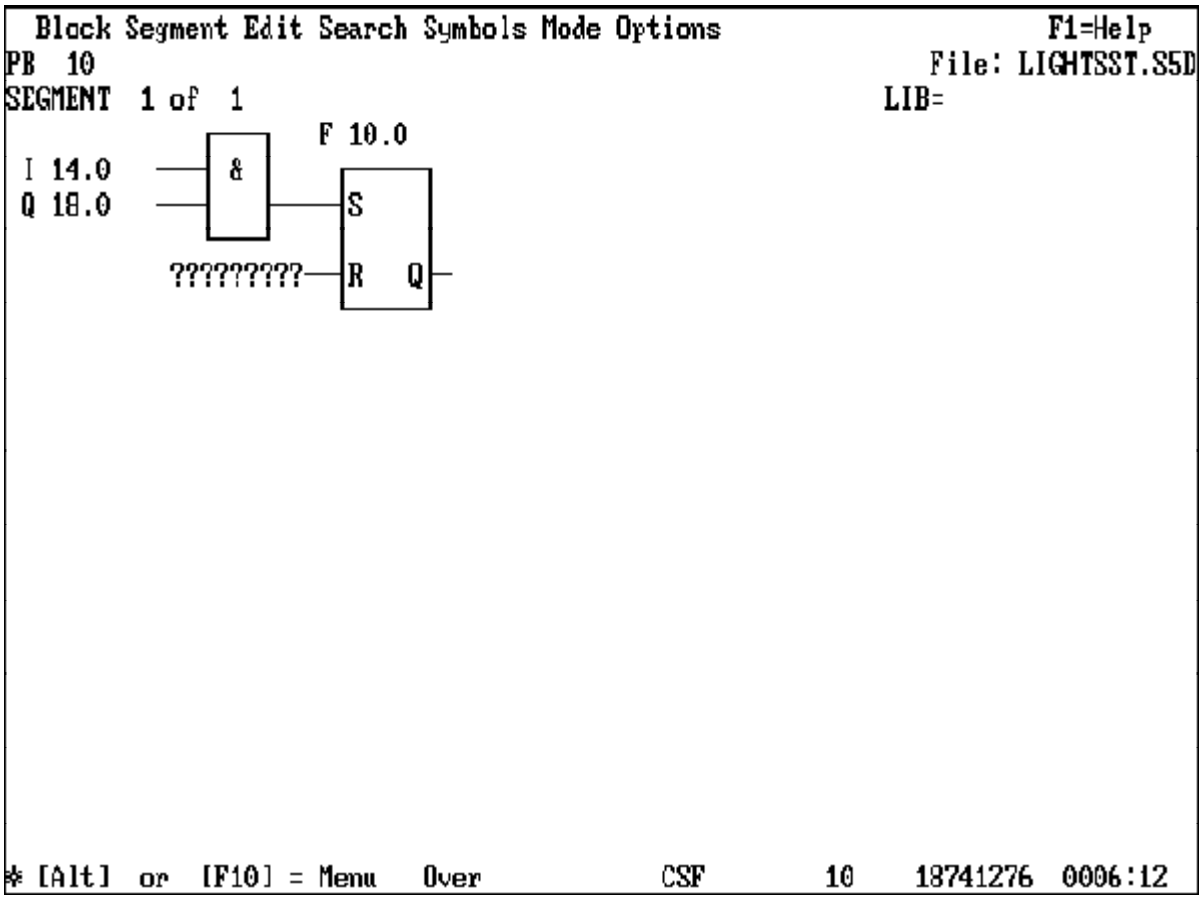

Fig. 4-21: Entering the operands

Remember the Reset condition for flag F 10.0: the red light has to be off. Therefore, we must not scan for signal state "1" but for "0". In CSF mode, you can achieve this by negating an input. Select »Negate input« from the menu »Edit«. An ‘o’, the symbol for a negating input, appears at the Reset input of the S/R symbol. Enter the operand (Q 18.0).

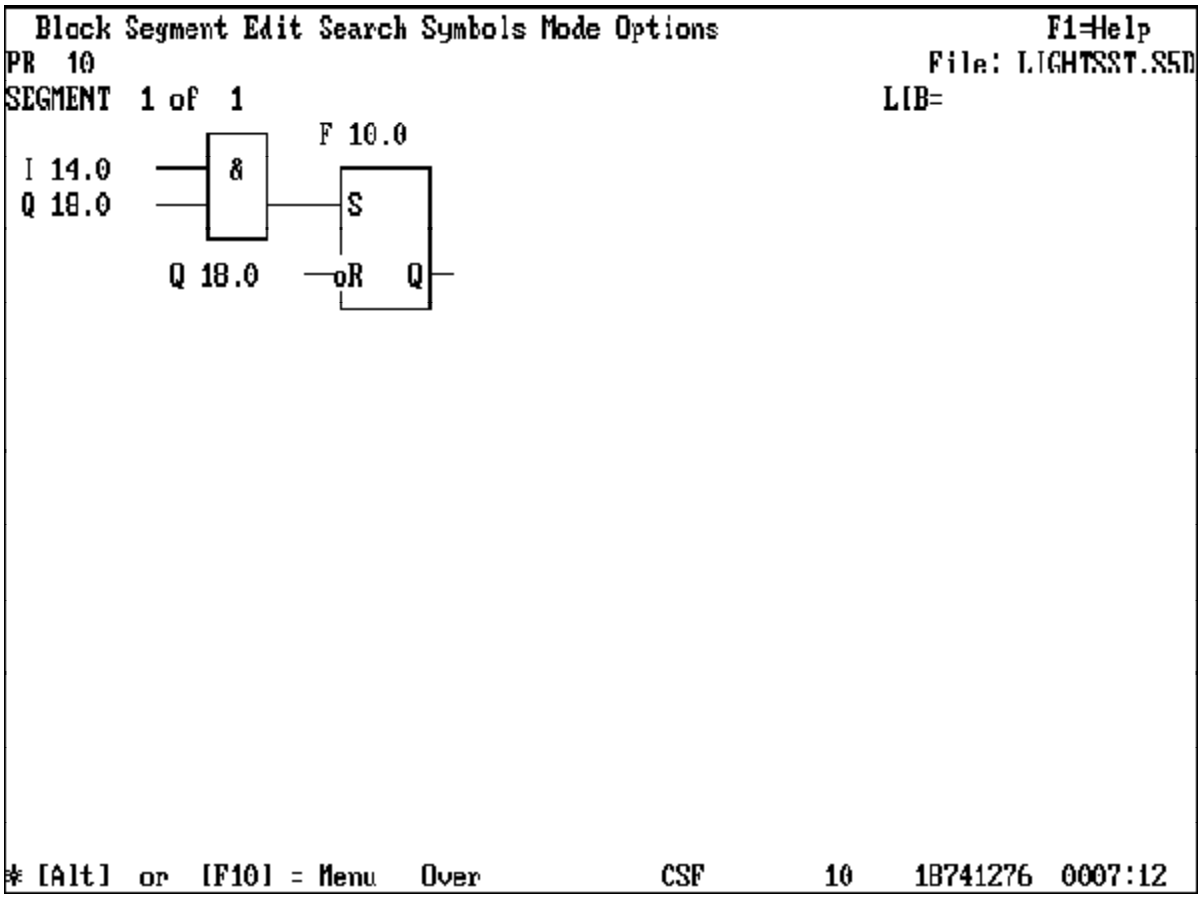

Fig. 4-22: A complete CSF segment

We have completed our first segment. Now we should store it. Select »Save« from the menu »File«. The star ('¤') in the last line disappears.

The segment is programmed but it will be quite difficult for somebody else to discover the meaning of the program. To make the program more readable, you can assign a symbolic name to each operand, e.g. the name "Red" to the output Q 18.0. ACCON-PGs symbolic editor is the solution to the problem of symbolic programming.

Select the menu command »Symbolic editor« from the menu »Programming«. If the current block has not yet been saved, you will now be asked whether to save it now. The following screen appears:

```
 File Edit TxtBlk Search Options                                    F1=Help
                                                          File: LIGHTSST.DT
  Operand  Symbol                    Comment

  [Alt]  or  [F10] = Menu   Over            SYM        1    18741276  0001:04
```

Fig. 4-23: The symbolic editor

The name of the symbols file will be the same as the name of the program file, except for the extension ‘DT’. A further file with extension ‘NX’ is created for internal reasons. You will now be in the symbolic editor where you can assign a symbolic name and a comment (up to 40 characters long) to each operand. The length of the symbolic name depends on the specified symbol length (see menu »Options«, menu command »Symbol length <= 8«. If this option is selected (ticked), the maximum length of a symbolic name is 8

characters, otherwise it is 24 characters. Symbolic names longer than 8 characters cannot be displayed completely in an operand field of the CSF resp. LAD editor; the check box »Always show symbolic operands« has to be ticked in the dialog box »Symbolic options« to enable this option.

We are now going to assign symbolic names to the operands used in our program: the input I 14.0 gets the name »WantGrn «, the output Q 18.0 is called »Red« and flag F 10.0 is called »OurFlag«. The names for the outputs corresponding to the yellow and the green light are »Yellow« resp. »Green«, of course.

Enter the name of the operand into the field at the left, the symbolic name of the operand into the next field and a symbolic comment into the field »Comment«. Use the keys [Tab] resp. [Shift] + [Tab] to go to the next resp. previous field. Use the [Enter] key to append a new line and locate the cursor on that line.

Now, the screen should appear like this:

```
 File Edit TxtBlk Search Options                                    F1=Help
                                                            File: LIGHTSST.DT
  Operand  Symbol                  Comment
  I14.0    press                   Button pressed: want green to walk
  Q18.0    red                     Output: red lights
  Q18.1    yellow                  Output: yellow lights
  Q18.2    green                   Output: green lights
  F10.0    PrFlag                  Flag: button has been pressed

* [Alt]  or  [F10] = Menu   Over          SYM        5    18741276  0001:04
```

Fig. 4-24: Symbolic assignments

Store the created assignment list using the menu command »Save as« of the menu »File«. A file-selection dialog box appears in which you should specify »DEMO@@Z0.DT« as the name for the symbols file (this name is compliant with the Siemens filenames conventions; you can specify any other name if compatibility is irrelevant). During saving, a message box appears informing you about the current state of the saving process (the number of saved lines and found errors is displayed). After the file has been saved completely, leave the symbolic editor using the menu command »File«/»End«. You will be asked whether to take the created file as the current

symbols file. Confirm this message box with “OK”. The block resp. the segment that has been edited before activating the symbolic editor appears again now showing the symbolic operands instead of the absolute operands. The hyphen before the name designates a symbolic name. When the cursor is located on an operand field, the operand plus the symbolic operand plus the symbolic comment are displayed in the fourth line of the screen.

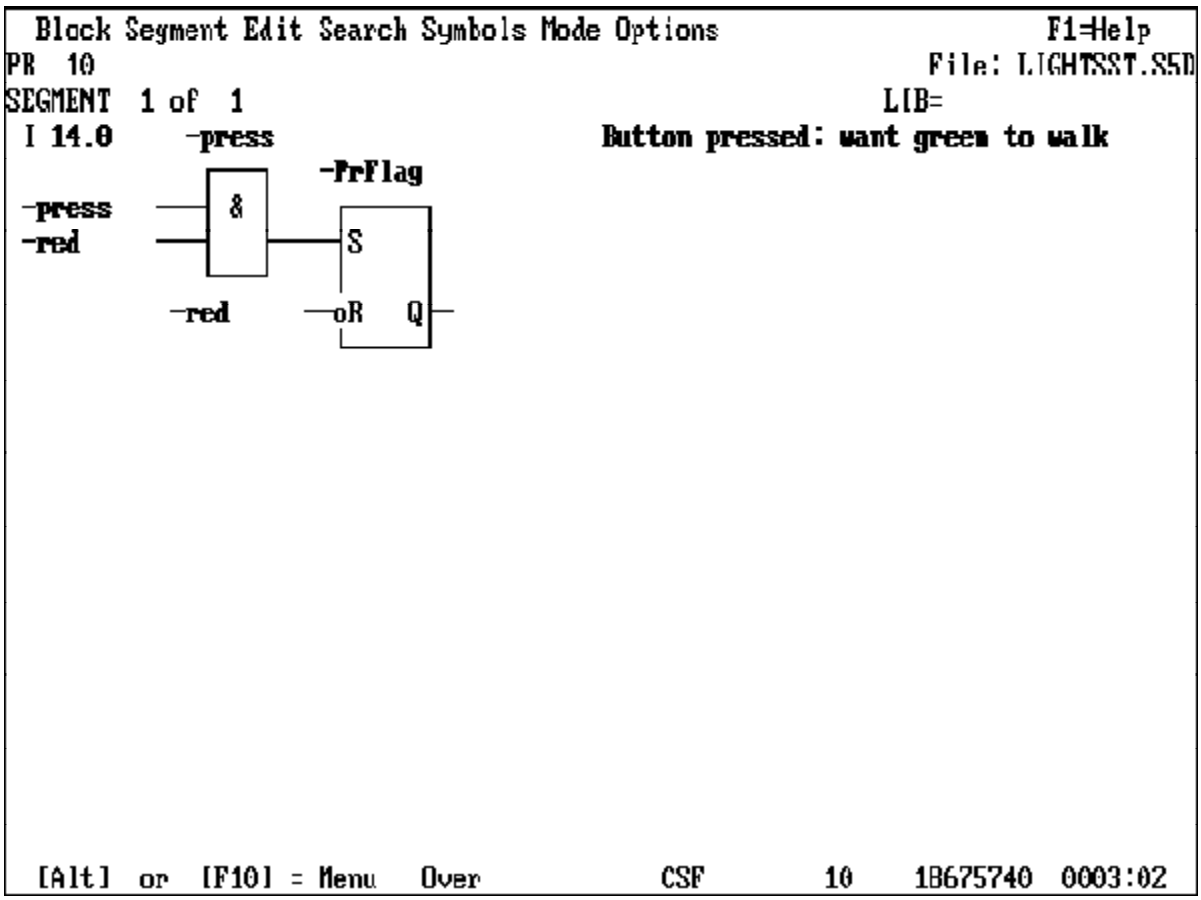

Fig. 4-25: Symbolic operands in a CSF segment

If you want to switch the symbolic representation off, you can select the menu command »Symbolic support off« in the menu »Options«. If the symbolic support is turned off, the menu command »Symbolic support on« is available

instead. Further options regarding the display of symbolic operands can be found in the menu »Options«, menu command »Symbolic options«. This menu command can be used only if the symbolic support is turned on.

To enhance the readability of the program, we can assign a title to our segment. Select »Segment title« from the menu »Edit«. The cursor is located on the third line of the screen where you can now enter a text of up to 32 characters. Enter e.g. "Detect signal for starting the first timer". You can leave the segment title field with the [Enter] key or the [↓] key.

Now, we are going to create the next segment. The task of this part of the program is to react on the detection of the start signal and to start a timer which turns on the yellow light in addition to the red light after a specified time.

First of all, we create a second segment. Select »Append segment« from the menu »Segment«. The screen is cleared, and a new empty segment appears. In the third line of the screen, you can read “Segment 2 of 2”. To insert a timer symbol, select »Timer« from the menu »Symbol«. A dialog box appears for selecting the exact type of the timer:

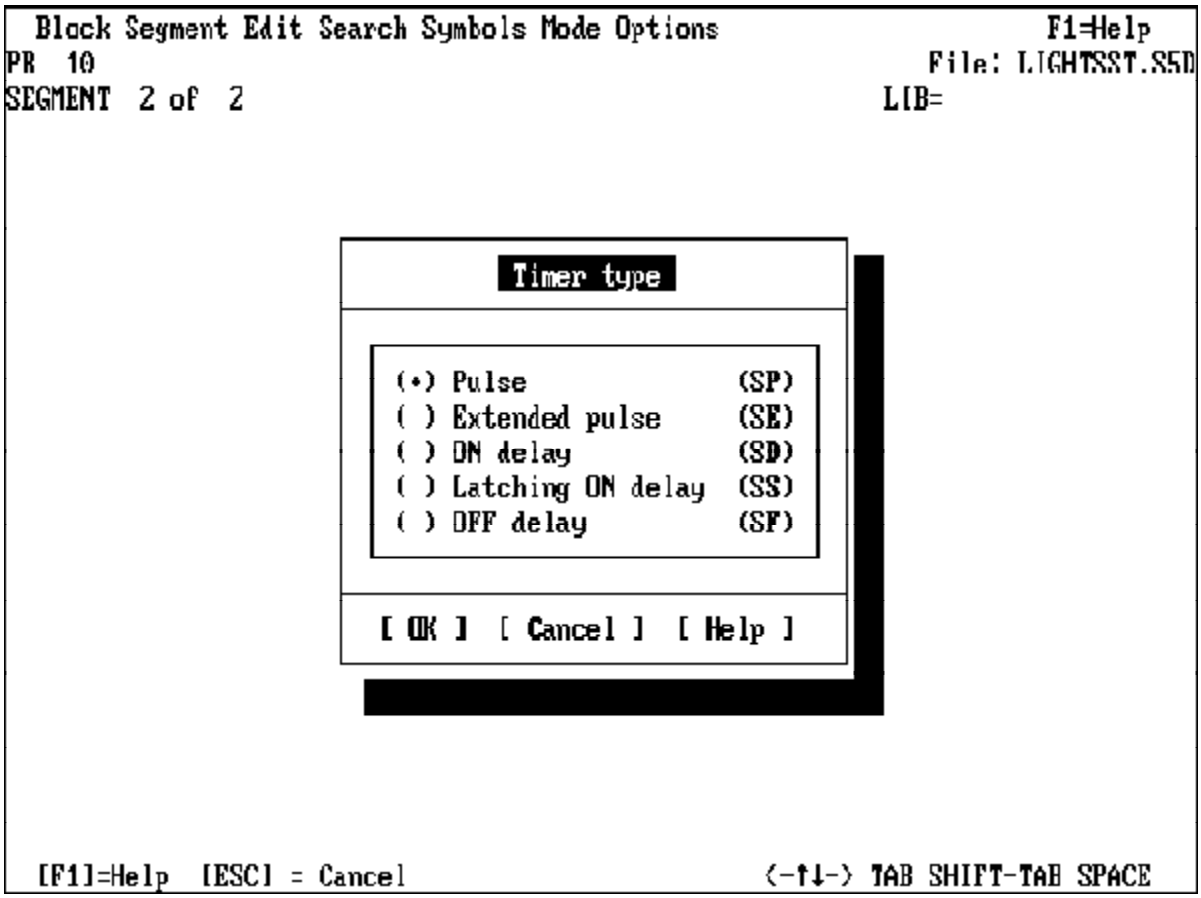

Fig. 4-26: The dialog box »Timer type«

To find out which type of timer we need, we are going to read the contextual help text supplied with the dialog box. Click on the "[Help]" push button. A window appears explaining the different types of timers using diagrams. We need a timer which is set to "1" after a specific time has elapsed. The appropriate timer type is "SD" (starting a timer as ON delay):

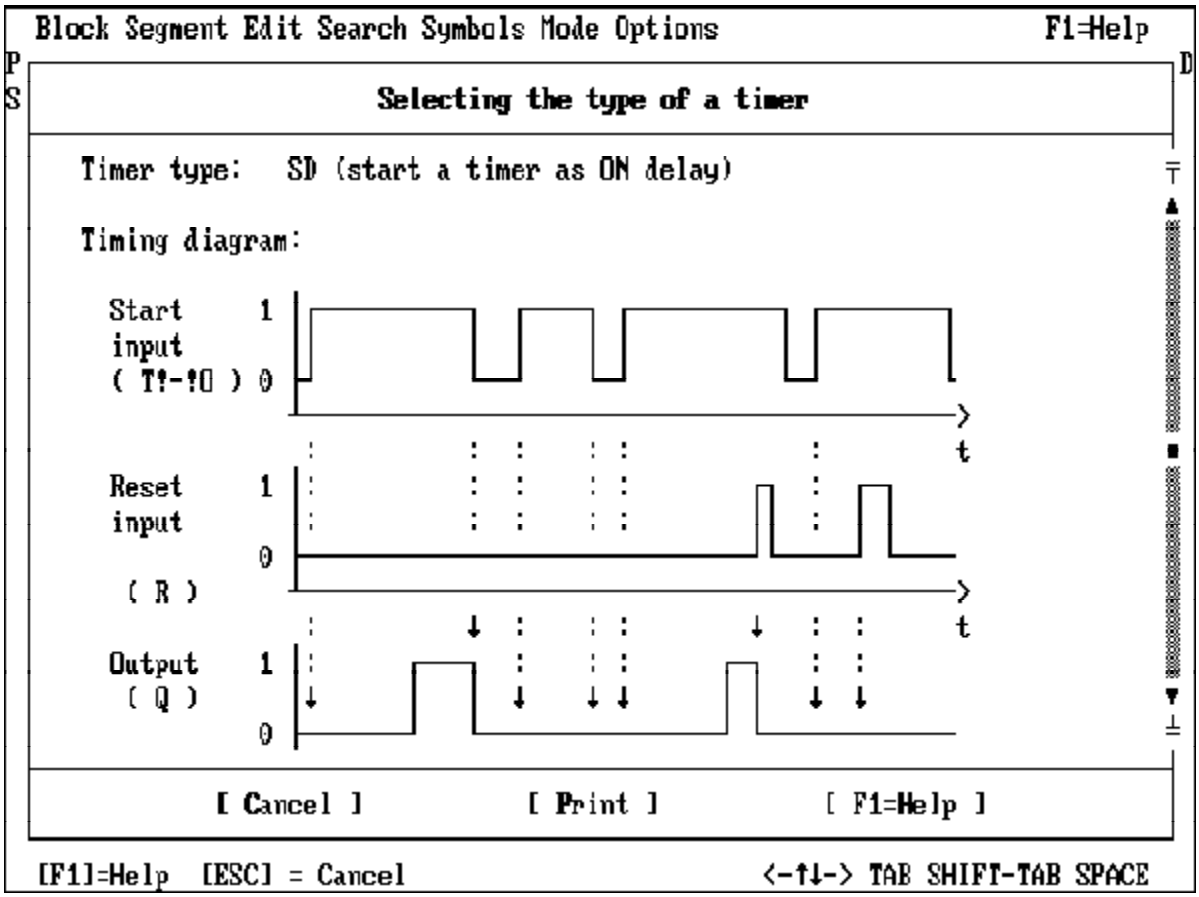

Fig. 4-27: The »Timer type« help window

Close the help window and select the type "SD" from the dialog box.

The screen shows a new timer symbol and an assignment symbol.

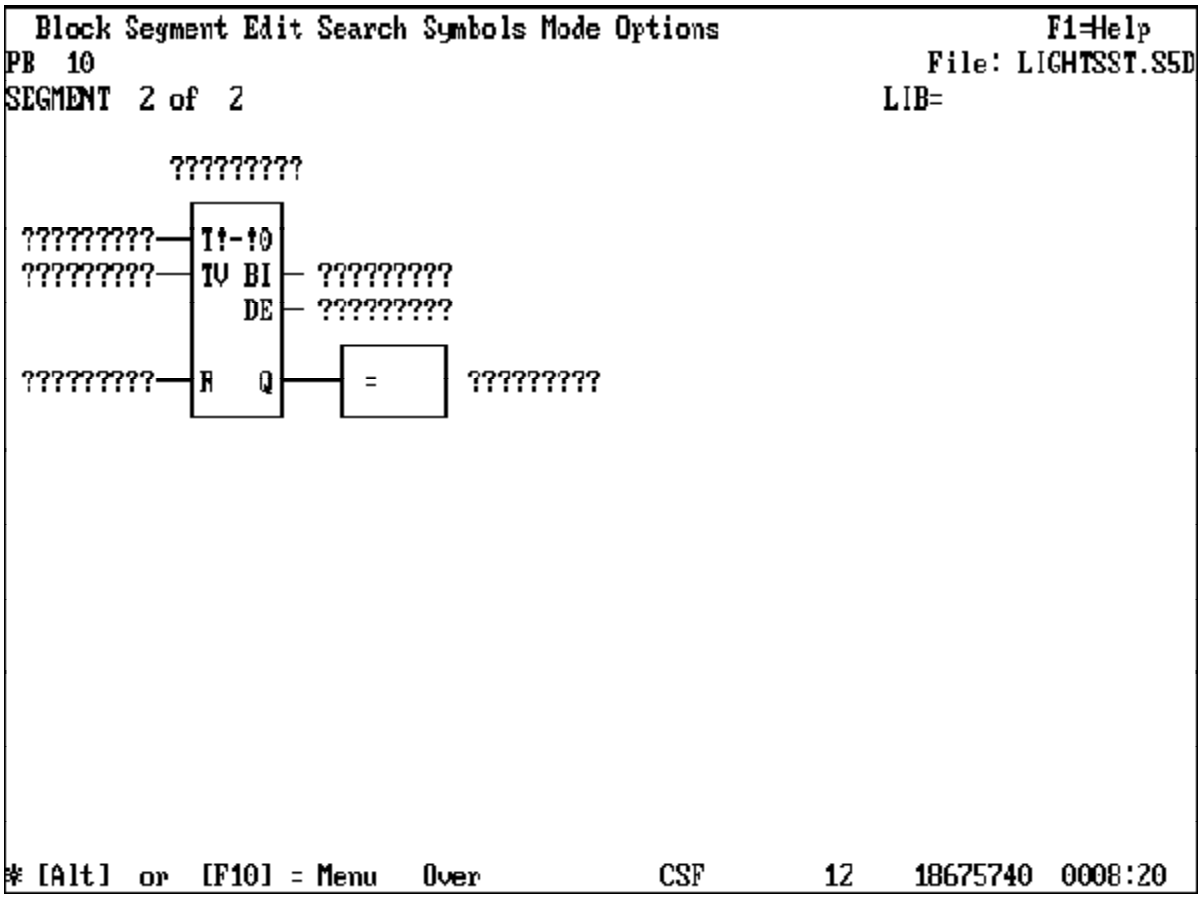

Fig. 4-28: The Timer symbol

The above input of the timer is the Start input; at the second input (TV), you can specify a time value. During that time interval, the timer is "running". The Reset input (R) serves for resetting the timer to "0". The two digitals inputs (BI and DE) serve for scanning the current timer value. The binary output (Q) enables you to use the current logical state of the timer ("0"/"1") in other operations.

In our example, the timer is to be started when the button is pressed. Press [Ctrl] + [Enter] to locate the cursor on the first operand, here the Start input of the timer. You can enter either an absolute operand or a symbolic operand (beginning with a hyphen). If the symbolic mode is activated, absolute

operands will automatically be replaced by the corresponding symbolic names); if the symbolic mode is not activated, you cannot enter symbolic operands. Enter "-OurFlag" at the Start input of the timer. Attention: Symbolic operands are treated case sensitive! We take the timer T 10 as the operand of the timer symbol. The time between pressing the button and turning on the yellow light (in addition to the red light) is e. g. 5 seconds. Therefore, the time value to be entered is 5 seconds. A time in form of a constant has the following format:

KT nnn.m

KT	designates a time constant
nnn	a number from 0 to 999
m	the time base:
	0 1/100 seconds
	1 1/10 seconds
	2 seconds
	3 10 seconds

The time value is then: nnn times the time base.

Example:

KT 005.2	5 seconds
KT 003.1	0.3 seconds
KT 020.3	200 seconds

In our example, we enter the value "KT 005.2" as the time value.

The Reset input and the digital outputs BI/DE of the timer are not activated. You can delete the operands by pressing the [Enter] key when the cursor is located on one of the ‘?’s.

The segment should now look like this:

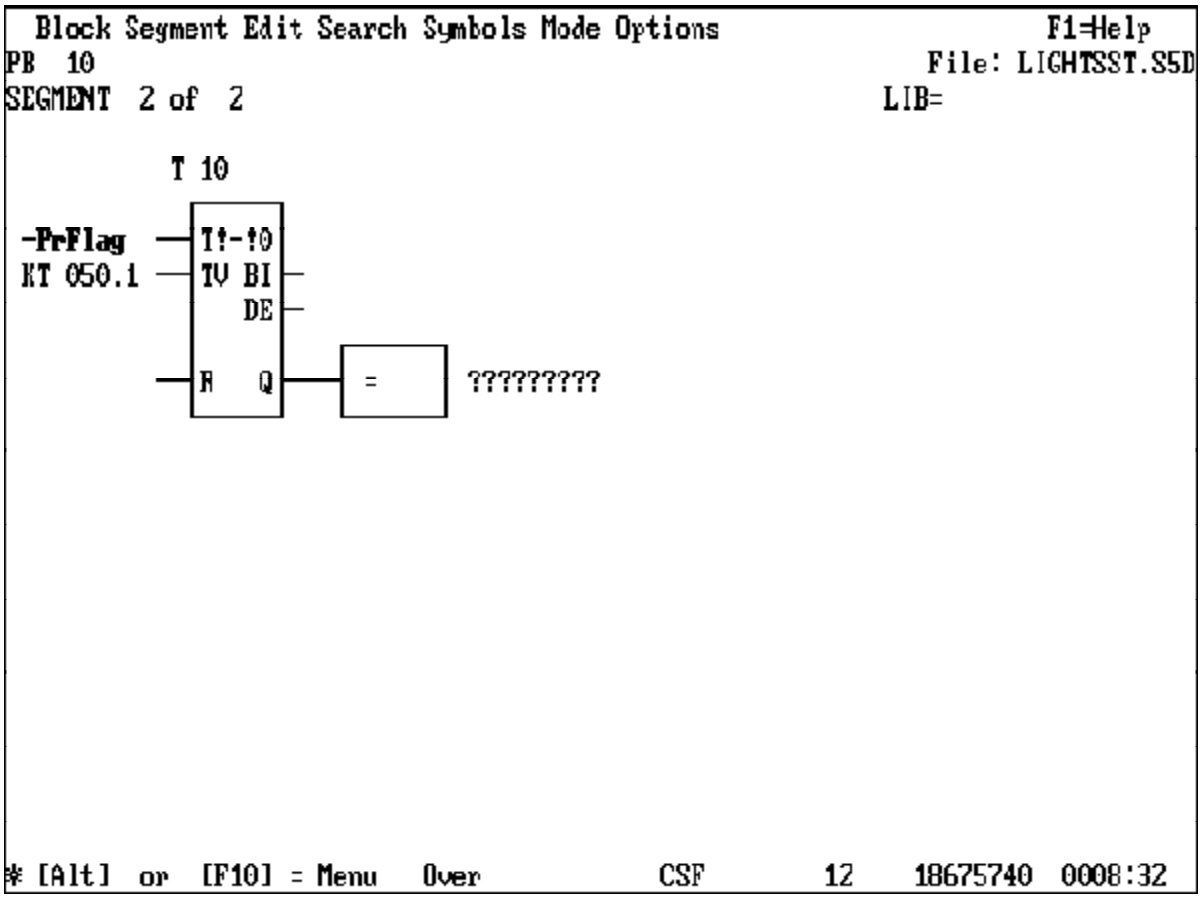

Fig. 4-29: Entering the operands

After the specified time has expired, the red and the yellow light must be turned on and stay on. If we used the assignment symbol (as it is displayed so far), the output operand would be equal to the current state of the timer. That means, the red light would be turned off before the time would have expired. To turn on the light and make it stay on, we have to change the assignment symbol into a Set assignment symbol. Using this symbol, we make sure that the operand to be activated will go into state "1" when its input changes from "0" to "1", and that it will stay in that state. Change the symbol by locating the cursor on the "=" within the assignment symbol and entering

"S" for the Set assignment symbol. When you have made your entries, the cursor is located on the operand field at the right side of the Set assignment symbol. Here, you have to enter the operand for the red light, i. e. "-Red".

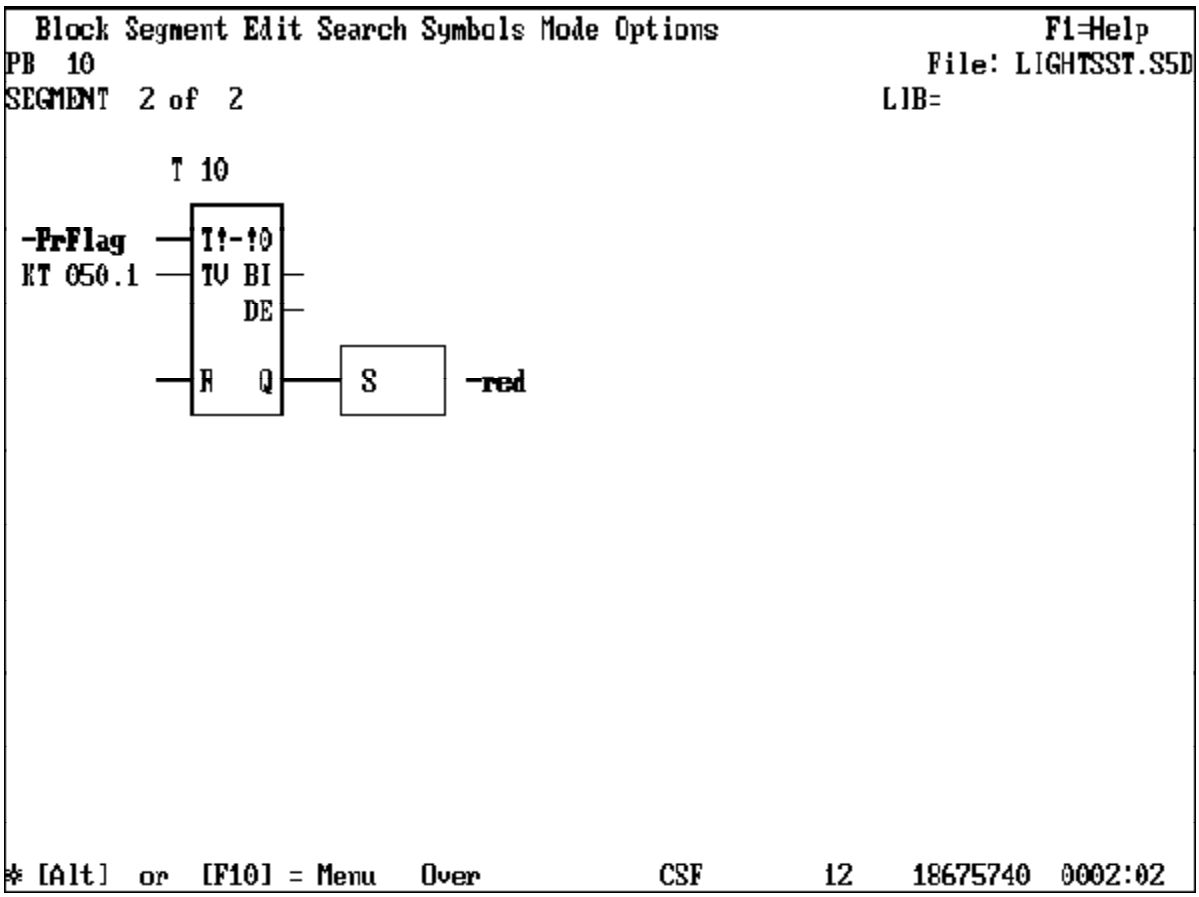

Fig. 4-30: A timer connected to a symbol

Now, we have to activate the output for the yellow light as well. To achieve this, we have to parallel a further Set assignment symbol. Locate the cursor one column before the assignment symbol and press [Ins]. A second output is paralleled:

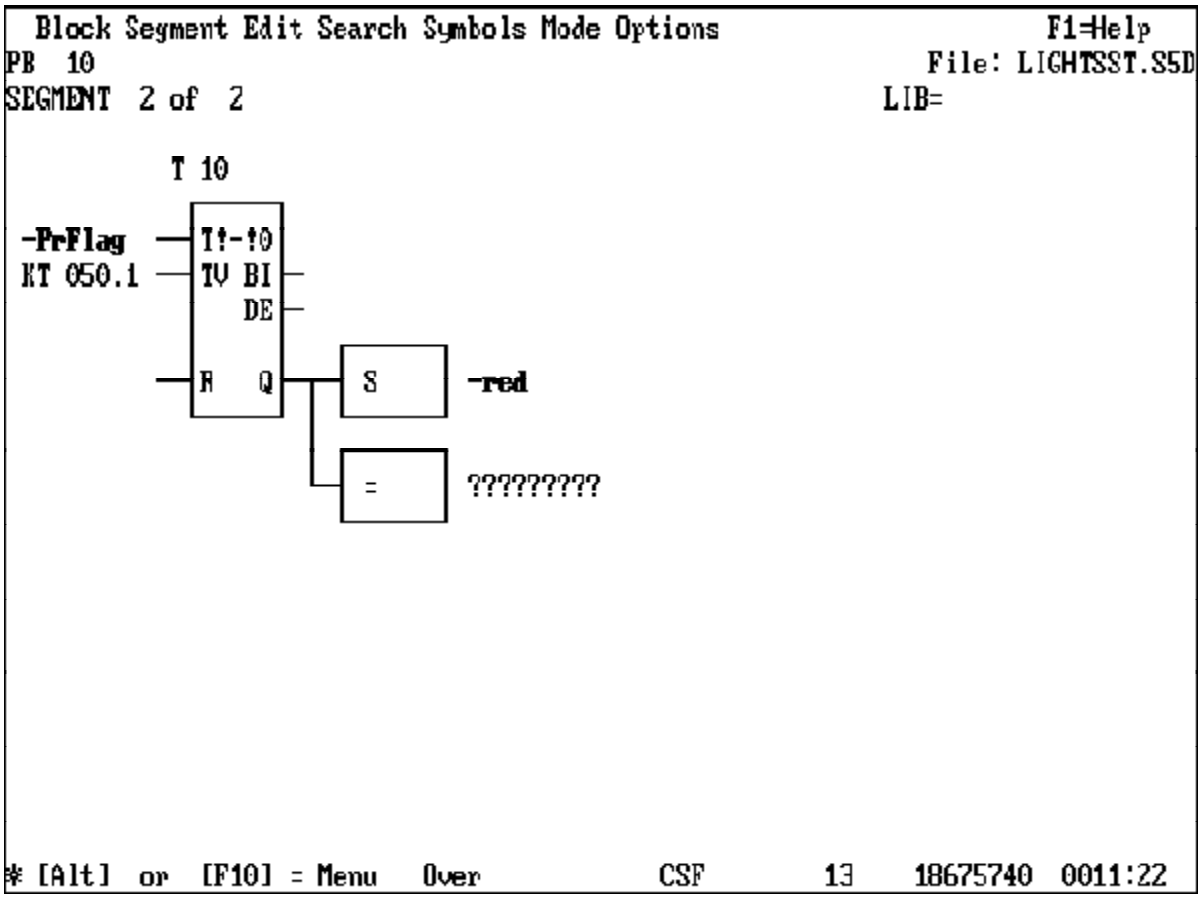

Fig. 4-31: Paralleling an output

Change the assignment symbol into a Set assignment symbol, and enter the operand for the yellow light.

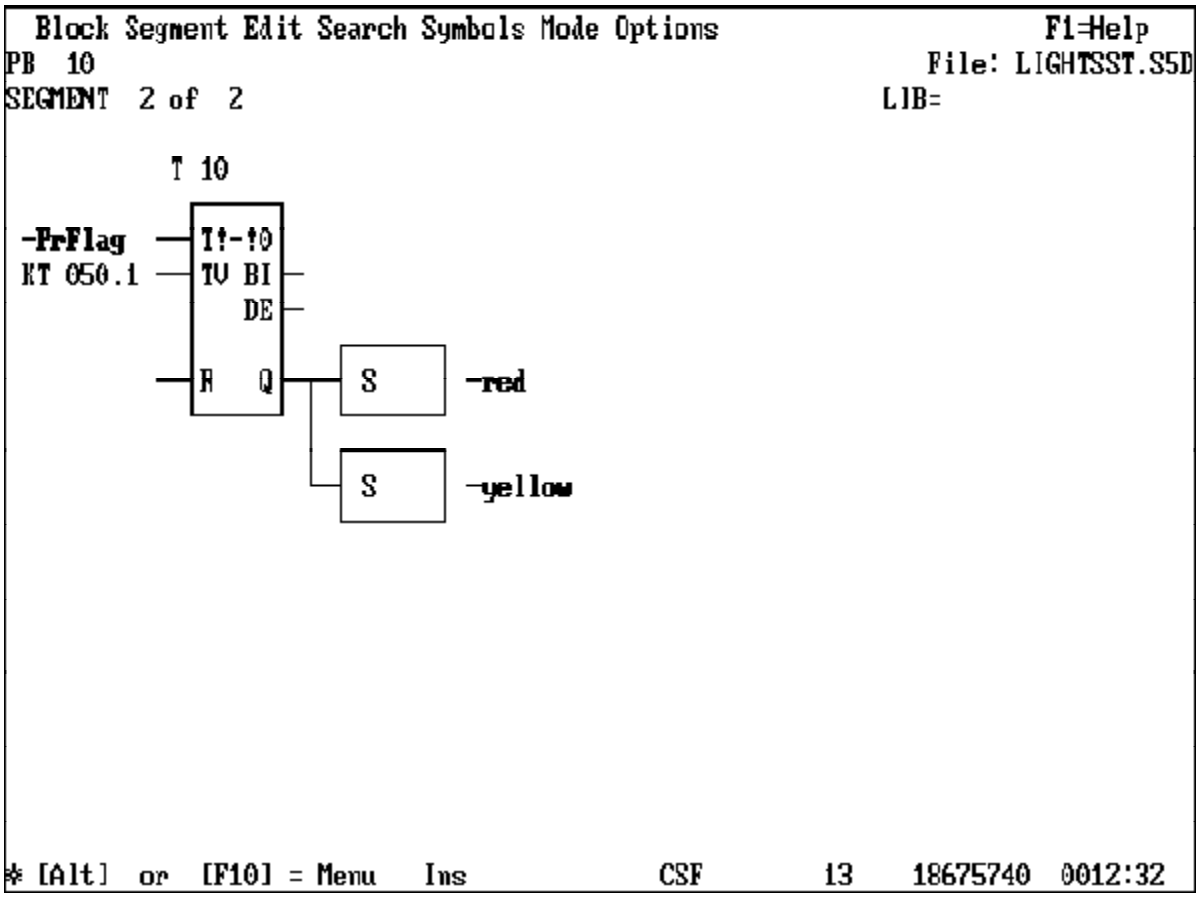

Fig. 4-32: A timer with two outputs in CSF

The timer T 10 does not yet have a symbolic name. We are now going to assign a symbolic name to it, using the menu command »Search/edit symbolic assignment« from the menu »Options«. A dialog box with the corresponding assignment (if existing) appears. Enter the following symbolic name resp. comment:

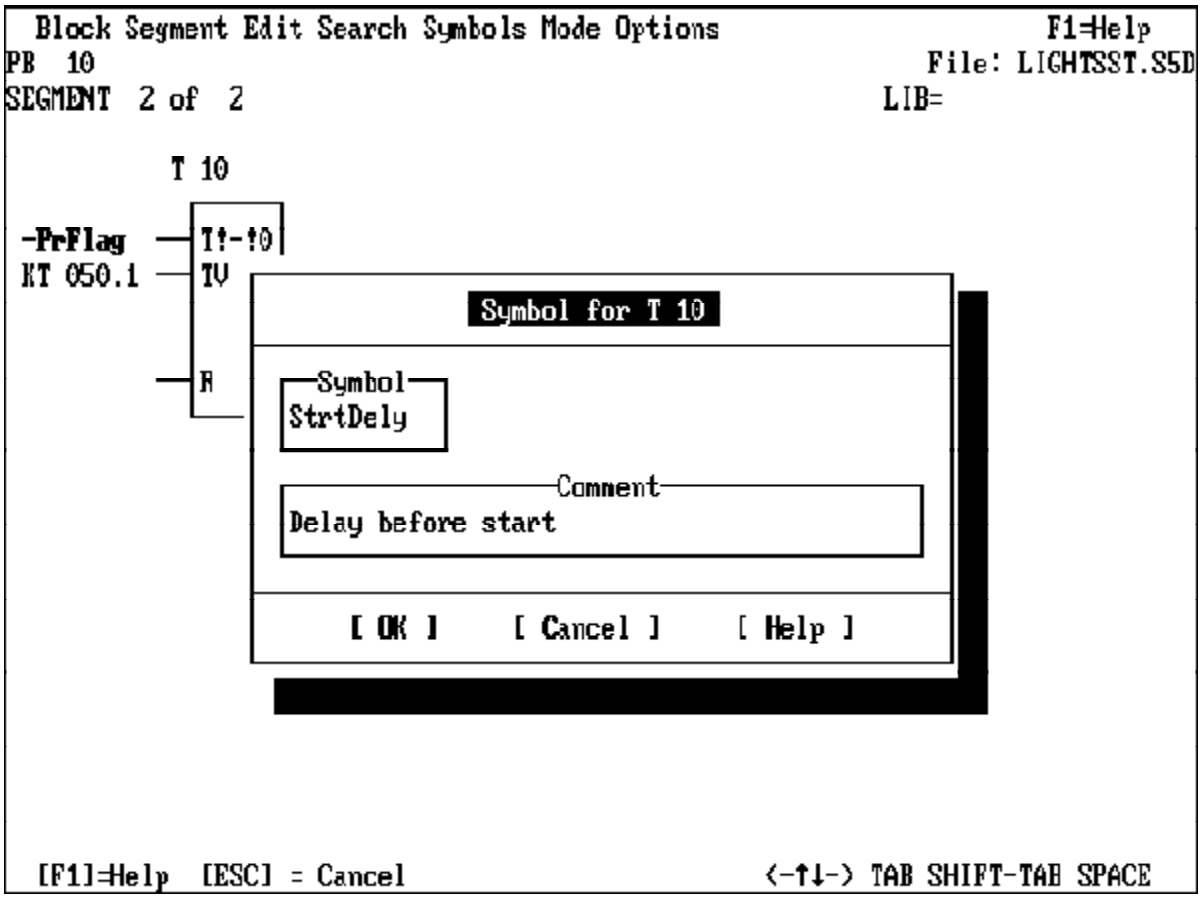

Fig. 4-33: Change the symbolic assignment

Note that this menu command lets you edit only a single symbolic assignment. If you want to edit more than one assignment, you should better use the quick edit mode of the symbolic editor.

For reasons of system design, we should program the next part in a new program block. After selecting »End« in the menu »File«, you will return to the directory. Confirm saving your changes with »Yes«. The directory contains the PB 10 and the corresponding comment block PC 10. In our case, the PC 10 contains only the segment comment. As for now, the PB 10 detects the signal for starting the cyclic traffic lights control program.

4.6.4 Extending the program

Now, we have to program the four periods occuring during a single cycle of this program. Create another new block and call it PB 11.

For the rest of this introductory example, we want to configure ACCON-PG to accept only symbolic operands for better readability. Tick the checkbox »Only operands from symbols file« in the dialog box appearing when selecting the menu command »Symbolic options« of the menu »Options«. If you enter a new absolut operand, you will automatically be asked for the corresponding symbolic assignment.

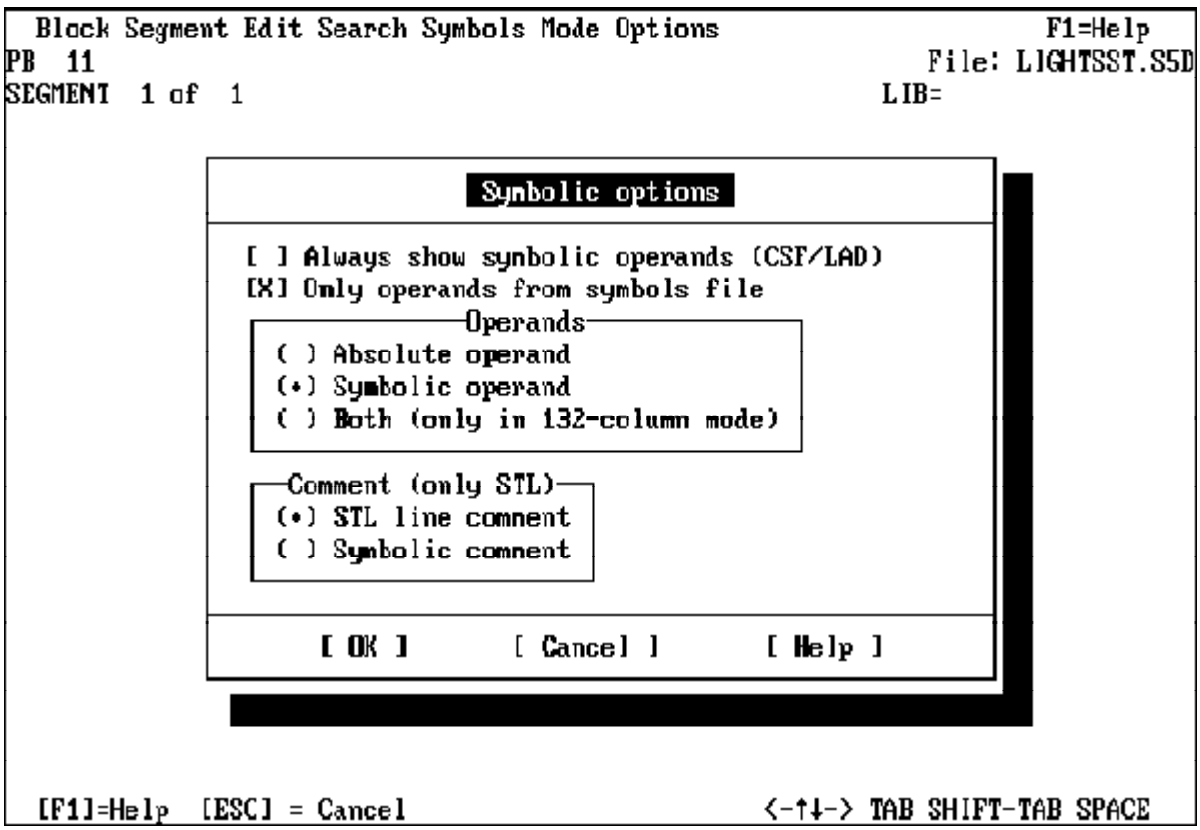

Fig. 4-34: The "Symbolic options" menu

The first segment of the new block controls the Red-Yellow period. A further timer (T 11 = -ReYeTime) is started, as soon as the red and the yellow lights are turned on. After the specified time (specified with the data word DW1 interpreted as a time constant) has expired, the green light is turned on and the red and the yellow lights are turned off.

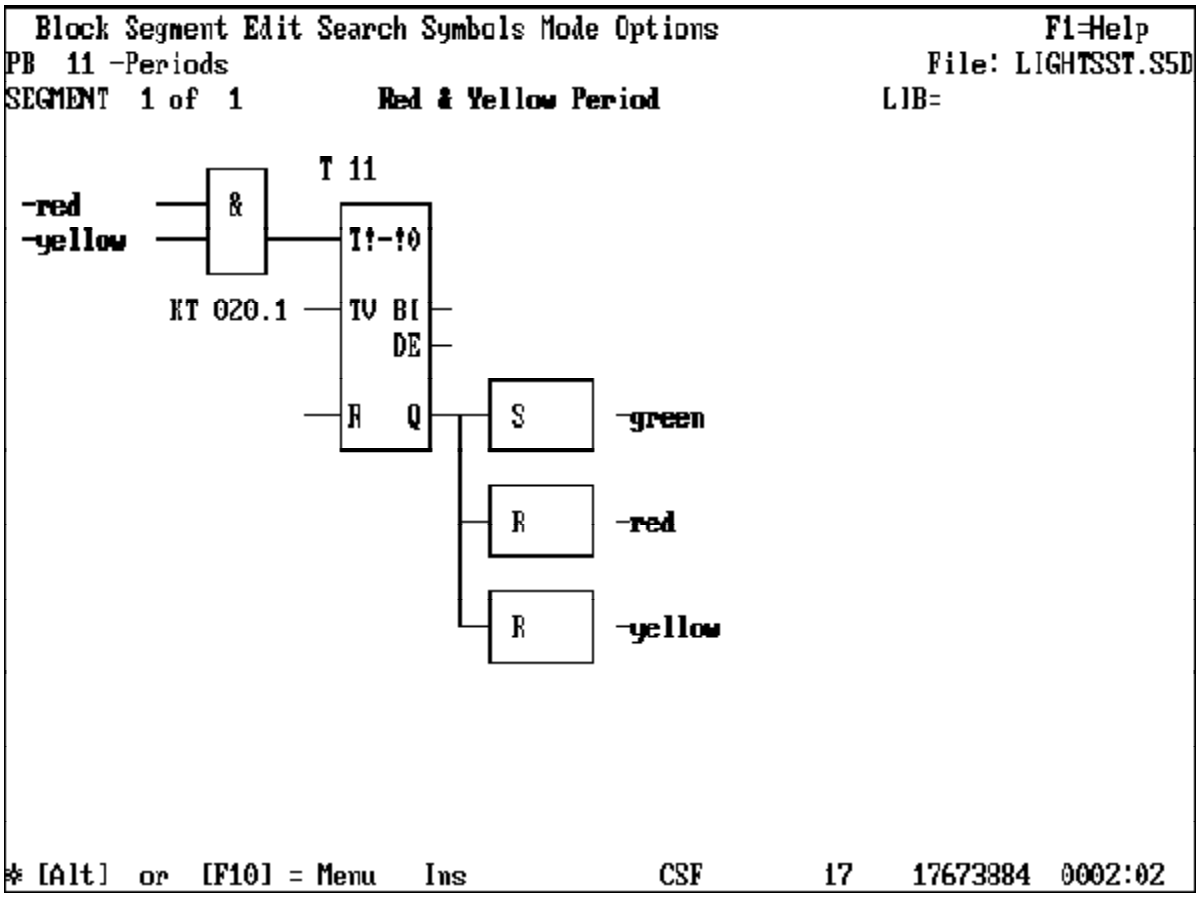

Fig. 4-35: Segment controlling the red-yellow period

When entering the timer T 11, a message box appears and informs you that this timer does not yet have a symbolic name. Select »Yes« to enter a symbolic name and make the following entries into the appearing dialog box:

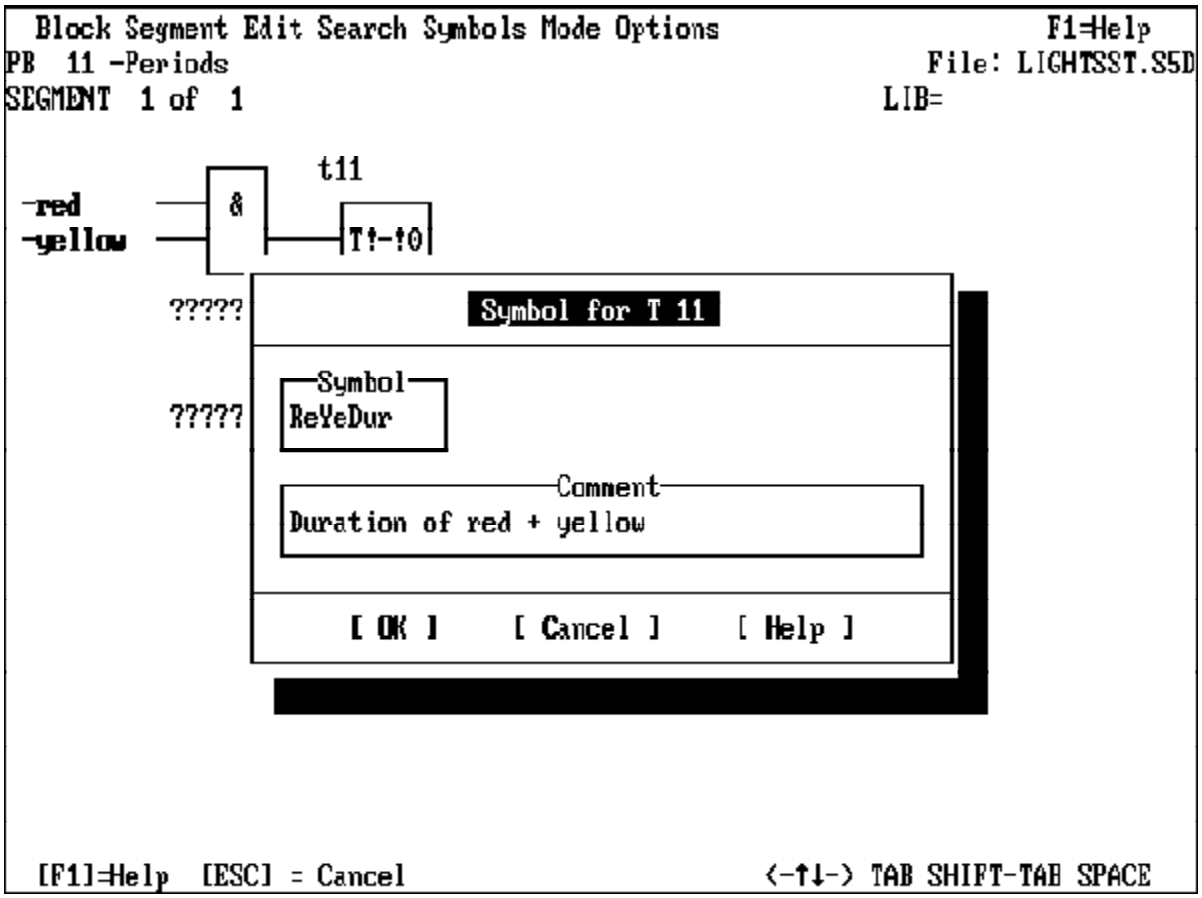

Fig. 4-36: Dialog box »Assignment for T 11«

When entering the DW 1, don't specify a symbolic assignment. It is not reasonable because during the execution of a STEP 5 program, different data blocks may be used, and the operand DW 1 will refer to quite different data items as time goes by.

Segment 2 controls the Green period. A further timer (T 12 = -GrTime) is started, as soon as the green light is turned on. After the specified time specified in the DW 2 has expired, the green light is turned off and the yellow light is turned on.

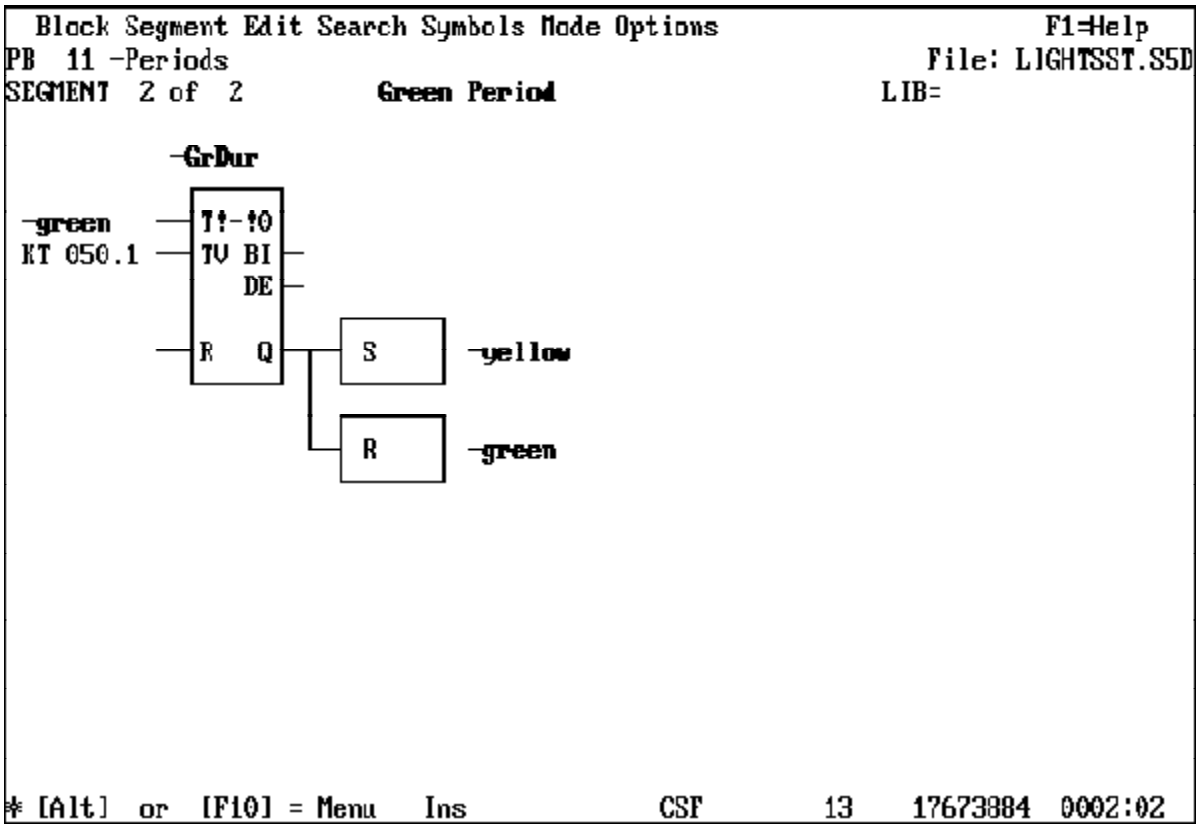

Fig. 4-37: Segment controlling the green period

Segment 3 controls the Yellow period. A further timer (T 13 = -YeTime) is started, as soon as the yellow light is turned on and the red light is off (!!). After the specified time (DW 3) has expired, the yellow light is turned on and the red light is turned on again.

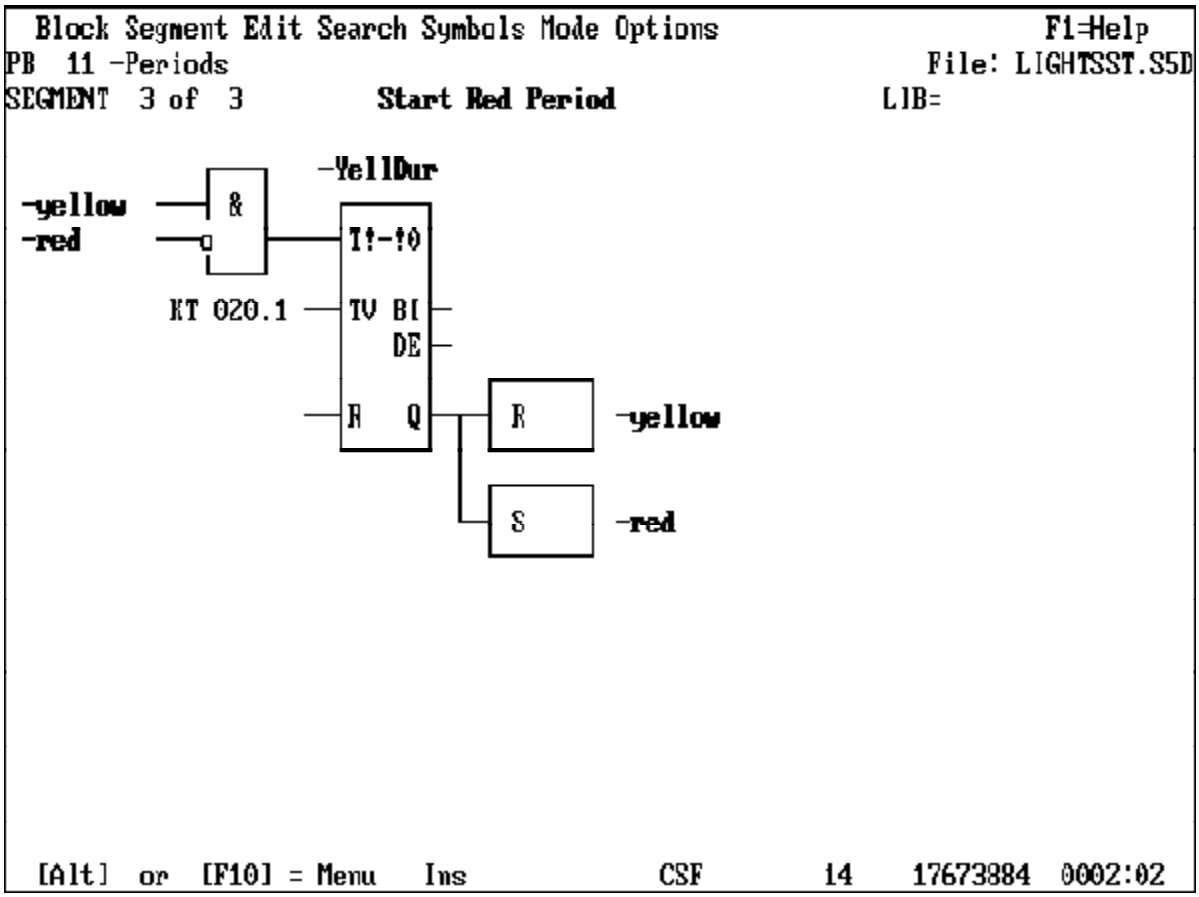

Fig. 4-38: Segment contolling the yellow period

After entering the segments, you should save the block and return to the directory.

To make our program executable for the PLC, we have to program the organization block OB 1. In any STEP 5 program, the OB 1 is automatically executed each time before a control program cycle is begun. To make the PLC execute the PB 10 and the PB 11, we have to call these blocks from the OB 1.

To create the OB 1, select »New« from the menu »Block«, and enter "OB 1" in the dialog box. After confirming, the CSF editor appears again.

To program the block call, select the menu command »Output / Block call« from the menu »Symbols«. This menu command reacts in a different way if there is already a symbol in the segment. If so, an assignment symbol is paralleled; if not, a symbol for a block call is inserted. As there is no symbol in the segment in our case, the following dialog box for selecting a block call appears:

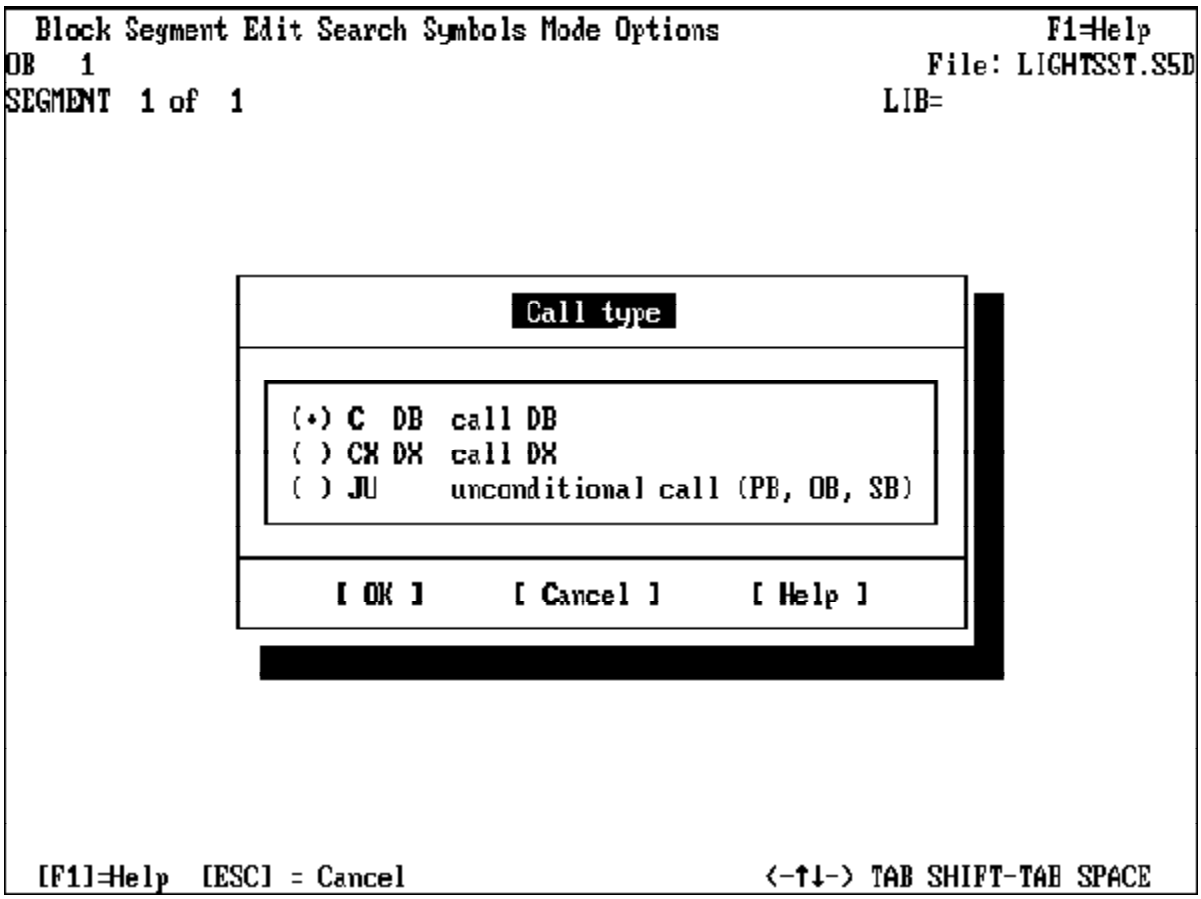

Fig. 4-39: The dialog box »Call type«

The first two elements serve for activating data blocks. Since we want to call a program block, we select the element at the bottom, "JU". "JU" means unconditional block call. After confirming your selection, the symbol for an unconditional block call appears on the screen:

```
 Block Segment Edit Search Symbols Mode Options                    F1=Help
OB   1                                                  File: LIGHTSST.S5D
SEGMENT  1 of  1                                       LIB=

        ─┤ JU  ├  ??????????

* [Alt]  or  [F10] = Menu   Ins            CSF        4    18675740  0003:21
```

Fig. 4-40: Calling a block in CSF

Locate the cursor on the column before the box of the symbol. Select the same symbol again. Enter PB 10 ("-Program") resp. PB 11 ("-Periods") as the operands. Call the directory again. A dialog box appears. Confirm saving the current block with "[Yes]". The directory contains now the OB 1 as well.

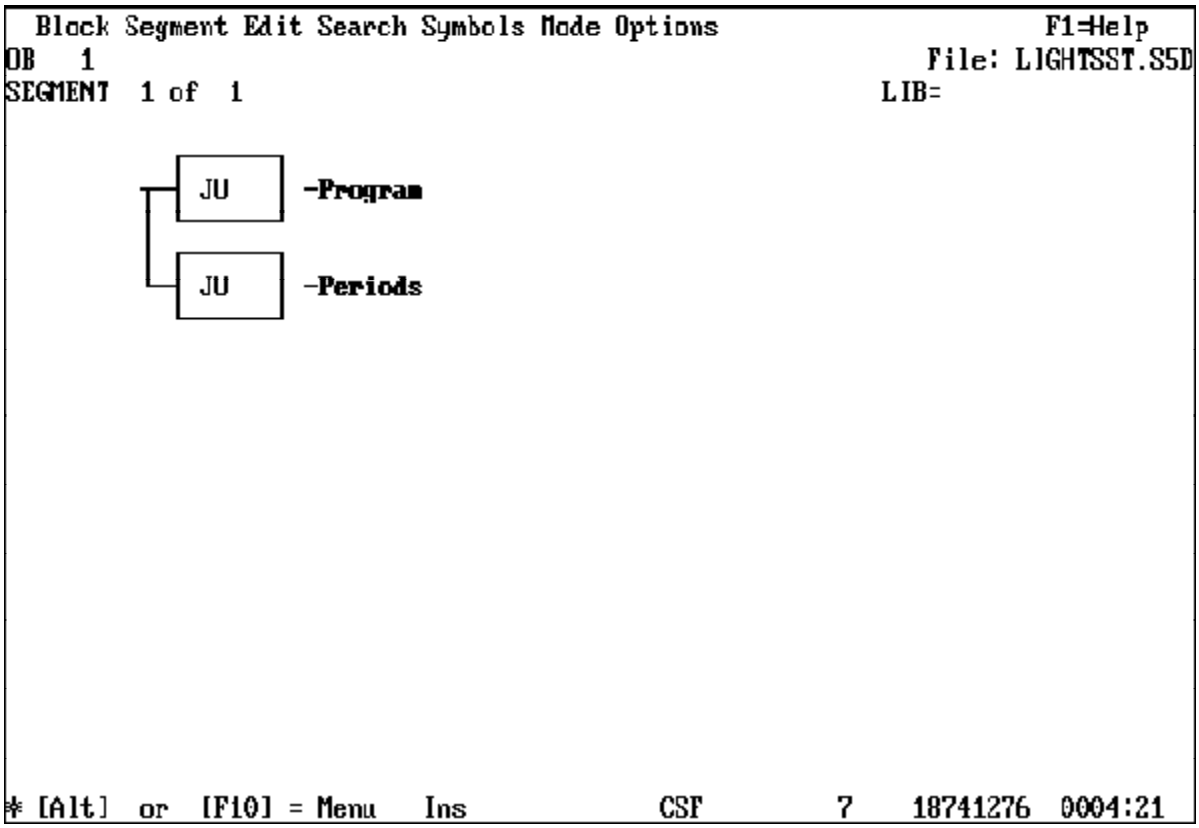

Fig. 4-41: The complete segment with two block calls

Finally, we have to program a reasonable initial state of our control system. When the PLC is turned on or restarted, the red light is to be turned on immediately, and the flag for the input signal "WantGrn" is to be set to "0".

For this purpose, there are two organization blocks, the OB 21 and OB 22, the so-called restart blocks. The OB 21 is executed when the PLC is restarted by the software; the OB 22 is executed when the PLC is turned on, or restarted with the corresponding switch of the PLC. In the OB 21, the output for the red light has to be set to "1", the flag F 10.0 must be set to "0".

Create the block OB 21 via the menu (»Block/New«). To make sure that the state "1" is set, we will OR the state of the flag with the negated state of the flag. So, we can guarantee a signal state of "1" at the output of the OR symbol.

Select »OR« from the menu »Symbols«. An OR symbol is created, together with an assignment symbol:

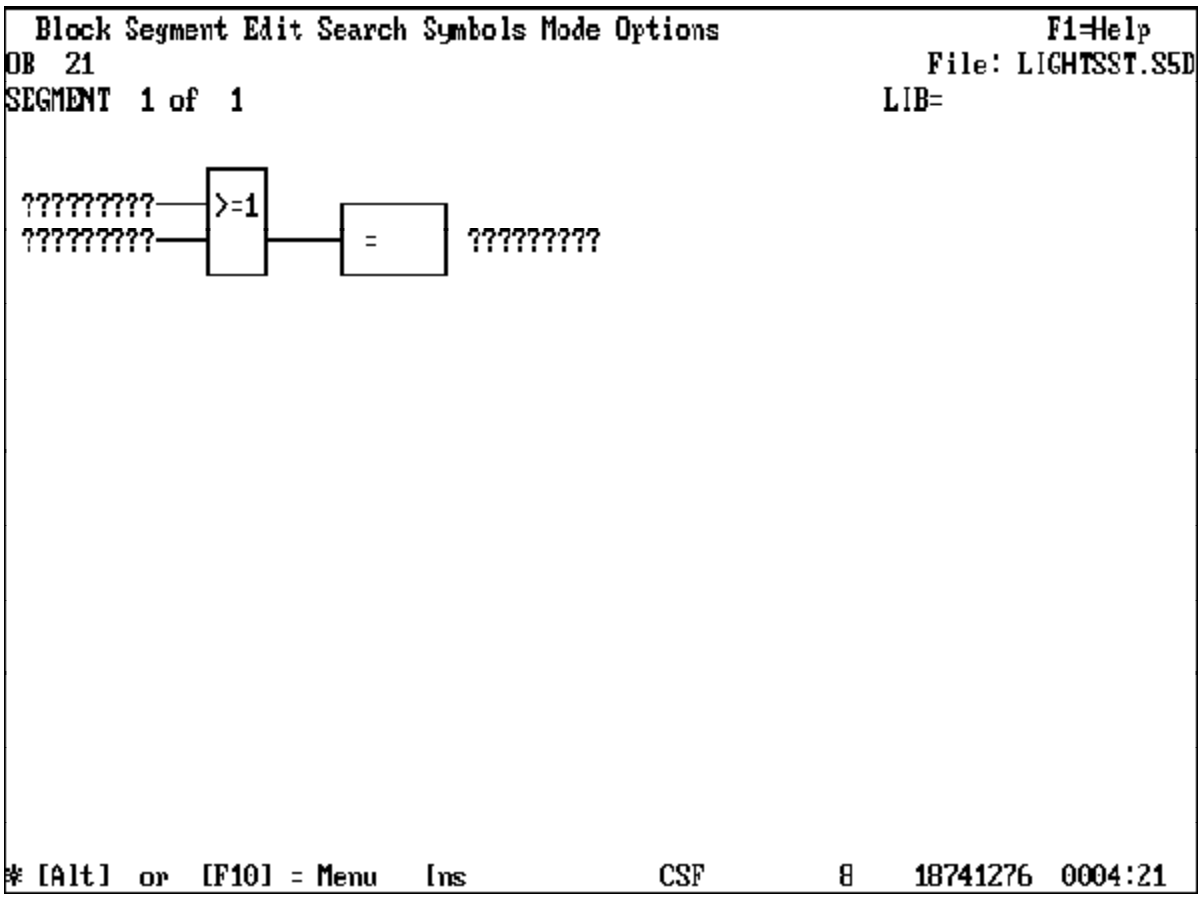

Fig. 4-42: Positioning an OR symbol

Enter F 10.0 ("-OurFlag") twice in the operand fields of the OR symbol. The below input must be negated. Locate the cursor on that input, and select »Negate input« from the menu »Edit«. Change the assignment symbol into a Set assignment symbol, as described above. Specify Q 18.0 ("-Red") as the operand for the red light. Parallel a further assignment symbol, change it into a Set assignment symbol, and enter the flag F 10.0 ("-OurFlag") as the operand. The segment should now appear as follows:

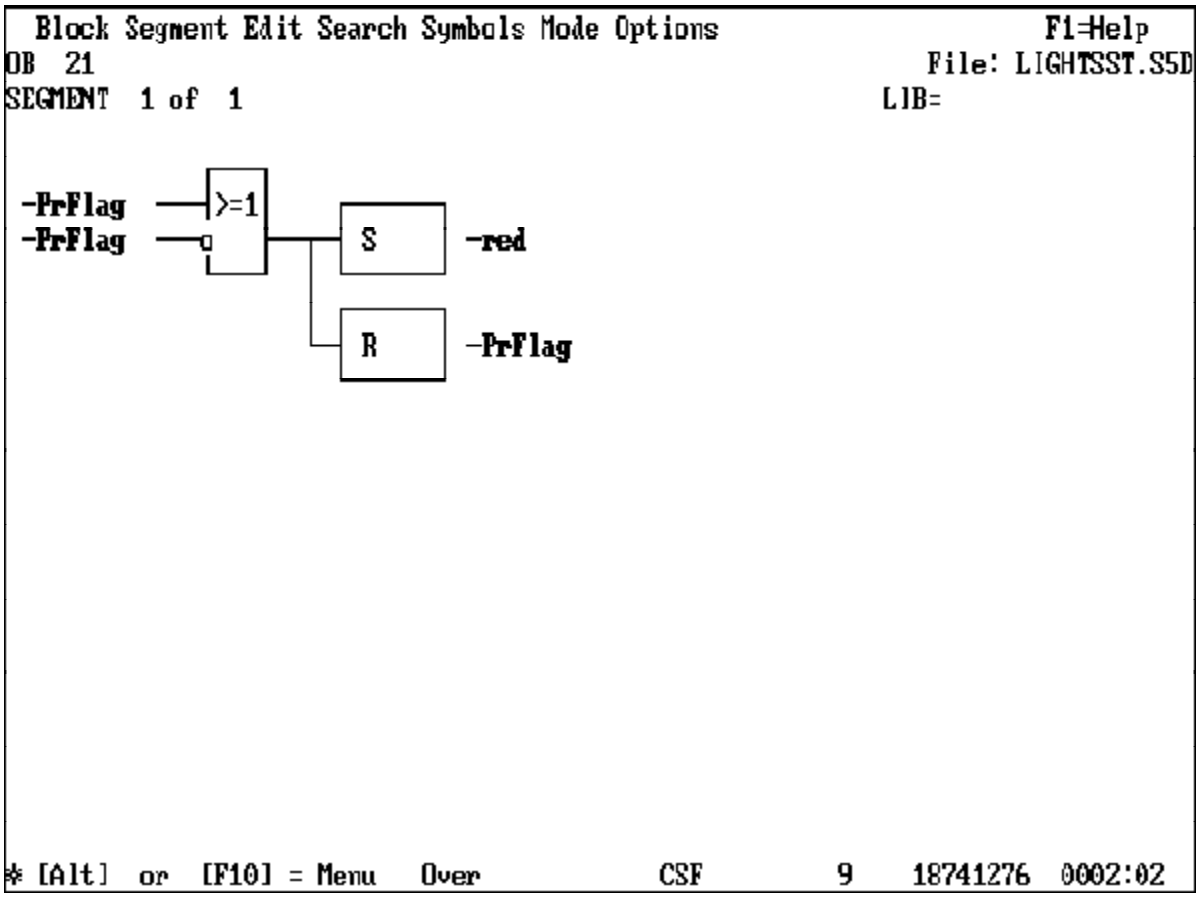

Fig. 4-43: Specifying a start state

Save the block, and call the directory again. The OB 22 should execute the same actions as the the OB 21. To save a lot of work, we are going to copy the block OB 21.

Locate the marking bar on the entry for OB 21 in the directory. Select »Copy...« from the menu »Block«. A file-selection dialog box appears, where you can select the destination file of the block transfer ("copy") operation. Select the current file to be the destination file (i. e. select "DEMO.S5D" using the [F3] key, or enter "FD"). Confirm your selection with the [Enter] key. A dialog box appears and asks you to specify a new block number. This dialog

box appears if you want to duplicate blocks within a file, i.e. if the source and the destination file of the block transfer operation are identical. Enter the number "22". The block OB 21 is copied to the block OB 22 within the file.

The duplicated block appears in the directory now.

Now, we have programmed all blocks necessary for making the control program executable on the PLC. We have to transfer the blocks to the PLC now. You can do this via the directory. To make sure that the PLC will contain only the blocks of our demo program, we should delete the PLC.

ATTENTION: When deleting the PLC, all programs and data contained in the PLC will be lost forever. Make sure that the PLC does not contain any important programs or data, resp. save the contents of the PLC to a file.

To be able to delete the PLC (i. e., delete all blocks from the PLC memory), the PLC has to be in the »Stop« mode. You can use the corresponding switch of the PLC, or select the menu command »Stop« from the menu »PLC«. Confirm your selection with "[Yes]". The PLC is now in the »Stop« mode. Now, you can select »Delete PLC« from the menu »PLC«. Confirm again. All blocks are deleted from the PLC memory, except perhaps for firmware blocks (e. g. the DB 1 on the PLC 90U).

Now, we are going to copy our blocks to the PLC memory. First, we have to mark our blocks in the directory. You can use several methods for doing this: using the [Spacebar] lets you change the marking state of the block under the marking bar. The menu »Mark« contains commands for marking whole groups of blocks. To mark e. g. all program blocks (PBs), locate the cursor on an unmarked program block, and select »Mark/Unmark group« from the menu »Mark«.

As we want to copy all blocks contained in the directory, select »Mark all« from the menu »Mark«. Now, select »Copy ...« from the menu »Block«. Select PLC from the file-selection dialog box which appears now (you can type in "PLC" as well). Confirm your selection with "[OK]". The blocks are copied to the PLC.

Now, we have to set the PLC into the »Run« mode again to test the program. Select »Run« from the menu »PLC«, and confirm the command.

The program should now run on the PLC. When switching the PLC input I 14.0 on, the outputs Q 18.0, Q 18.1 and Q 18.2 should be turned on and off after a certain period of time.

If your PLC is not a PLC 115U, and your PLC does not have the input or outputs we use in our program, you can adapt the program to your specific PLC conveniently. See the following section for details.

4.6.5 Rewiring

You need not rename the operands manually. ACCON-PG provides you with two different methods of rewiring. Both methods are accessible from the directory, and can be used to modify several blocks (i.e., all marked blocks) simultaneously.

4.6.5.1 Rewiring manually

Using the function »Rewire manually«, you can replace up to 16 operands. Suggest we want to use the flag F 20.0 instead of the flag F 10.0 in our demo program. To replace F 10.0 by F 1.0 in all blocks, proceed as follows:

Call the directory. If the current file is not the file to modify, you have to open the desired file (menu »File«, menu command »Open«). The directory now contains the blocks of the file. Mark all blocks and select »Rewire manually« from the menu »Block«. The following dialog box appears:

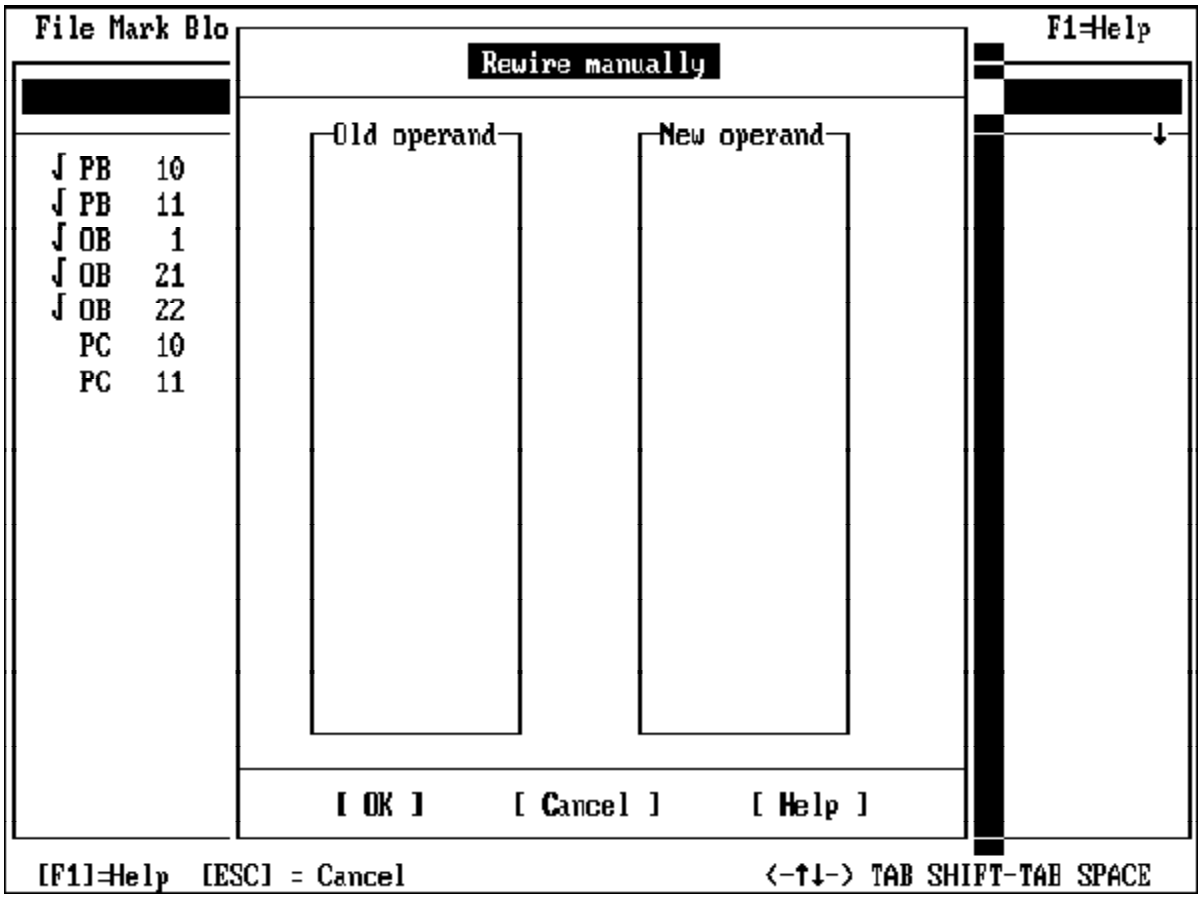

Fig. 4-44: The dialog box »Rewire manual«

You can specify the operands to rewire in the dialog box. The pair new + old operand must appear on one line. Enter the old operand (F 10.0) into the left field, the new operand (F 20.0) into the right field. You can enter up to 16 pairs of operands. Confirm your entries with "[OK]". You will now have to specify the destination file which is to contain the modified blocks. Hereafter, the blocks are rewired. The rewire operations are listed in a message box.

4.6.5.2 Rewiring automatically

Here, the rewire operation is specified by and performed according to two symbols files:

If the symbols files both contain the same symbol for different absolute operands, all occurences (in the program file) of the operand specified in the first symbols file are replaced by the operand specified in the second symbols file.

Suggest we want to assign new outputs to the traffic lights of our example program. Call the symbolic editor (you will perhaps have to leave the directory first). If the current symbols file is not in the editor, you have to load it (menu »File«, menu command »Open«). To duplicate the symbols file, select »Save as ...« from the menu »File«. Enter e. g. "DEMO1.DT" in the dialog box appearing. The symbols file will be saved in a file named "DEMO1.DT".

Now, you can modify the operands for the red, yellow and green light. The new symbols file (DEMO1.DT) could then look like this:

```
File Edit TxtBlk Search Options                                  F1=Help
                                                        File: LIGHT1Z0.DT
 Operand  Symbol                  Comment
 I 32.0   press                   Button pressed: want green to walk
 Q 32.0   red                     Output: red lights
 Q 32.1   yellow                  Output: yellow lights
 Q 32.2   green                   Output: green lights
 F 10.0   PrFlag                  Flag: button has been pressed
 T 10     StrtDely                Delay before start
 T 11     ReYeDur                 Duration of red + yellow
 T 12     GrDur                   Duration of green
 T 13     YellDur                 Duration of yellow
 PB 10    Program                 Traffic lights control program
 PB 11    Periods                 Periods

* [Alt] or [F10] = Menu   Over          SYM       11    18741276  0001:04
```

Fig. 4-45: The symbols file for automatic rewiring

Save the file, leave the symbolic editor (without taking the current file as the current symbols file!) and call the directory again. When performing the automatic rewiring, the program file is searched for symbolic operands contained in the first symbols file. If ACCON-PG finds e. g. the symbolic operand "wantGrn", the corresponding absolute operand I 14.0 is replaced by the corresponding absolute operand (I 32.0) specified in the second file.

Therefore, the following replacements are made in our example:

I 14.0	->	I 20.0
Q 18.0	->	Q 20.0
Q 18.1	->	Q 20.1
Q 18.2	->	Q 20.2

To achieve this, proceed as follows:

First of all, make sure that the current program file is DEMO@@ST.S5D, and that the current symbols file is DEMO@@Z0.DT. You can check this via the menu item »Program settings« in the menu »Help«.

Mark all blocks in the directory. Select »Rewire automatically« from the menu »Block«. In the following file-selection dialog box, select "DEMO1.DT" as the destination symbols file. Then, you will be asked to specify the program destination file. Enter "DEMO2.S5D".

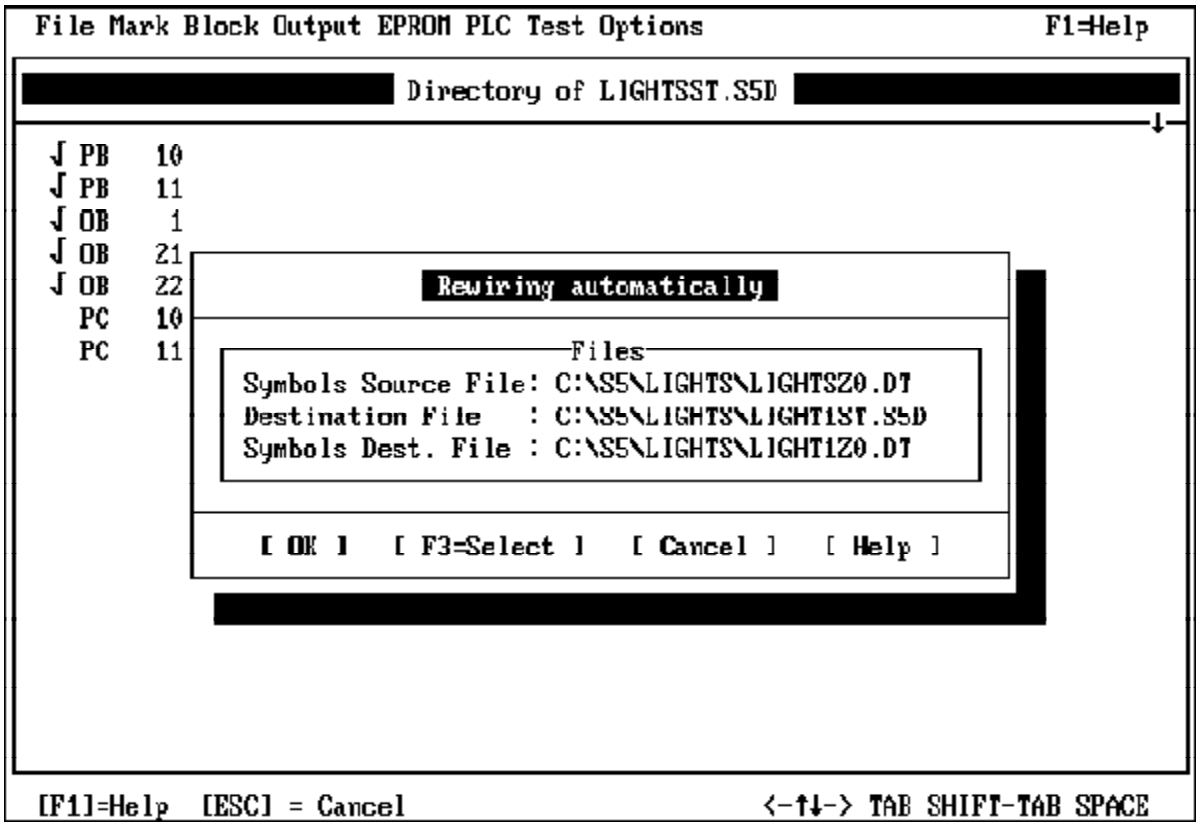

Fig. 4-46: Setup for automatic rewiring

After confirming your selection, the rewiring is started. You can see the replacements in the message box.

Chapter 5:

The Main Menu

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Directly after starting ACCON-PG, the starting screen (the "main screen") with the main menu appears. The commands accessible via the main menu are described in the following sections.

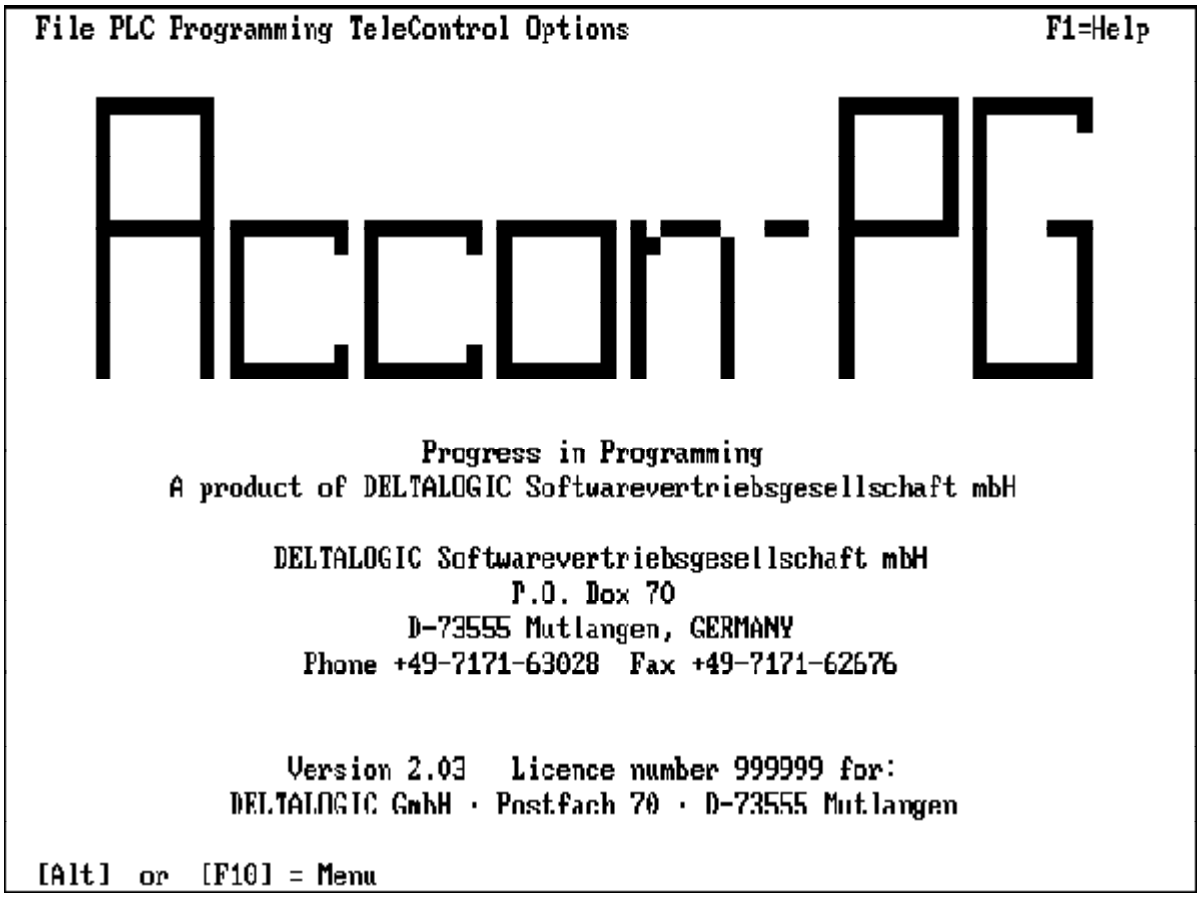

Fig. 5-1: The starting screen of ACCON-PG

5.1 File operations

The menu »File« provides for operating system file operations. Furthermore, it allows you to exit from the application.

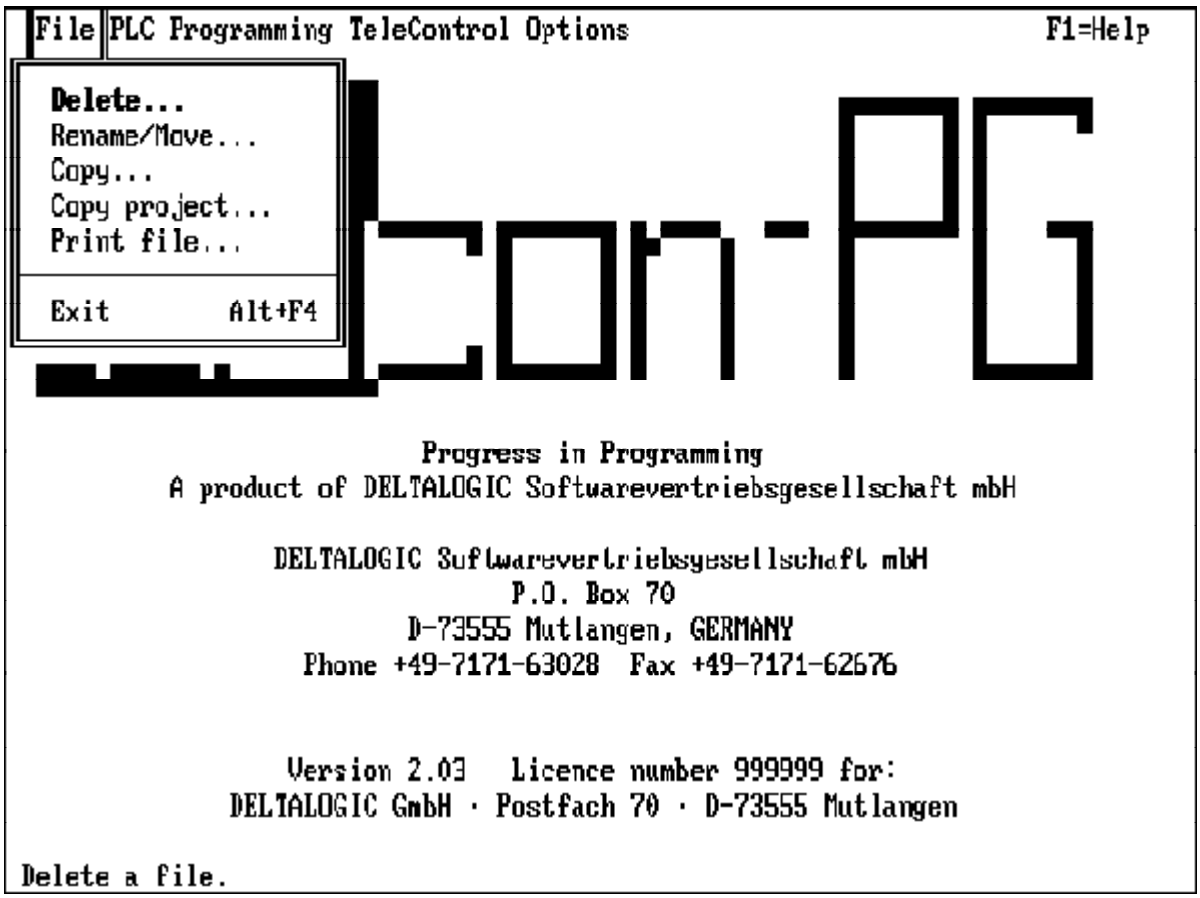

Fig. 5-2: The menu »File«

Each one of the menu commands »Delete«, »Rename/Move«, »Copy«, »Copy project« and »Print file« causes a dialog box to be opened, in which you have to specify one or two filenames, depending on the specific operation.

5.1.1 Delete a file

»Delete« deletes the selected file.

5.1.2 Rename or move a file

»Rename/Move« assigns another name to the selected file, or moves the file to another directory on the disk. You cannot move a file to another drive.

5.1.3 Copy a file

»Copy« creates a copy of the selected file on the floppy disk or the hard disk.

5.1.4 Copy a project file

»Copy project« lets you create a copy of a complete project file. In the project file, the program file, the symbols file etc. are stored. All these files will be copied to the destination directory which must be specified. The path names of these files will be updated automatically.

After selecting this menu command, a file-selection dialog box appears for selecting the existing project to be copied. A second dialog box follows in which you can specify the directory and the name of the project to be created.

5.1.5 Print a text file

»Print file« sends an ASCII text file to the standard printer.

5.1.6 Exit from ACCON-PG

»End« lets you leave ACCON-PG and return to DOS.

5.2 PLC operations

All the operations to be carried out on the PLC are accessible in the menu »PLC« of ACCON-PG.

The PLC has to be properly connected to your computer, or else the PLC operations are not accessible.

In the latter case, you will get a corresponding message in a pop-up window.

You should then check,

- whether the PLC is actually connected to the serial port of your PC you have specified using the menu command »Select port...«in the menu »Options«.
- whether the PLC power supply is OK.
- whether the PLC cable is OK.

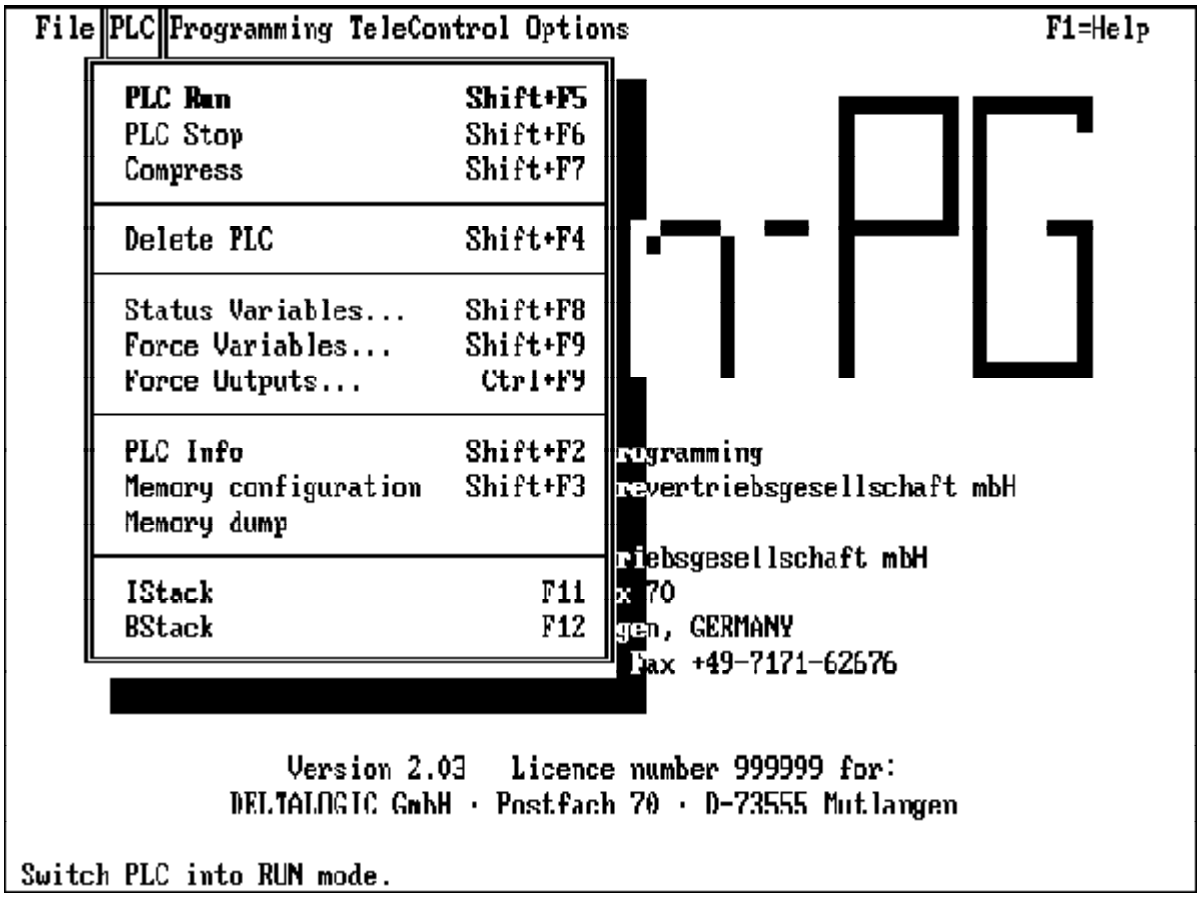

Fig. 5-3: The menu »PLC«.

5.2.1 Run PLC

The menu command »Run« will execute a restart on the PLC, if the PLC is in the »Stop« mode.

Before the PLC will actually be switched into the »Run« mode, you must confirm the restart operation in a dialog box. When confirming the »Run« command, the PLC will be switched into the »Run« mode; when cancelling the operation, the PLC will stay in the currently active mode.

If the connected PLC is a PLC 135U or a PLC 155U, you have to specify whether to execute a cold restart operation or a warm restart operation, or to cancel the operation.

This menu command can also be selected by typing the hotkey ⇧ + F5.

5.2.2 Stop PLC

The menu command »Stop« will switch the PLC into the »Stop« mode. Before the PLC will actually be switched into the »Stop« mode, you must confirm the restart operation in a dialog box. When confirming the »Stop« command, the PLC will be switched into the »Stop« mode; when cancelling the operation, the PLC will stay in the currently active mode. This menu command can also be selected by typing the hotkey ⇧ + F6.

5.2.3 Compress PLC

When deleting blocks from the PLC memory, these blocks will not be destroyed physically in the PLC memory, but only declared to be not valid. Similarly, when modifying a block, a copy of the block (containing the modifications) will be created, and the old block will only be declared to be invalid.

For these reasons, the PLC memory can be filled by invalid blocks. As a consequence, you will not be able to store new blocks into the PLC memory.

In order to delete the invalid blocks physically, and to store the valid blocks consecutively, you have to execute the operation »Compress PLC«. After the compression has been done successfully, a message box with a corresponding notice will appear.

If you want to store a block in the PLC memory which is too large to fit in the memory because there is not enough free memory left, a dialog box will appear in which you can also select the described compress operation. You can then choose between:

- compressing the PLC memory and subsequently storing the block
- cancelling the operation.

This menu command can also be selected by typing the hotkey ⇧ + F7.

5.2.4 Delete PLC

By selecting the menu item »Delete PLC«, you can delete all blocks from the PLC memory (except for the firmware blocks) and restore a well-defined state of the PLC memory. The PLC has to be connected to the PC and be in the »Stop« mode, otherwise this operation will not be executed.

Before the blocks in the PLC memory will be deleted, you have to confirm the operation in a warning box. You can then press Esc to cancel the operation, or Enter to delete the blocks. You cannot delete the whole PLC memory if the PLC is in the »Run« mode. When trying to do so, a message box with the corresponding notice will be displayed. This menu command can also be selected by typing the hotkey ⇧ + F4.

5.2.5 Status Variables

When selecting the menu command »Status Variables«, a new menu and the status scan table are displayed. The process variables you want to inspect can be entered into the table now. The whole screen can be used for these process variables. ACCON-PG does not ask the PLC for more values than

the PLC is able to deliver. Usually, this limit is higher than the room limit for the process variables. This menu command can also be selected by typing the hotkey ⇧ + F8.

When entering a variable, a proposal for the data format is given. You can accept the format or replace it.

This menu command is described in chapter 15.

5.2.6 Force Variables

When selecting the menu command »Force Variables«, a menu is displayed similar to that of »Status Variables«. The only difference is that you can here enter and modify the values of the process variables. This menu command can also be selected by typing the hotkey ⇧ + F9.

This menu command is described in chapter 15.

5.2.7 Force Outputs

When selecting the menu command »Force Outputs«, a menu is displayed similar to that of »Force Variables«. You can here modify the state of the specific outputs directly (but not the process image). The PLC has to be in the »Stop« mode and must not be a PLC 90U. Allowed process variables are output bytes (QB), output words (QW) and output double words (QD). This menu command can also be selected by typing the hotkey Ctrl + F5.

This menu command is described in chapter 15.

5.2.8 PLC Info

Selecting the menu command »PLC Info« gives you information on the PLC connected to the serial port of your PC. You can close the window containing the information by pressing any key or with the mouse. This menu command can also be selected by typing the hotkey ⇧ + F2.

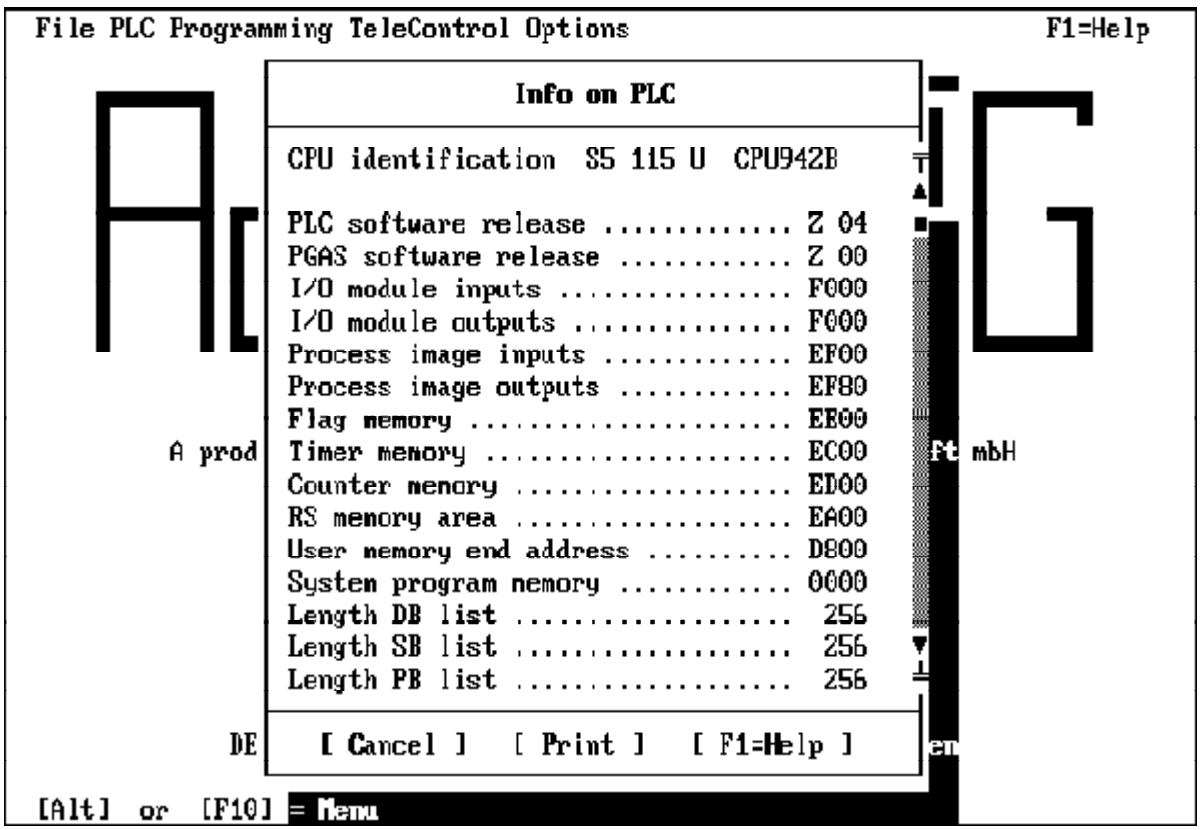

Fig. 5-4: The window »PLC Info«

5.2.9 Memory configuration

Selecting the menu command »Memory configuration« gives you information on the memory configuration of the PLC connected to the serial port of your PC. This menu command can also be selected by typing the hotkey ⇧ + F3.

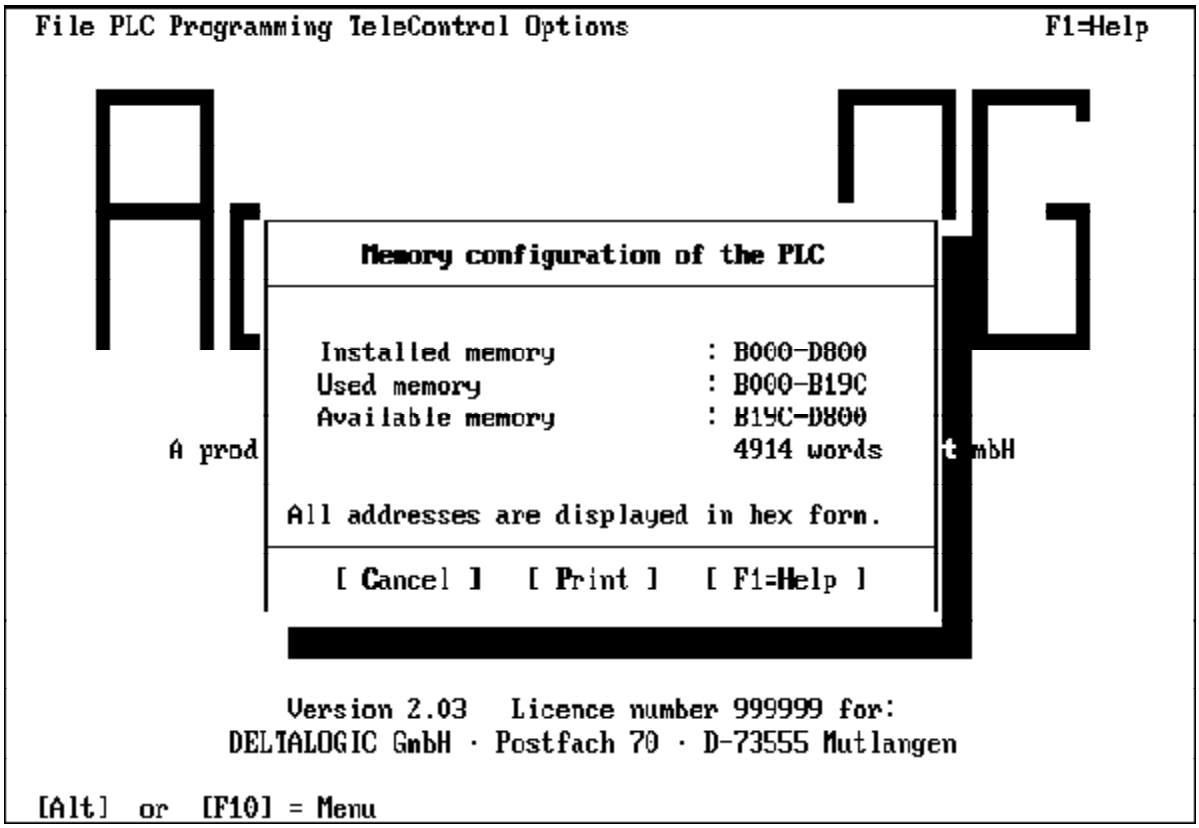

Fig. 5-5: The window »Memory configuration«

The displayed information includes

- the amount of memory installed in the PLC,
- the amount of currently used memory,
- the amount of available free memory.

5.2.10 Memory dump

When selecting the menu command »Memory dump«, a dialog box is opened in which you can enter the start address for a PLC memory dump. The entered address is interpreted as a hexadecimal address. After completing your entry, the memory dump (starting with the currently specified address) is displayed in a window.

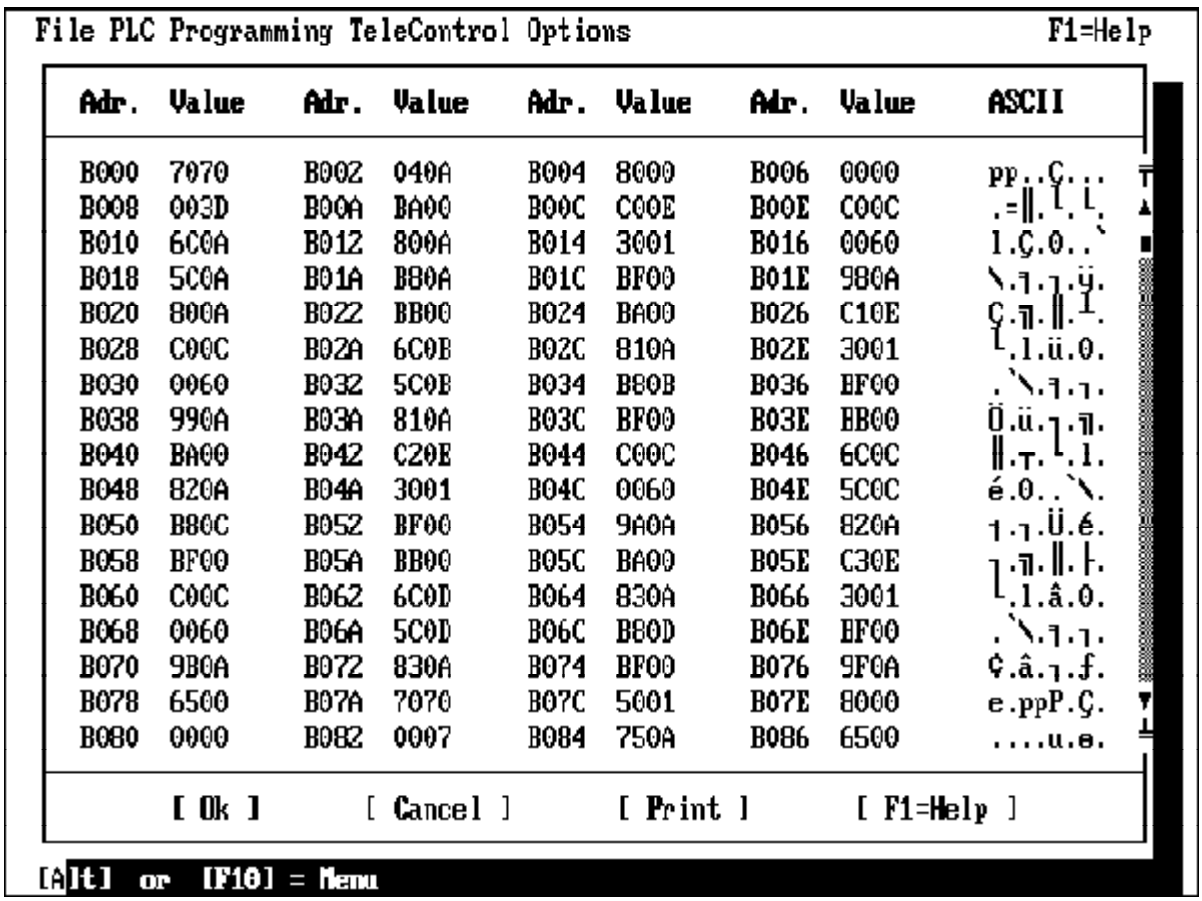

Fig. 5-6: The window »Memory dump«

You can view the memory contents and even edit them. Press Ctrl + Tab to activate the editing mode. You can now modify the displayed values directly.

Attention: You should only use this function if you know exactly what you are doing. The crucial point about this function is that you can easily modify the PLC program (at run-time!!). The results of your actions can not always be foreseen.

5.2.11 IStack

When selecting the menu command »IStack« or typing the hotkey F11, you can view the control bits (status flags) and the current interrupt stack of the PLC. You can always view the control bits; the interrupt stack, however, can be examined only when the PLC is in the »Stop« mode.

The reason for the PLC going into the »Stop« mode can be e.g. a timeout, trying to execute a command not supported by the PLC, trying to activate a non-existing DB or output.

The second page contains the interrupt stack with the block being active when the PLC went into the »Stop« mode, the currently valid DB etc.

File PLC Programming TeleControl Options F1=Help

Control bits

NB	PBSSCH	BSTSCH	SCHTAE	ADRBAU	SPABBR	NAUAS	QUITT
NB	NB	NB	REMAN X	NB	NB	NB	NB
STOZUS X	STDANZ X	NEUSTA	NB	BATPUF X	NB	BARB	BARBEND
NB	UAFEHL	MAFEHL	EOVH	NB	AF	NB	NB
ASPNEP	ASPNRA	KUPFNI	PHUEND	ASPNEEP	PADRFE	ASPLUE	RANADFE
KEINAS X	SYNFEH	NINEU	NB	NB	NB	SUMF	URLAD

NB : Not used

[Alt] or [F10] = Menu

Fig. 5-7: The control bits

```
File PLC Programming TeleControl Options                    F1=Help

                          Interrupt stack

DEPTH:  01

Oper. register:      3Z00      SAC:            B0AE     DB address: 0000
Block stack pointer: EB07      PB number:        11     DB number:
                               Relative SAC:   0006

Accu1: 1050     Accu2: 1020

Condition code :  CC1    CC0    OVFL  CARRY    OR   STATUS  RLO    ERAB

Cause of interr: STOPS    NB    SUF   TRAF    NNN    STS   STUEB    NB
                                     X
                  NAU    QVZ    NB    ZYX     NB    PEU    BAU   aSPFA



TRAF  : Transfer error with data block command

[Alt]  or  [F10] = Menu
```

Fig. 5-8: The interrupt stack

5.2.12 BStack

Selecting the menu command »BStack« (block stack) or typing the hotkey F12 lets you know the blocks which had been active before the PLC went into the »Stop« mode. If this menu command is called when the PLC is not in the »Stop« mode an error occurs.

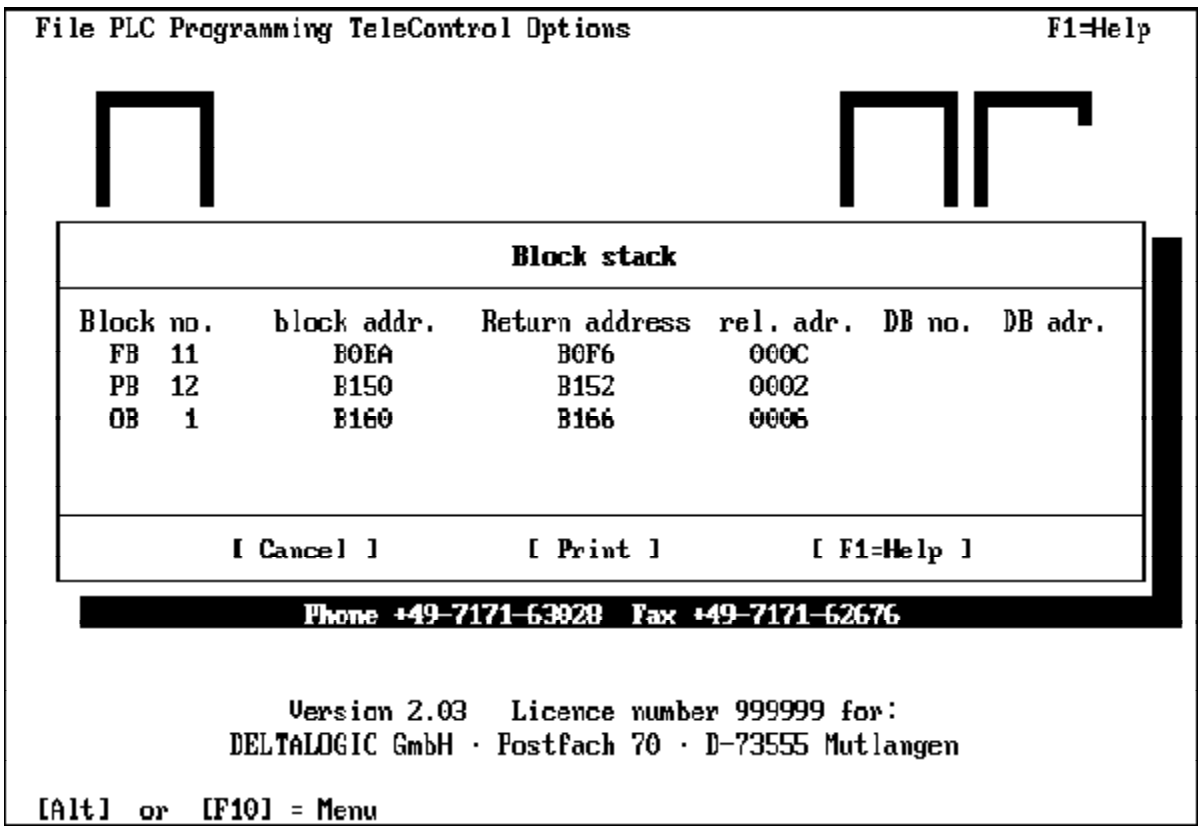

Fig. 5-9: The window »BStack«

5.3 The menu »Programming«

The menu commands of the menu »Programming« enable you to call one of the editors for editing programs.

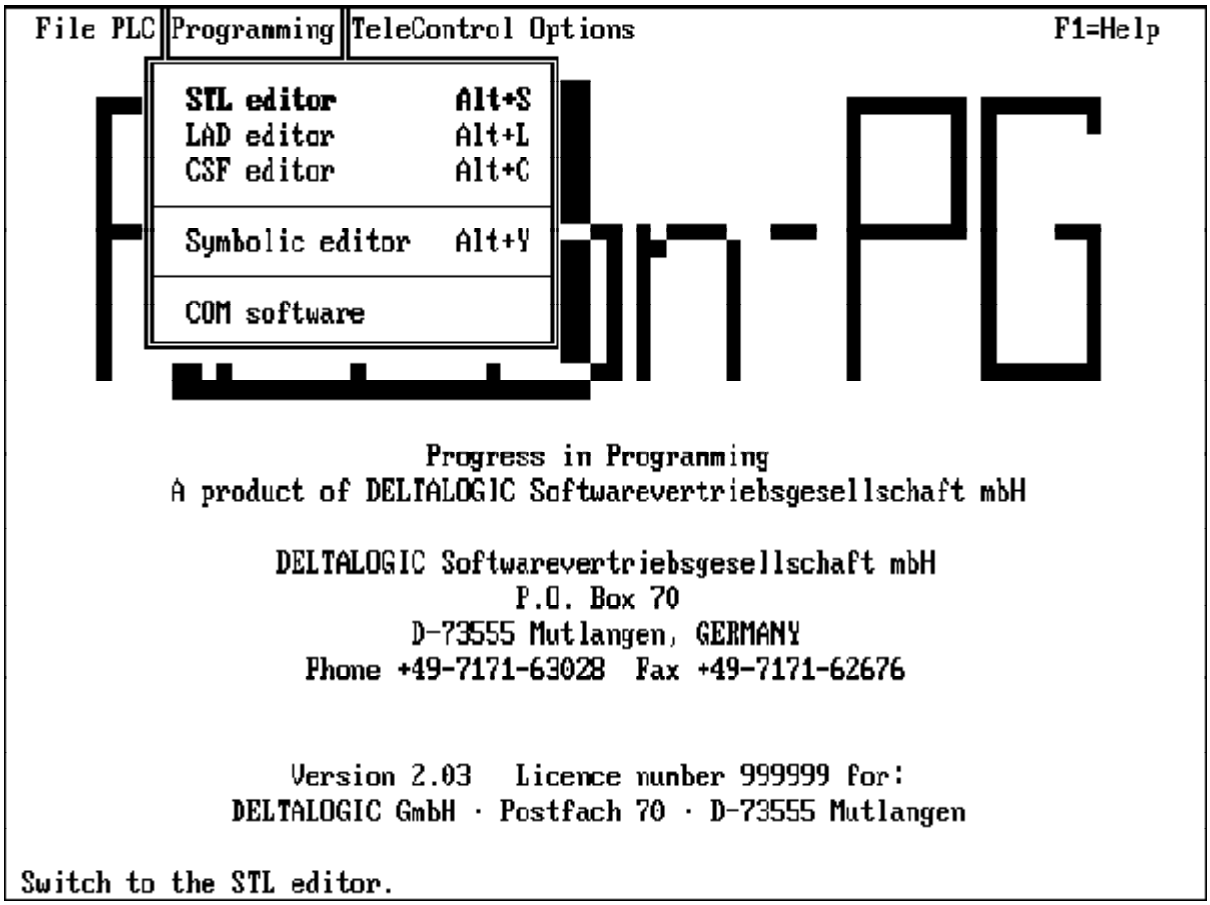

Fig. 5-10: The menu »Programming«

5.3.1 Programming in STL

You start the STL editor by selecting the menu command »STL editor«. In this editor, you can enter and modify programs as statement lists. This editor is described in detail in chapter 8.

5.3.2 Programming in LAD

You start the LAD editor by selecting the menu command »LAD editor«. In this editor, you can enter and modify programs as ladder diagrams. This editor is described in detail in chapter 10.

5.3.3 Programming in CSF

You start the CSF editor by selecting the menu command »CSF editor«. In this editor, you can enter and modify programs as control system flowcharts. This editor is described in detail in chapter 11.

5.3.4 The symbolic editor

You start the symbolic editor by selecting the menu command »Symbolic editor«. In this editor, you can give a symbolic name to an absolute operand and modify such a symbolic name. This editor is described in detail in chapter 12.

5.3.5 COM software

You can call an original COM software package using this command. This can be a device driver for a CP/IP peripheral device, e.g. the COM 525.

This menu command is available only if you purchased the COM software option; otherwise this menu item is grayed and cannot be selected.

The COM software being executed is the original package from Siemens and must be purchased from Siemens. For information on installing and using the specific COM software, consult the Siemens documentation.

The COM software option is especially interesting for machine manufacturers who equip their machines with CP/IP peripherals and want to deliver a comfortable and powerful STEP5 programming system with their product for software maintenance. If you need further information, consult your local ACCON reseller.

5.4 Options

The menu »Options« lets you modify the user interface and program parameters of ACCON-PG according to your wishes and requirements.

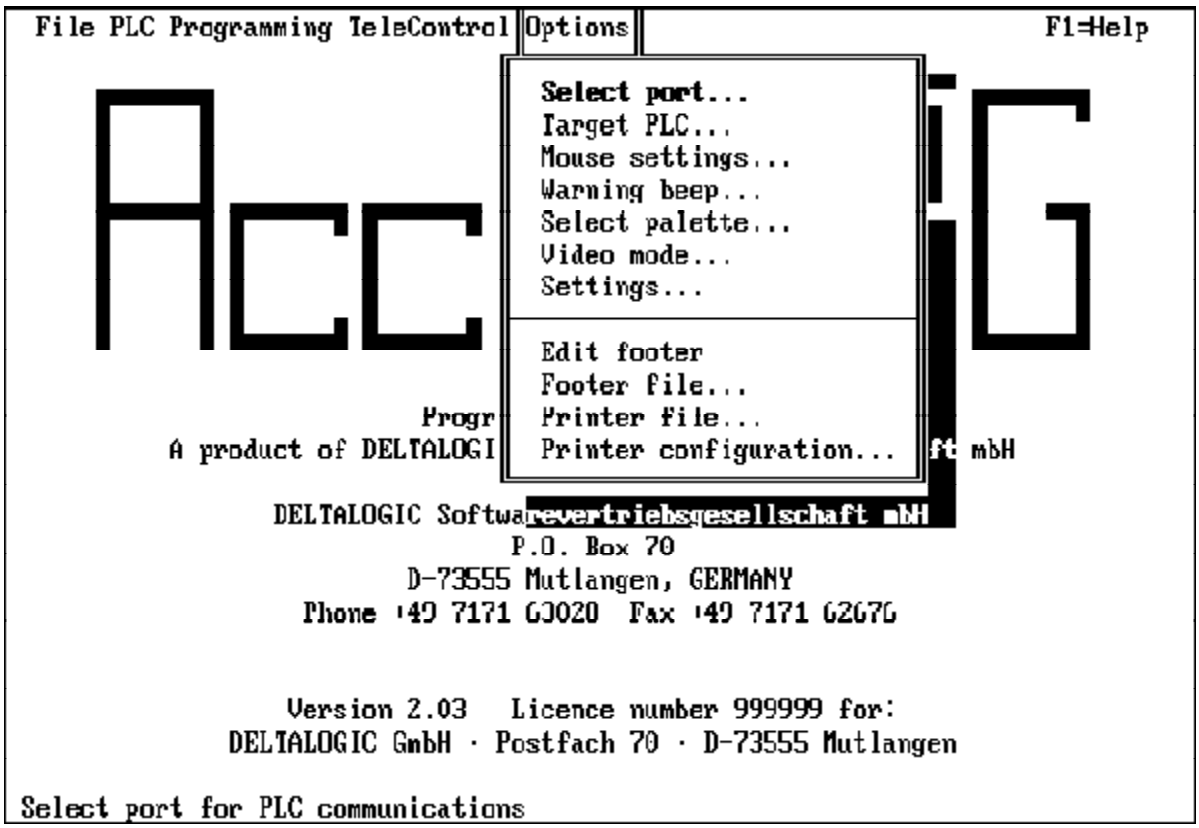

Fig. 5-11: The menu »Options« of the main screen.

This includes

-selecting a printer file,

-selecting a footer file,

-editing a footer,

-modifying various settings,

-selecting the serial port (for the PLC),

You will learn more about these settings in chapter 6.

Chapter 6:

Configuring ACCON-PG

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The menu commands of the menu »Options« (shown in the next figure) enable you to modify the user interface and the parameters of the program according to your wishes and requirements.

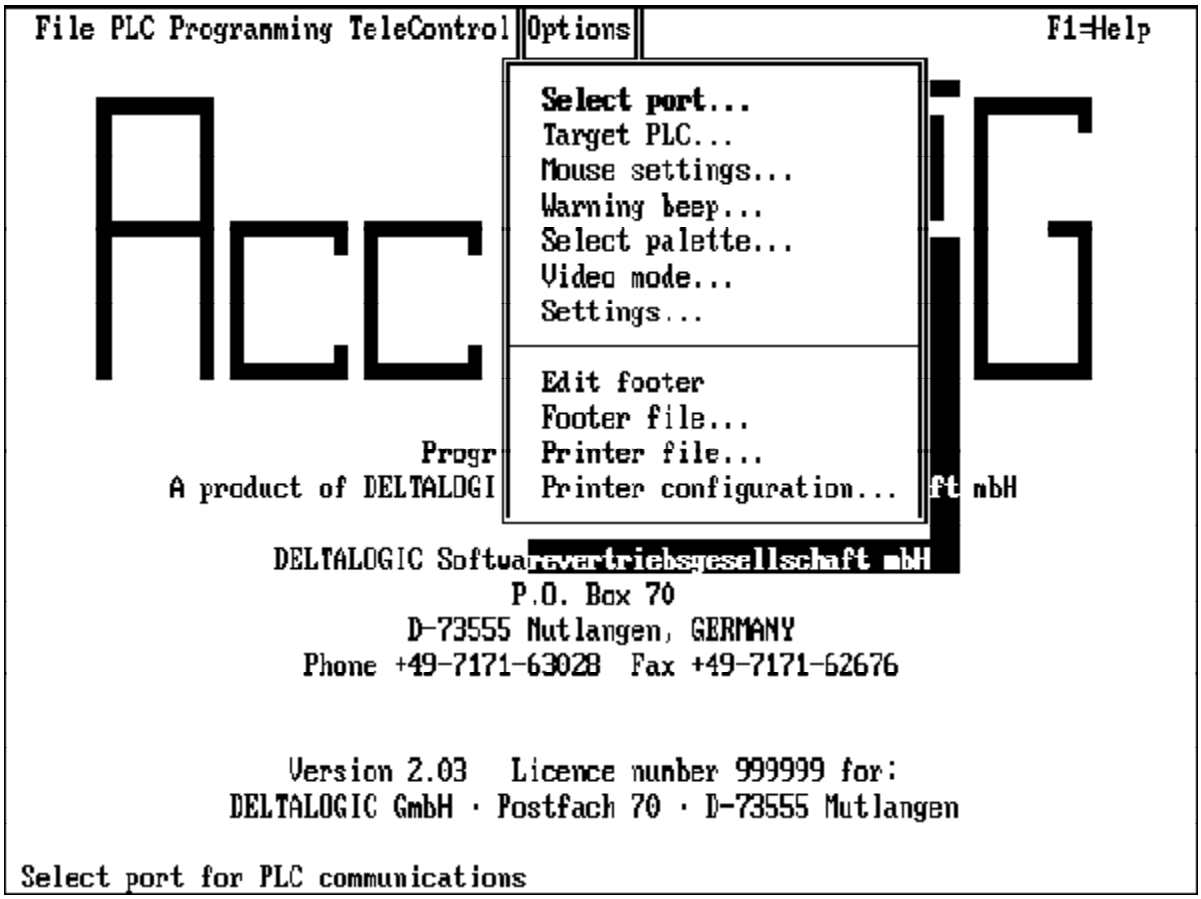

Fig. 6-1: The menu »Options«.

The specific elements of this menu are explained in this chapter.

6.1 Select the serial port for the PLC

The menu command »Select port...« lets you select the serial port which connects your PC to the PLC. You can select any of the RS232 / V24 ports installed in your PC from a dialog box shown in Fig. 6-2.

You should consider the following: other applications running in the background (DOS TSRs or other Windows applications when running »ACCON-PG« in the DOS box of Windows) cannot use a serial port which is serviced via the same interrupt used by the serial port for the PLC.

Usually, the serial ports of a PC are configured as follows: COM 1 and COM 3 share the same interrupt, and COM 2 and COM 4 share the same interrupt. As a consequence, you usually cannot use COM 1 and COM 3 simultaneously, and you cannot use COM 2 and COM 4 simultaneously.

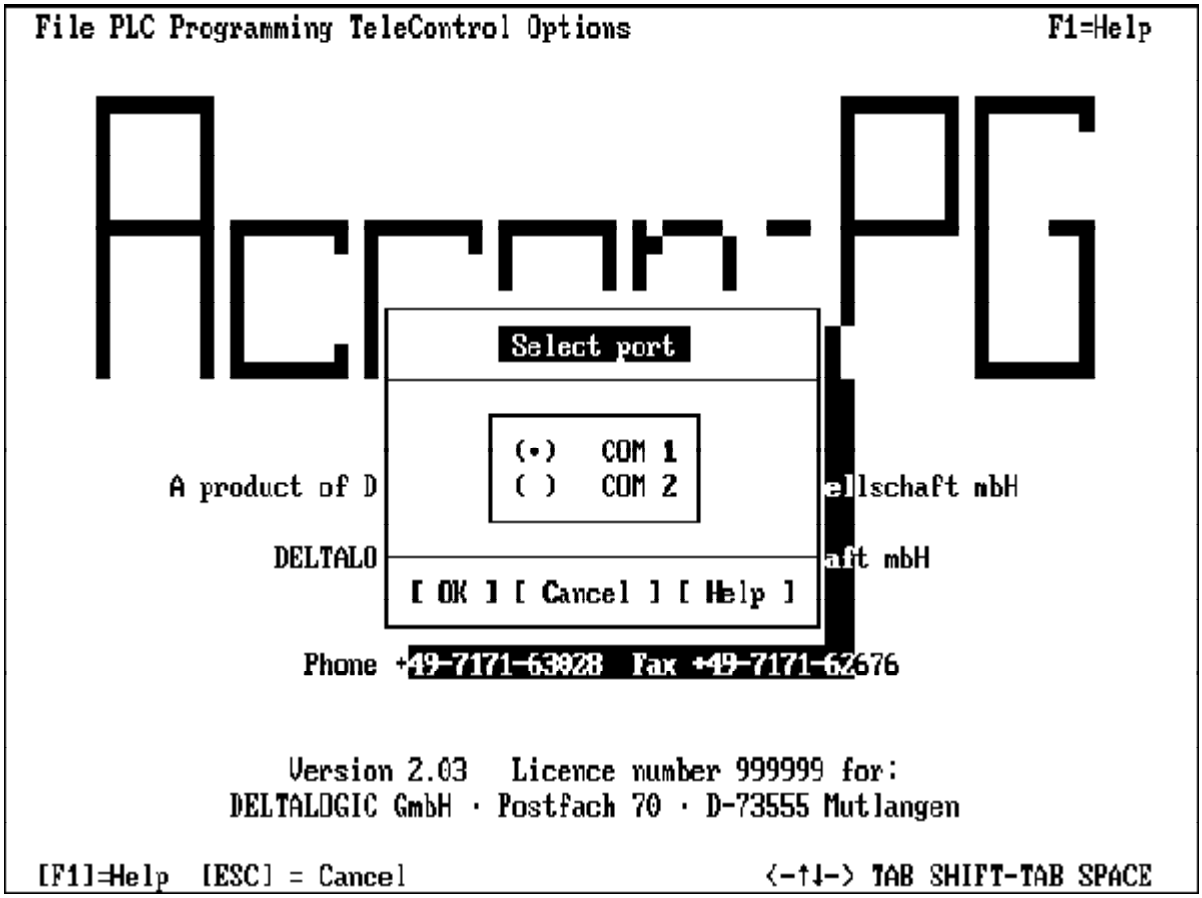

Fig. 6-2: The dialog box »Select port...«

6.2 Selecting the target PLC

The menu command »Target PLC...« lets you select the specific SIMATIC S5 PLC you want to program. You can select any SIMATIC PLC; the latest CPUs are the S5-115U CPU 945 and the S5-155 CPU 948. (Depending on the software version, the dialog box »Target PLC« does not list the CPU 948 explicitly. Select the S5-155U CPU 946/948 instead; there are no real differences between these CPUs, except for memory size and performance.)

Specifying the target PLC has a number of considerable advantages. ACCON-PG will warn you if you enter any operands and commands which are not available on the specified PLC. You can also check a whole program or a group of blocks for executability on the specific PLC using the menu command »PLC conformance« of the menu »Test« of the directory. This simplifies porting an application to another PLC; and you can find out which CPU is "just good enough" for your program. So you need not buy a PLC which is unnecessarily expensive.

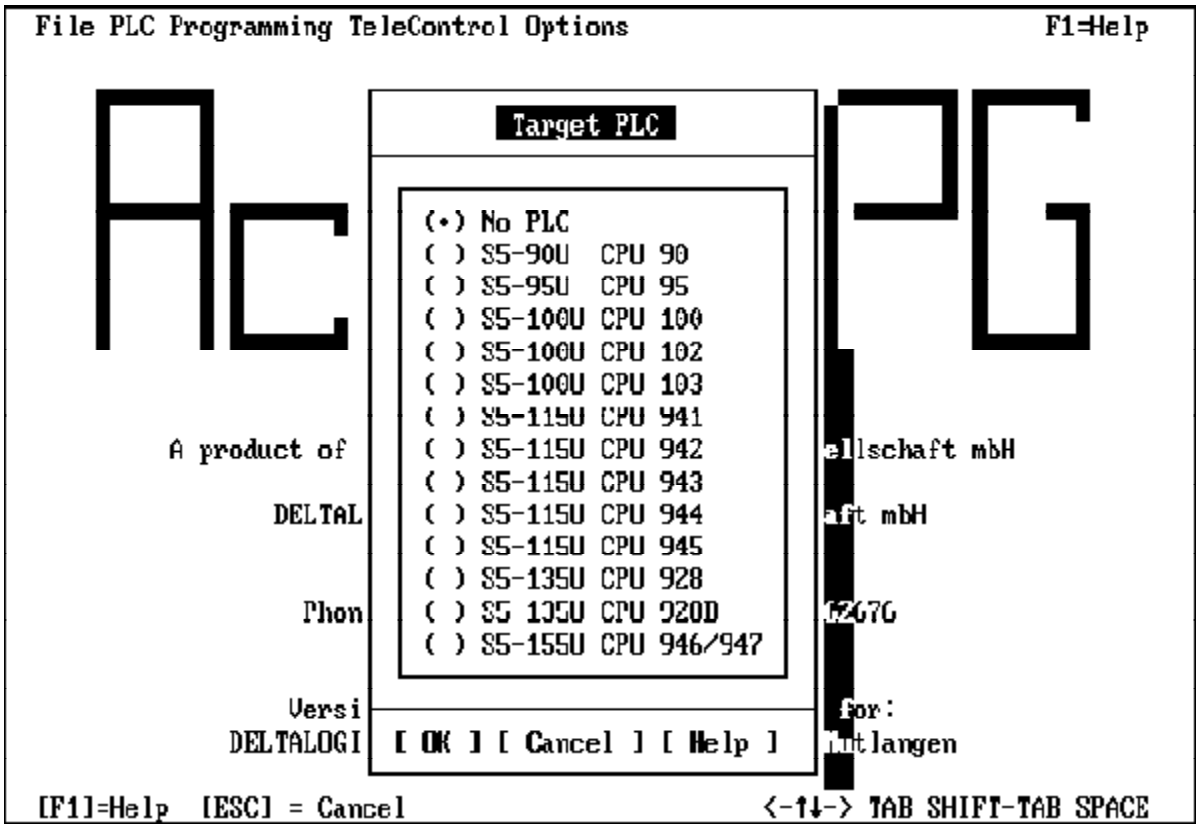

Fig. 6-3: The dialog box »Target PLC«

6.3 Mouse settings

The menu command »Mouse settings...« lets you adjust the mouse speed in a dialog box shown in fig. 6-4. The higher the speed value, the faster you can move the mouse cursor on the screen. The smaller the value, the more room is needed for moving the mouse cursor from one border of the screen to the opposite border.

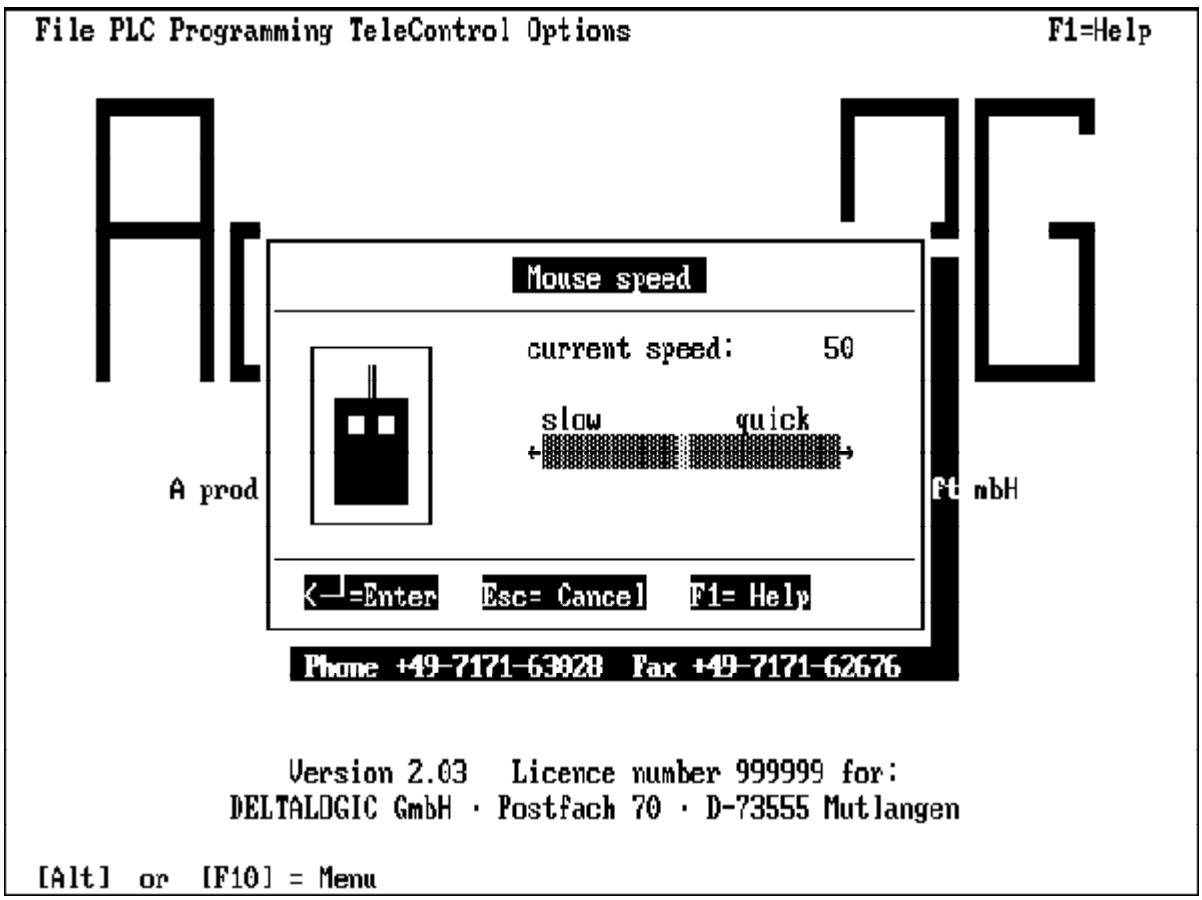

Fig. 6-4: The dialog box »Mouse speed«

6.4 Warning beep

When the user makes erroneous input, or ACCON-PG wants to send a warning message to the user, a warning beep is given (per default). You can adjust this beep tone according to your wishes, using the menu command »Warning beep...«. In the dialog box shown in fig. 6-4, you can set the beep length to a value in the range from 55 up to 1100 milliseconds, and the beep frequency to a value in the range from 50 up to 1000 hertz. You can also switch the beep off. You can listen to the currently set beep tone by pressing F4 or clicking on the corresponding push button.

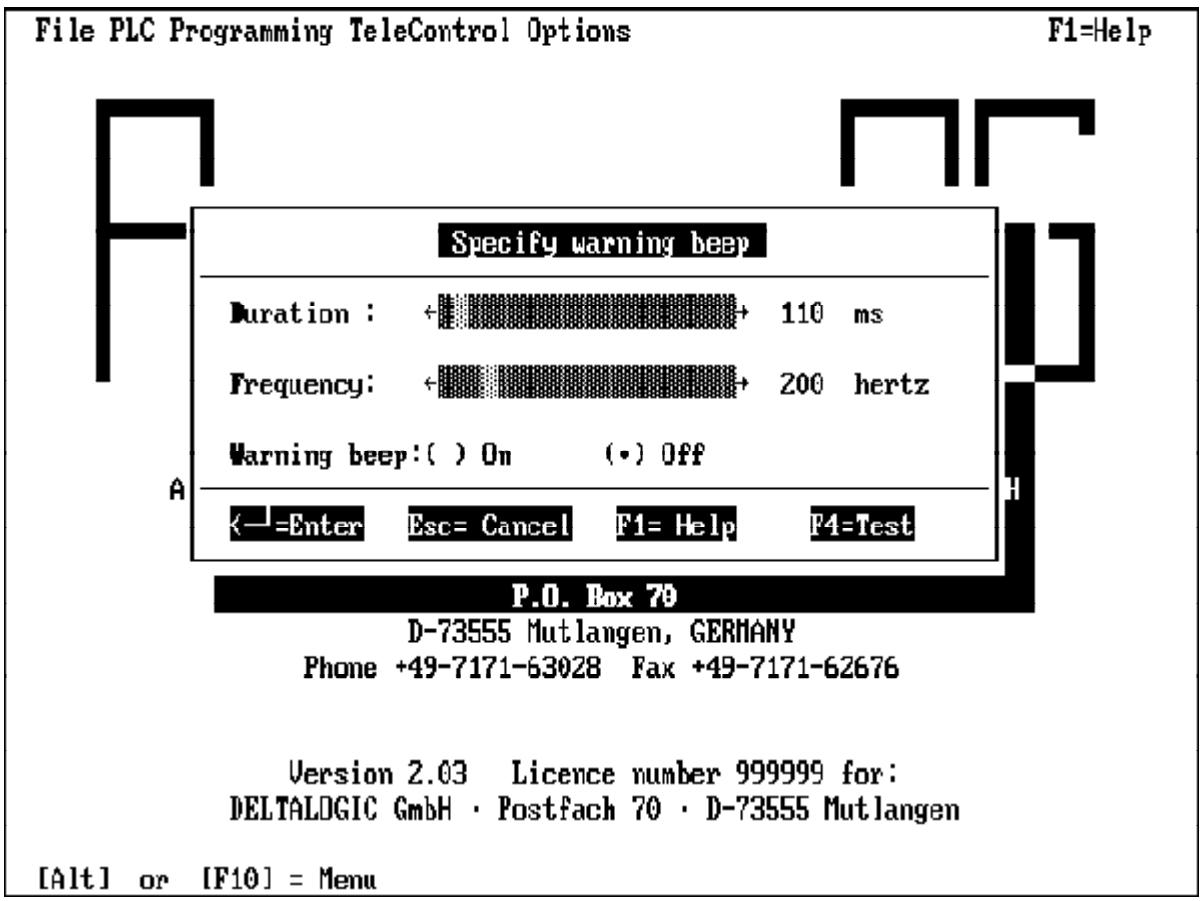

Fig. 6-5: The dialog box »Specify warning beep«

6.5 Select a palette

The menu command »Select palette...« lets you select another palette if possible. The currently active palette determines the colors used for displaying e.g. the control program elements on the screen. The only purpose of this option is to let the user select the colors he likes most resp. the colors providing for best visibility on his screen. If your computer is equipped with a monochrome display, we recommend you select the monochrome palette; otherwise some parts of the text displayed in a color of their own will be difficult to recognize.

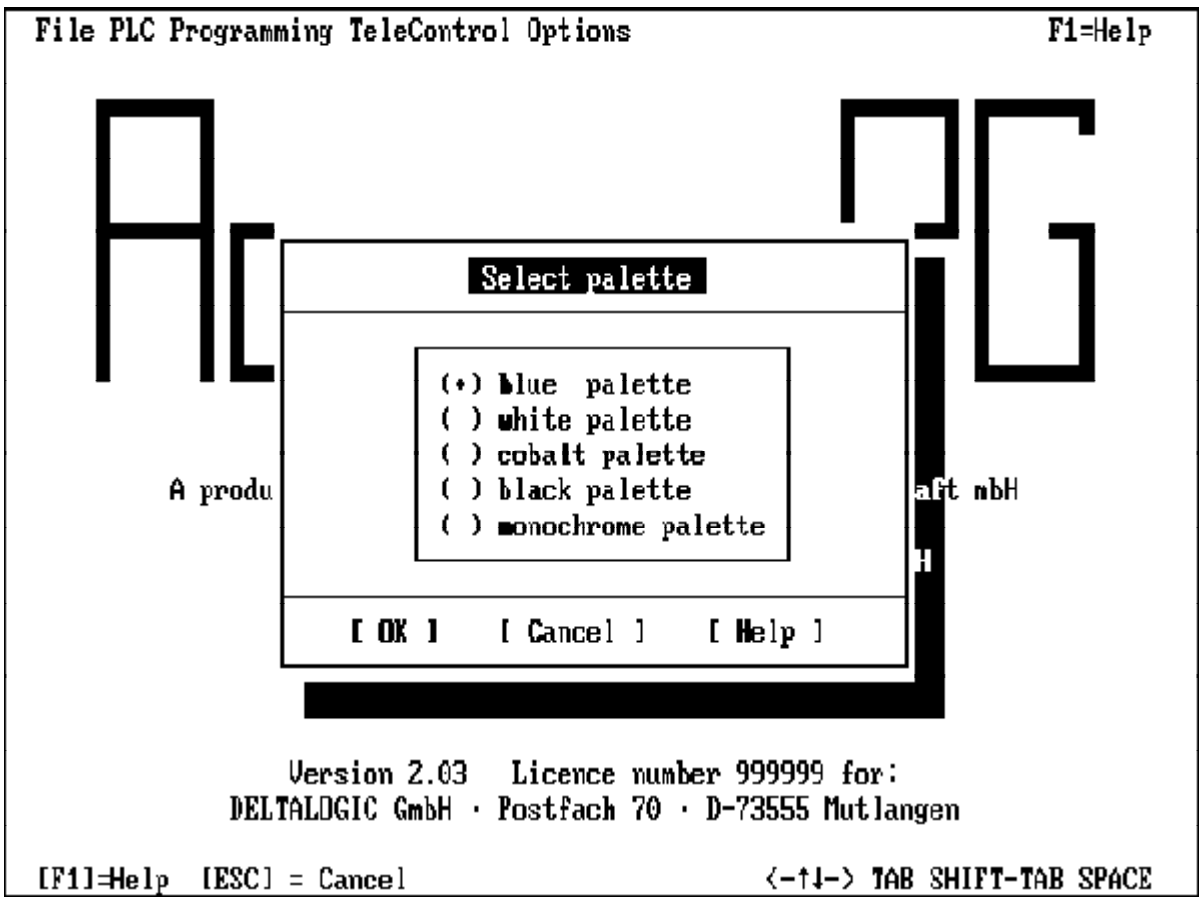

Fig. 6-6: The dialog box »Select palette«

6.6 Select a video mode

The menu command »Select video mode...« lets you switch into any other video mode supported by the video adapter installed in your system. The dialog box »Select video mode« shown in the next figure lets you choose between one or several video modes; the number of possible choices depends on the capacity of your video adapter.

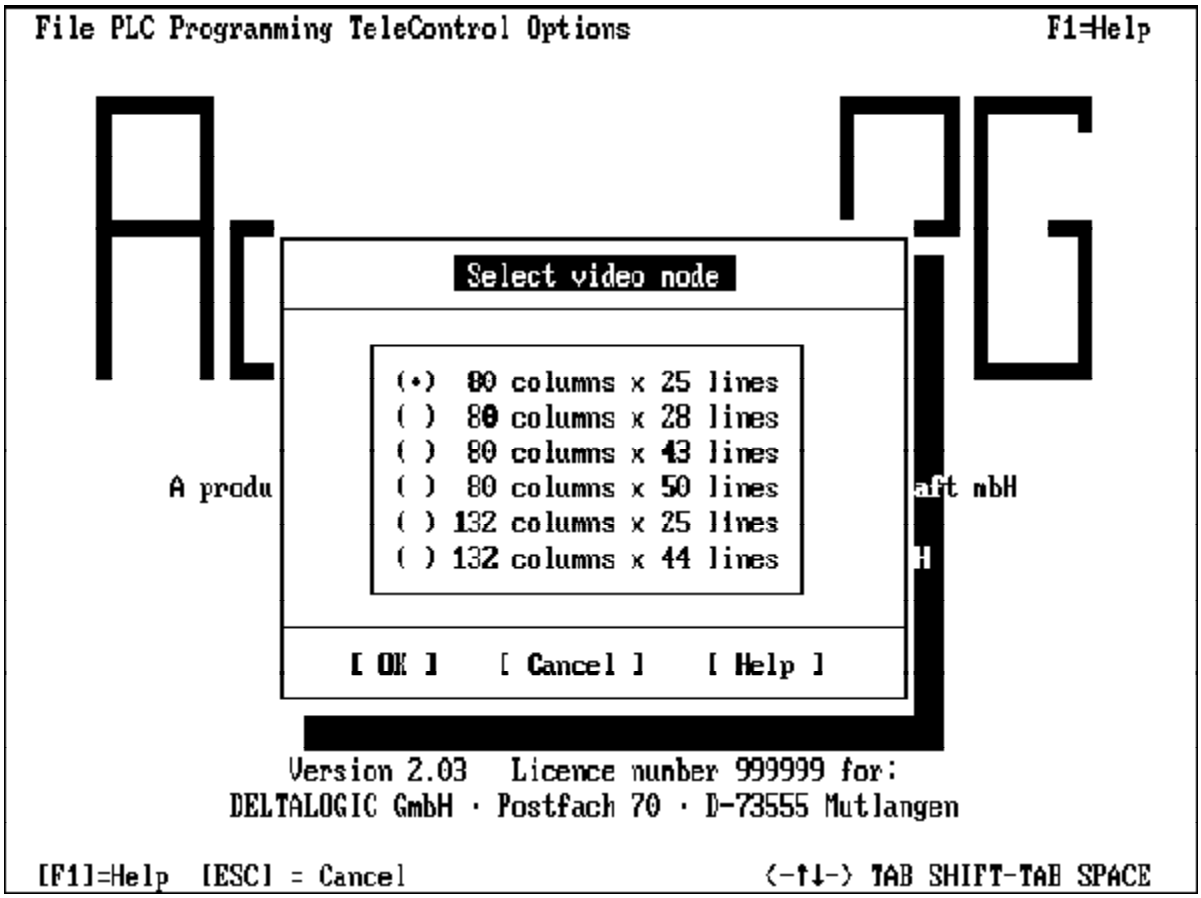

Fig. 6-7: The dialog box »Select video mode«

When using an extended video mode (e.g., a 132-column text mode supported by most EGA or VGA adapters), you have the possibility of displaying more information simultaneously on one screen. You can e.g.

display wider LAD and CSF segments completely on one screen page; in STL mode, you can display the line comment and the symbolic comment simultaneously. When running »Status blocks STL«, you can display the status information together with the line comment or with the symbolic comment simultaneously.

6.7 Other settings

When selecting the menu command »Settings...« in the menu »Options«, the following dialog box appears:

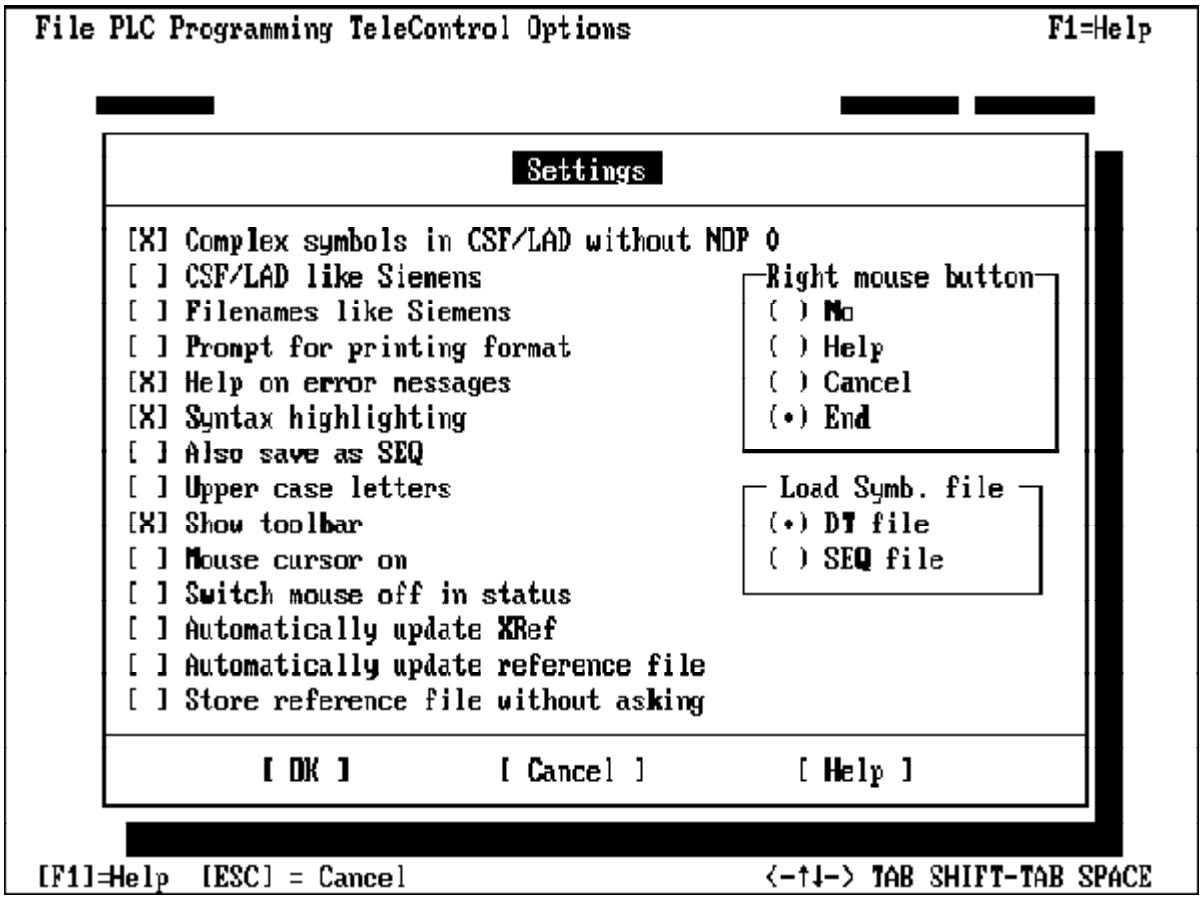

Fig. 6-8: The dialog box »Settings«

You can perform the following settings in this dialog box:

- complex LAD/CSF symbols without NOP 0s on/off,
- LAD/CSF Siemens-compatible on/off,
- filenames according to Siemens conventions on/off,

- automatically prompt for printing formats on/off,
- help on error messages on/off,
- syntax highlighting on/off,
- toolbar on/off,
- upper case letters on/off,
- save symbols files also as SEQ on/off,
- always display symbolic operands on/off,
- mouse cursor on/off,
- mouse off in status mode (yes/no),
- update XREF automatically ,
- update the reference file automatically ,
- saving the reference file without asking,
- function called when clicking the right mouse button,
- select the file to be loaded when activating the symbolic editor.

6.7.1 Complex symbols without NOP 0 in LAD / CSF

The Siemens PG software requires a NOP 0 (null operation) for each unactivated operand of a timer or counter in LAD or CSF. If you program a timer with unactivated operands (e.g. the Reset input is not activated) but without NOP 0s in STL, the Siemens PG software cannot translate the corresponding segment into LAD / CSF mode. As a consequence, programs written in LAD/CSF are unnecessarily large, slow (a null operation takes time!) and less readable.

ACCON-PG does not need these NOP0s. Tick this option if you want to save PLC memory and runtime. If you want your program to appear exactly as it appears on the Siemens PG, you should tick this option off. ACCON-PG will

then generate NOP0s for unactivated operands, and the Siemens PG and other STEP 5 programming systems can display your segments in LAD or CSF mode (otherwise, the software would switch into STL mode). You can let ACCON-PG insert and delete automatically these NOP 0s at any time, even when you are not in the editor (see the corresponding menu commands of the menu »Block« in the directory).

6.7.2 LAD / CSF Siemens-compatible

If this checkbox is ticked, the LAD resp. CSF editor of ACCON-PG behaves exactly like the Siemens PG software, i.e. you have to do without some improvements and extensions of ACCON-PG. On the other hand, you can ensure that the Siemens PG software is able to display your segments in LAD resp. CSF mode.

This option influences the following features of ACCON-PG:

- Segments wider than 80 characters will not be displayed, even if ACCON-PG could display them in a 132-column video mode.
- You cannot insert a further complex symbol at an input of an existing complex symbol if the input is not the "first" (counted top-down) input of the symbol.
- Only one complex symbol (timer, counter etc.) per LAD segment is allowed.

6.7.3 Filenames like Siemens

If this checkbox is ticked, the names of all files to be used with the STEP 5 software of Siemens have to obey the Siemens conventions for filenames. You should tick this checkbox, if you want to make sure that the Siemens

software can easily find your files correctly (Siemens software is not flexible with filenames at all). S5D files e.g. must be named »xxxxxxST.S5D« where »x« stands for any letter or digit.

6.7.4 Automatically prompt for printing formats

If this check box is ticked, the dialog box for specifying the printing formats appears automatically before each printing job is begun. If the check box is ticked off, always the same formats (specified using the menu command »Options / Printer configuration / Formats«) will be used.

6.7.5 Help on error messages

If this checkbox is ticked, you will get error messages in a window with an »[OK]« button. You can then confirm the message with the [↵] key or with the mouse. You can also press [F1] to get help on the specific error.

If this checkbox is ticked off, you will get the error messages in a window without error push buttons. The window will be closed automatically after 5 seconds or when a key is pressed. Furthermore, there is no help information available.

6.7.6 Syntax highlighting

If this check box is ticked, the different parts of a program will be shown in the editor using different colors. For example, labels, FB calls, symbolic names, comments etc. are shown in their own color.

If you are using a monochrome video adapter, the status of this checkbox is ignored.

6.7.7 Save symbols files also in the SEQ format

If the check box »Also save as SEQ« is ticked , a symbols file will not only be saved as a (ACCON-PG) specific ".DT" file, but also as a (Siemens) ".SEQ" file. When using the quick edit mode of the symbolic editor, the status of this check box is ignored. In this case, the symbols file will always be stored in the ".DT" format.

6.7.8 Upper case letters

Use this check box to specify the way in which commands and operands are displayed.

If the check box is ticked, commands and operands are always displayed in upper case letters, otherwise (check box is ticked off) they are displayed as you typed them in. This is necessary if you want to enter symbolic operands containing lower case letters.

6.7.9 Show toolbar

If this checkbox is ticked, the toolbar will be displayed in the STL resp. LAD resp. CSF editor at the bottom border of the screen. However, the toolbar is displayed only if a mouse is connected to your computer and the mouse is activated.

The STL editor has a one-line toolbar containing commands for cursor movement and selecting the segment comment (these commands can also be reached via the menu, but not that conveniently). In the LAD resp. CSF editor, you have a double-line toolbar containing most of the LAD resp. CSF symbols in addition to the commands of the STL toolbar.

You can select a symbol with the toolbar this way:

- Locate the cursor (using the mouse or the cursor keys) on the desired position (where the LAD resp. CSF symbol is to be inserted).
- Position the mouse cursor on the desired symbol in the toolbar and press the left mouse button. That symbol should then appear on the desired position, if the result of the whole operation is syntactically correct.

6.7.10 Mouse cursor on / off

Use this checkbox to switch the mouse cursor off (resp. on).

You should tick this checkbox when the mouse cursor is displayed not correctly in a high-resolution video mode of an "exotic" video adapter (the cursor may not be displayed at all, or displayed twice etc.).

This problem is caused by an outdated mouse driver. Try to get a new version.

6.7.11 Mouse off in status mode

Use this checkbox to switch the mouse off (resp. on) during the status functions. This is necessary if the mouse and the serial port to which the PLC is connected are using the same interrupt. This is true for Siemens PGs. If you do not tick this checkbox on a Siemens PG, the status scan breaks down as soon as you touch the mouse.

6.7.12 Automatically update XREF

If you want to use the online XREF function, it is recommended that you check this option so that the reference list will be updated each time you save your changes in an editor. The reference list keeps all occurences of all operands in a list. You can inspect that list in any block editor (STL, LAD, CSF) and directly go to any of these occurences.

If this option is activated, storing a block will take a slightly longer time.

6.7.13 Automatically update reference file

If this checkbox is ticked, the reference file and the PLC will be kept up-to-date synchronously. Each time you save your changes on the PLC, the reference file will also be updated. The reference file comments and contains information on data formats.

If an error occurs when storing a block in the PLC, the block will not be saved in the reference file. Blocks which are transferred to the PLC using the menu command "Copy" or "Import from...", will also not be saved in the reference file.

6.7.14 Store reference file without asking

If this checkbox is ticked, data formats and comments will be stored in the reference file without asking. If you tick the option »Automatically update reference file«, this will be done anyway; the state of this checkbox will be ignored in this case.

6.7.15 Function of the right mouse button

Use this radio button to specify which function to execute when pressing the right mouse button:

- No : No action.
- Help : Display context-sensitive help.
- Cancel : Cancel action in progress (equivalent to pressing Esc).
- End : Return to the last menu, e.g. from a block editor to the directory.

6.7.16 Load symbols file

With this radio button, you can specify the symbols file to be loaded when the symbolic editor is called.

Select "DT file" if you want to load the DT file. If you save the DT file without the SEQ file, the SEQ file (if existing) will no longer be up-to-date. If the SEQ file is saved together with the DT file, comment lines (those starting with a ';' in the first column) will be lost.

Select "SEQ file" if you want to load the SEQ file. If you save the SEQ file, the DT file will automatically saved together with the SEQ file; the only exception to this is when you select "Save as SEQ file".

If the SEQ file contains comment lines (those starting with a ';' in the first column), select "SEQ file"; the SEQ file will then stay up-to-date and the comment lines will not be lost. If you do not work with SEQ files, or you do not use comment lines, select "DT file".

6.8 Edit a footer

When selecting the menu command »Edit footer...«, the following file-selection dialog box appears:

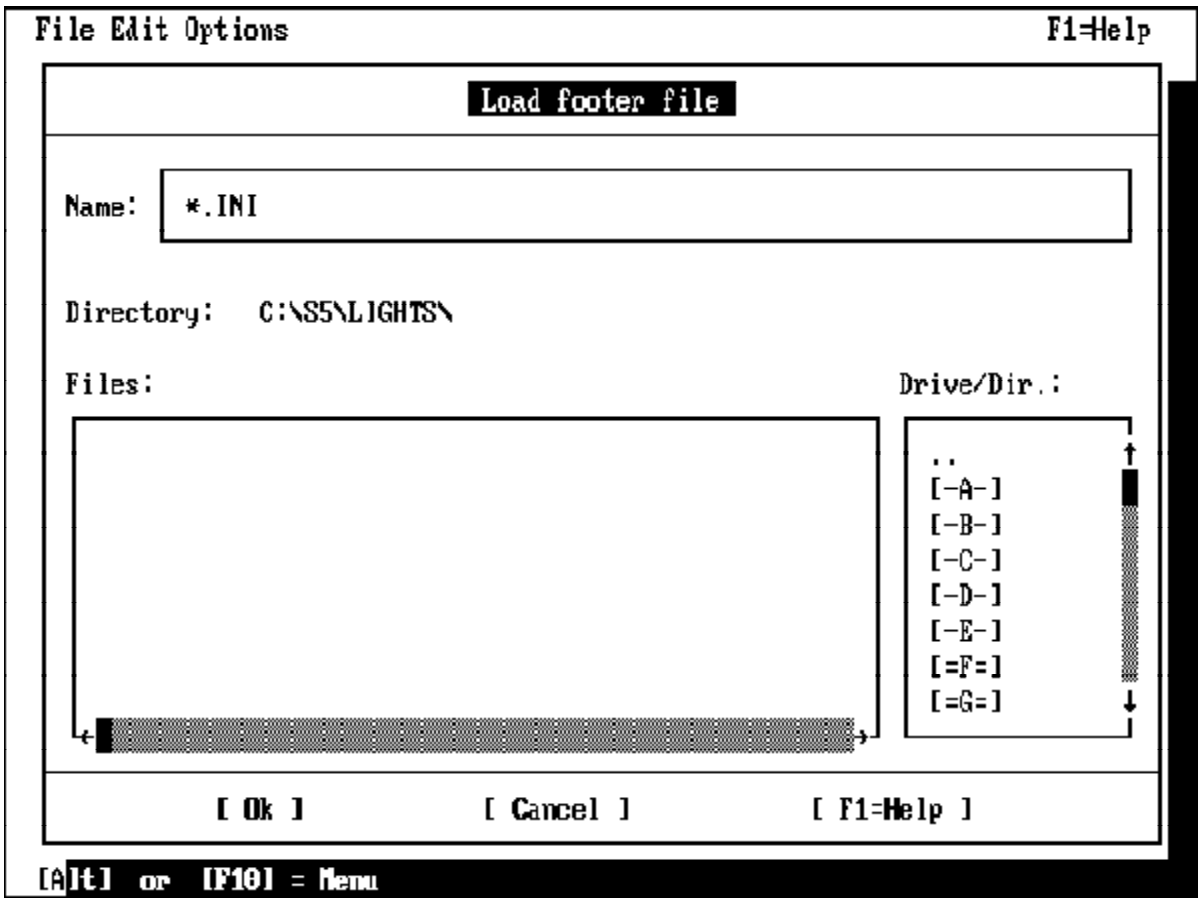

Fig. 6-9: The file-selection dialog box »Load footer file«

You can now load an existing footer file into the footer editor, or enter a new filename to create a new footer file. In our example, the footer file »DEMO.INI« does not yet exist. When entering »DEMO.INI« into the text input field

»Name« and confirming your input, a dialog box appears (as shown in the next figure) in which you can select a footer width of 80 characters or of 132 characters per line or cancel the action.

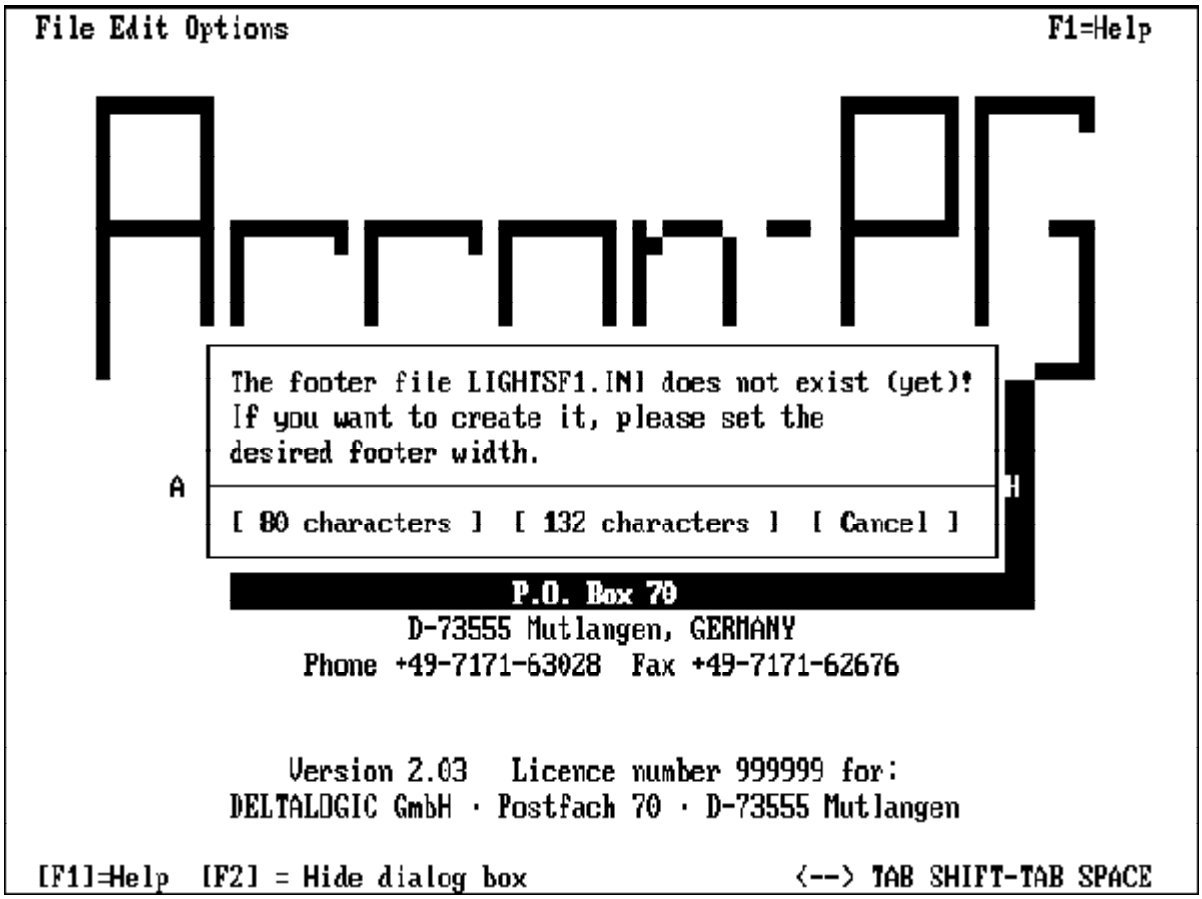

Fig. 6-10: The dialog box »Footer width«

After selecting a footer width of 80 characters, an »empty« footer will be displayed (as shown in the following figure).

```
 File Edit Options                                                F1=Help
80 character footer file   : LIGHTSF1.INI

 A C C O N - P G

 Job identifier:                  Date:
 Plant:                           Modification:                  PAGE
 Plant pos. number:               Name:

 [Alt]  or  [F10] = Menu   Over
```

Fig. 6-11: An empty footer

In fig. 6-12, an example of a footer is given. If you complete your work now and save the footer file, the footer is available in the future and can be selected to be the current footer using the menu command described in the next section.

```
 File Edit Options                                                F1=Help
80 character footer file   : LIGHTSF1.INI

 A C C O N - P G

 Job identifier:    1234-5678-90        Date:          30.09.1994
 Plant:             08/15               Modification:                PAGE
 Plant pos. number: Crssg. B27/K2531    Name:          Kurt Bachmann

 [Alt]  or  [F10] = Menu   Over
```

Fig. 6-12: Footer example

In chapter 14, the footer editor is described in detail.

6.9 Select a footer file

You can select one of the existing footer files as the current footer file using this menu command. The file-selection dialog box shown in fig. 6-13 appears from which you can select any of the existing footers. The selected footer file will be loaded when a printing job is executed, and the footer will be printed at the bottom of each page. You can suppress the printing of a footer by ticking off the corresponding check box in the printing options.

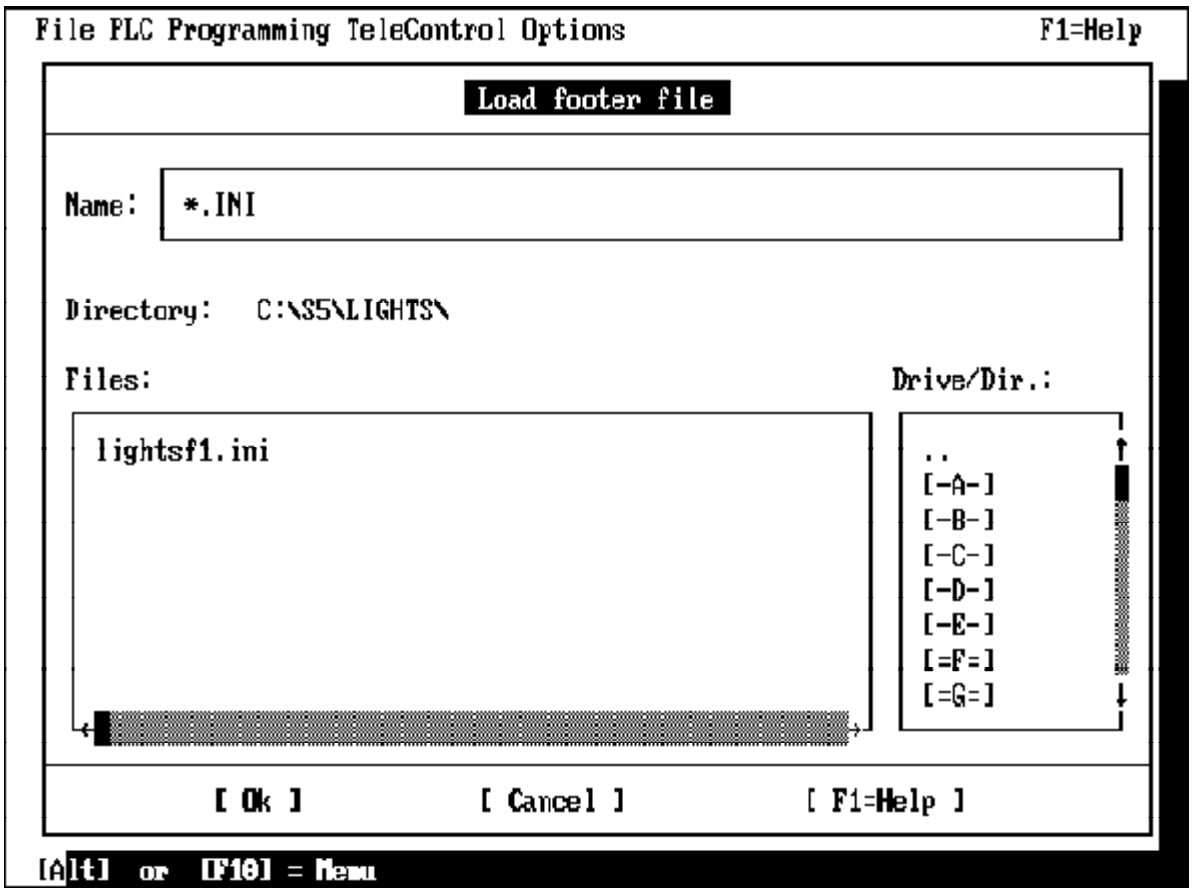

Fig. 6-13: The file-selection dialog box »Load footer file«

6.10 Select a printer file

Use the menu command »Printer file...« to select the printer configuration file to use for printing jobs. The file-selection dialog box »Select printer file« (shown in the following figure) appears from which you can select a printer file.

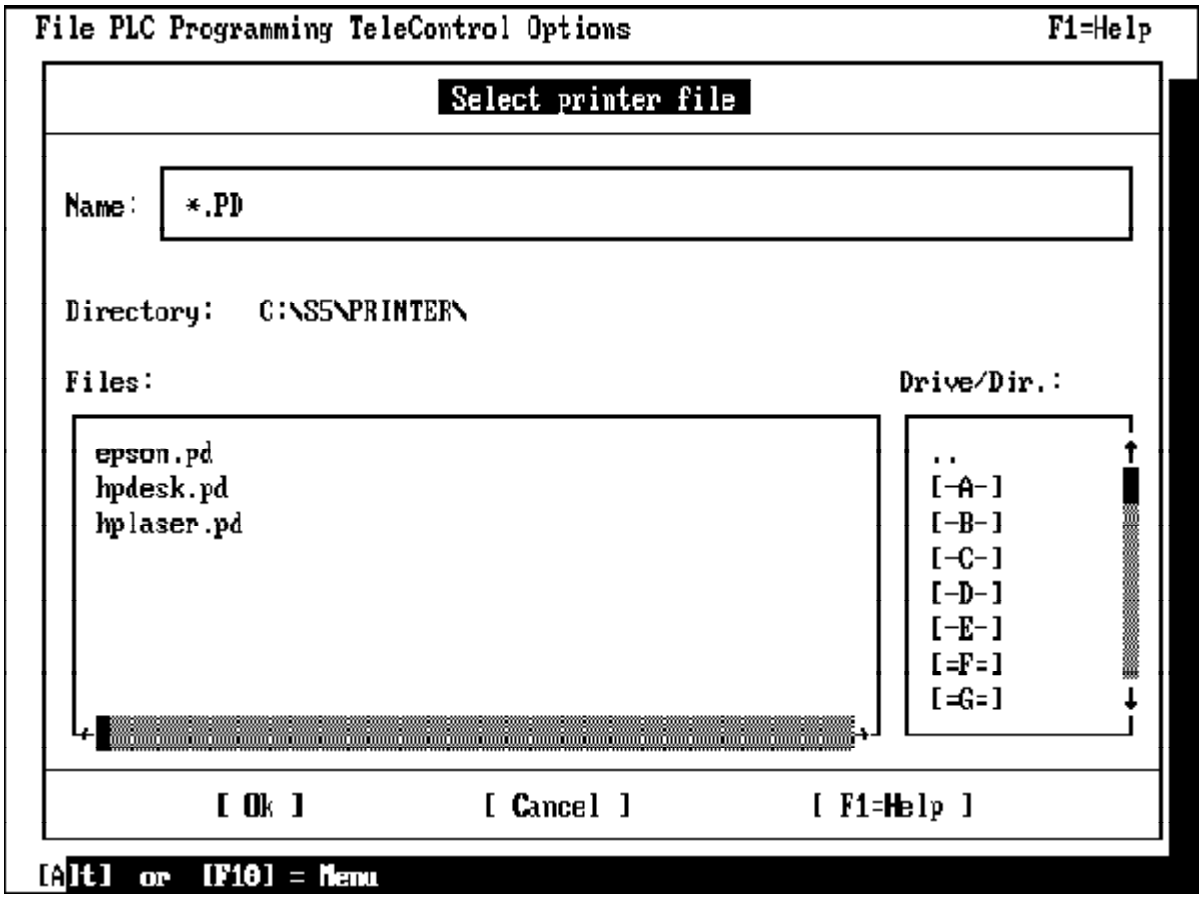

Fig. 6-14: The file-selection dialog box »Select printer file«

The printer configuration file contains various control sequences and printing parameters, e.g. the control sequence for printing in condensed mode, the printer port number, ...

In our example, the printer files »EPSON.PD« and »HPLASER.PD« delivered with ACCON-PG are displayed in the file list.

To create a new printer file, you have to select the menu command »Printer configuration...«, which is described in the following section.

6.11 Printer configuration

Using the menu command »Printer configuration...«, you can adapt ACCON-PG to your specific printer. The file-selection dialog box »Select printer file« is opened, and the existing printer files are displayed. You can modify one of the existing files, or create a new file by simply entering a new file name.

If e.g. the lines of a LAD or CSF segment or of the footer are printed using exotic characters although the IBM character set has been activated, the following initialization sequence solves this problem on LaserJet-compatible printers: "1B, 28, 31, 30, 55".

In our example, we do not yet have many printer files. When creating a new printer file, you should assign a reasonable name to it, i.e. take the name or the type of the printer as the printer name. If you want to create a new printer file for e.g. the »Mannesmann Tally« printer, the name »TALLY.PD« seems appropriate (see fig. 6-15).

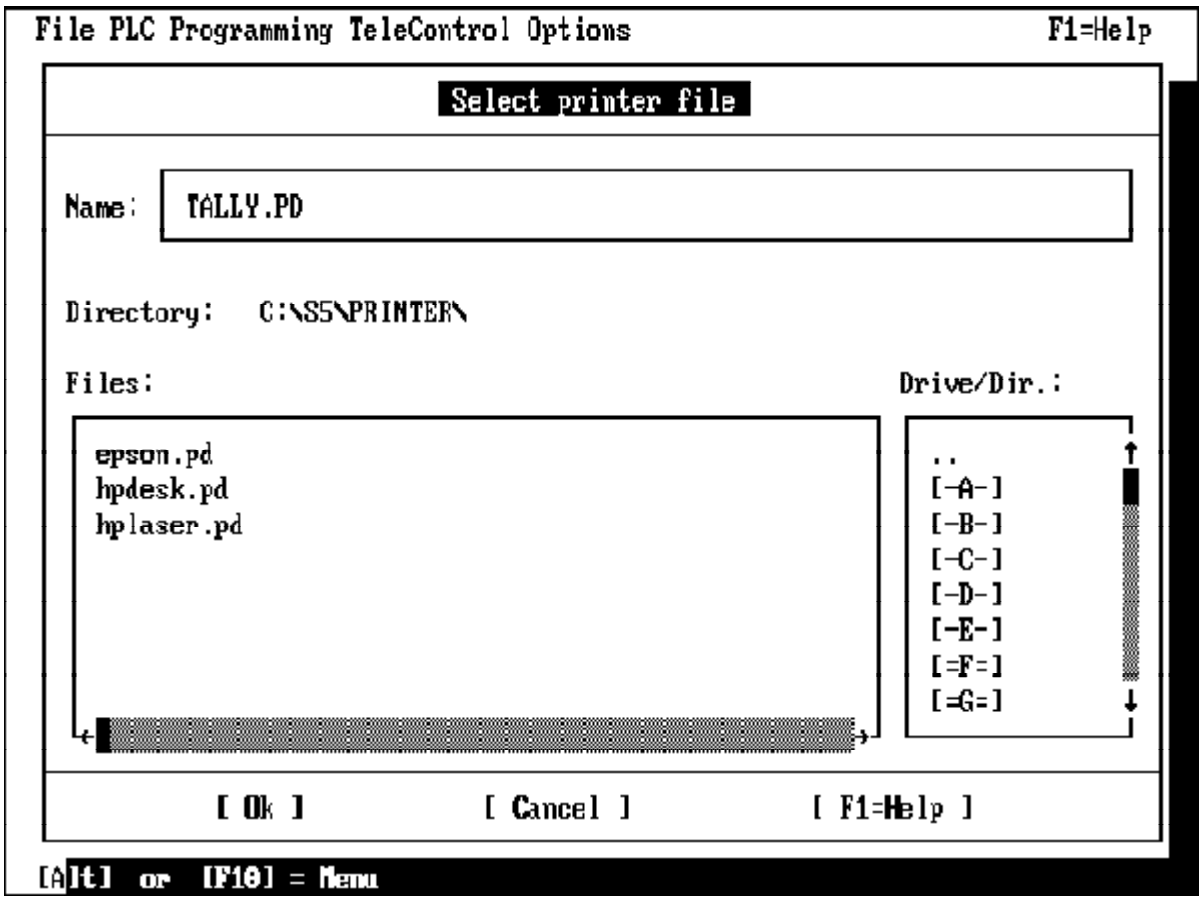

Fig. 6-15: The file-selection dialog box »Select printer file«

After entering a new name, another dialog box appears according to figure 6-16. You are expected to confirm the creation of a new printer file.

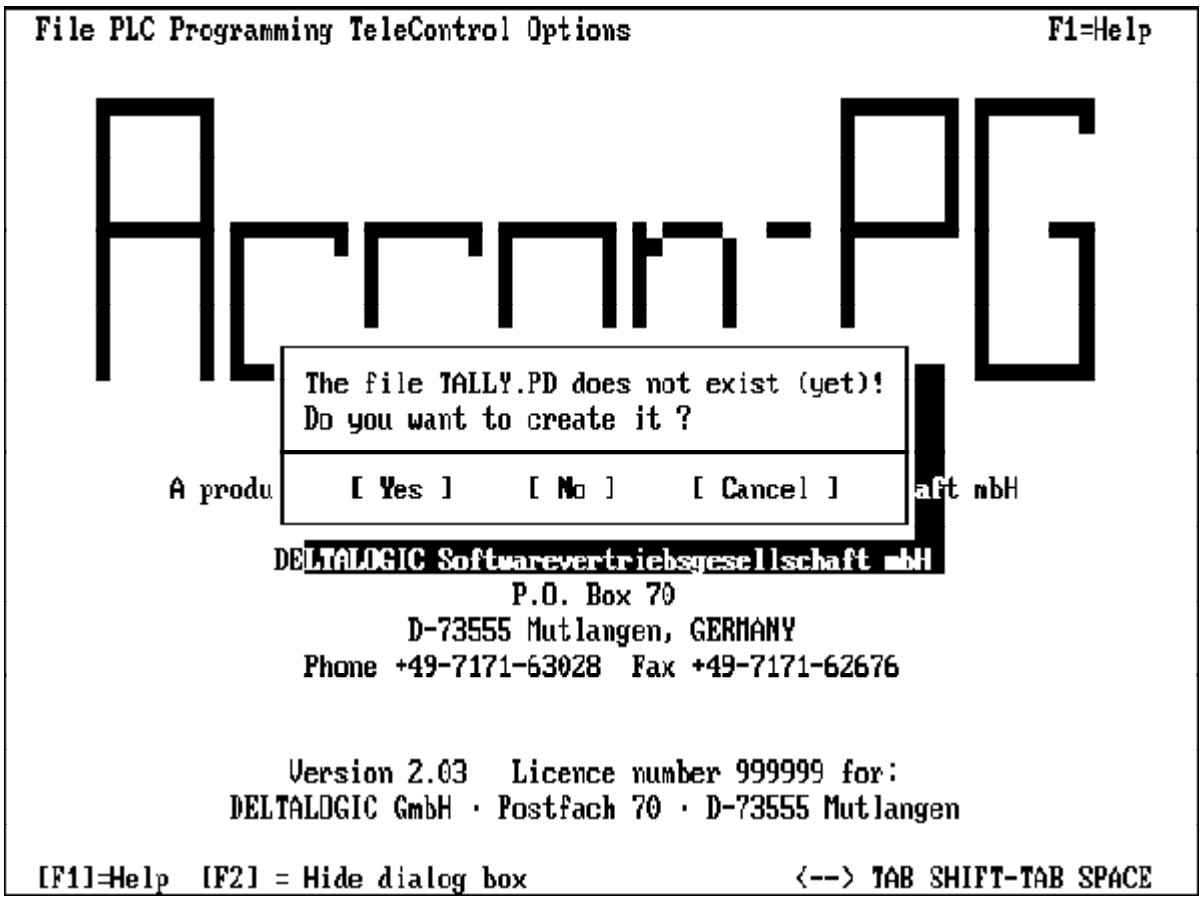

Fig. 6-16: The dialog box for confirming the creation of a new printer file

After confirming, the dialog box »Printer configuration« appears (as shown in fig. 6-17). In this dialog box, you can specify the printer-specific commands for setting margins or the printer port etc.

```
File PLC Programming TeleControl Options                    F1=Help

                      Printer configuration

        General                    Device          Character set
 Printer name :                  (•) LPT 1        (•) IBM
 Left margin  :   0 chars        ( ) LPT 2        ( ) ASCII
 Lines/page   :  66 lines        ( ) LPT 3
                                 ( ) File
[X] Form feed
[ ] Control sequences in file
            Printer commands (e.g.: 1B,52,02,4b)
 Start sequence:
 End sequence  :
 Bold on       :
 Bold off      :
 10 cpi        :
 12 cpi        :
 17 cpi        :

     [ OK ]     [ Cancel ]     [ Help ]     [ Format... ]

[F1]=Help  [ESC] = Cancel                  <-↑↓-> TAB SHIFT-TAB SPACE
```

Fig. 6-17: The dialog box »Printer configuration«

In addition to specifying the printer-specific commands, you can open the dialog box »Printing format« by clicking on the push button [Format...]. In this dialog box, you can specify the way in which your project appears on paper:

This includes specifying

- the page width,
- when to perform a form-feed,
- the representation mode used for printing,

- how to print the segment comment,
- whether to print a symbolic list,
- whether to print symbolic operands in bold type,
- whether to print a footer.

Some options are relevant only for printing in STL mode:

- whether and how to print comments,
- whether and how to print line numbers,
- how to print operands.

The dialog box »Printing format« is shown in the next figure.

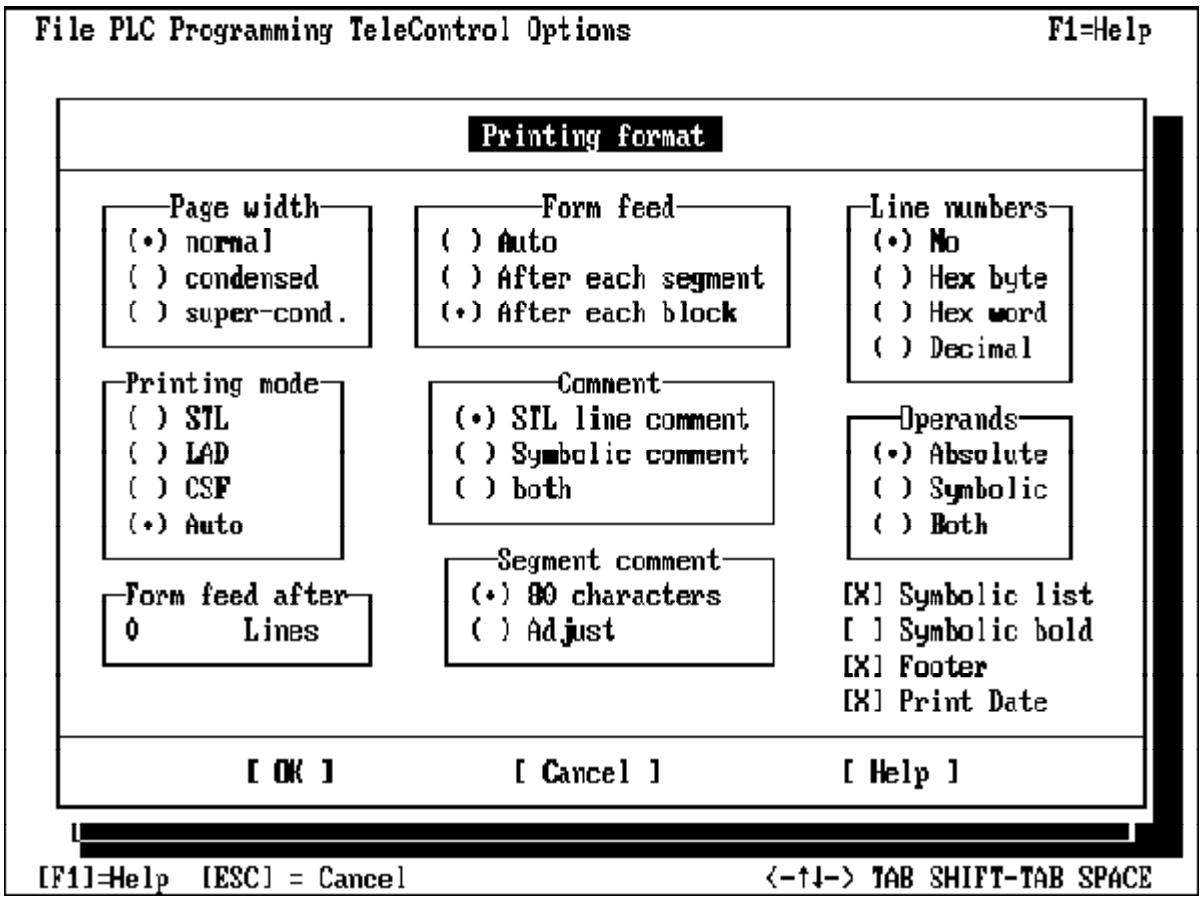

Fig. 6-18: The dialog box »Printing format«

When you have done all the specifications, store them into the printer file which can be selected now using the menu command »Select printer file...«.

Chapter 7:

The Directory

Overwiew

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7.1 Starting the directory

The directory plays a central role in ACCON-PG. You can access all important functions (described in the following) from the directory.

When the starting screen of ACCON-PG is displayed, you can select one of the editors from the menu »Programming«, e.g. the STL editor. Then, you will be in the directory. If a program file has been loaded during your last ACCON-PG session, this file will automatically be loaded again now. The directory will display the blocks of this file (or it will be empty). Locate the cursor bar on the desired block, and select »Edit« from the menu »Block« to load this block into the (e.g. STL) editor. Other possibilities to do this: double-clicking on the name of the desired block, or pressing [↵] when the cursor bar is on the block name.

You can perform a quick search for a certain block in the directory by simply typing its name. You will see a small window in the top left corner of the screen. This window serves for controlling your input. Each time you type in a new letter, the cursor bar will be positioned on the first block in the directory whose name matches your input. You can use the [←] key to correct your input. Remember that the name of a DOC block must start with a "#".

You can leave the block editor with the hotkey [Alt] + [F4] and return to the directory. If you have not yet saved your changes, you will be asked whether to save and exit, or to exit without saving, or to stay in the editor without saving.

The directory will now appear on the screen. You can also assign the function »End« to the right mouse button, i.e. you can e.g. return from a block editor to the directory with one single mouse-click.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

                    Directory of LIGHTSST.S5D

   PB   10
   PB   11
   OB    1
   OB   21
   OB   22
   PC   10
   PC   11

[Alt]  or  [F10] = Menu
```

Fig. 7-1: The directory

The menu of the directory is described in the following section.

7.2 File operations

The menu »File« provides functions for creating a new file, for opening an existing file or for leaving the directory and returning to the editor.

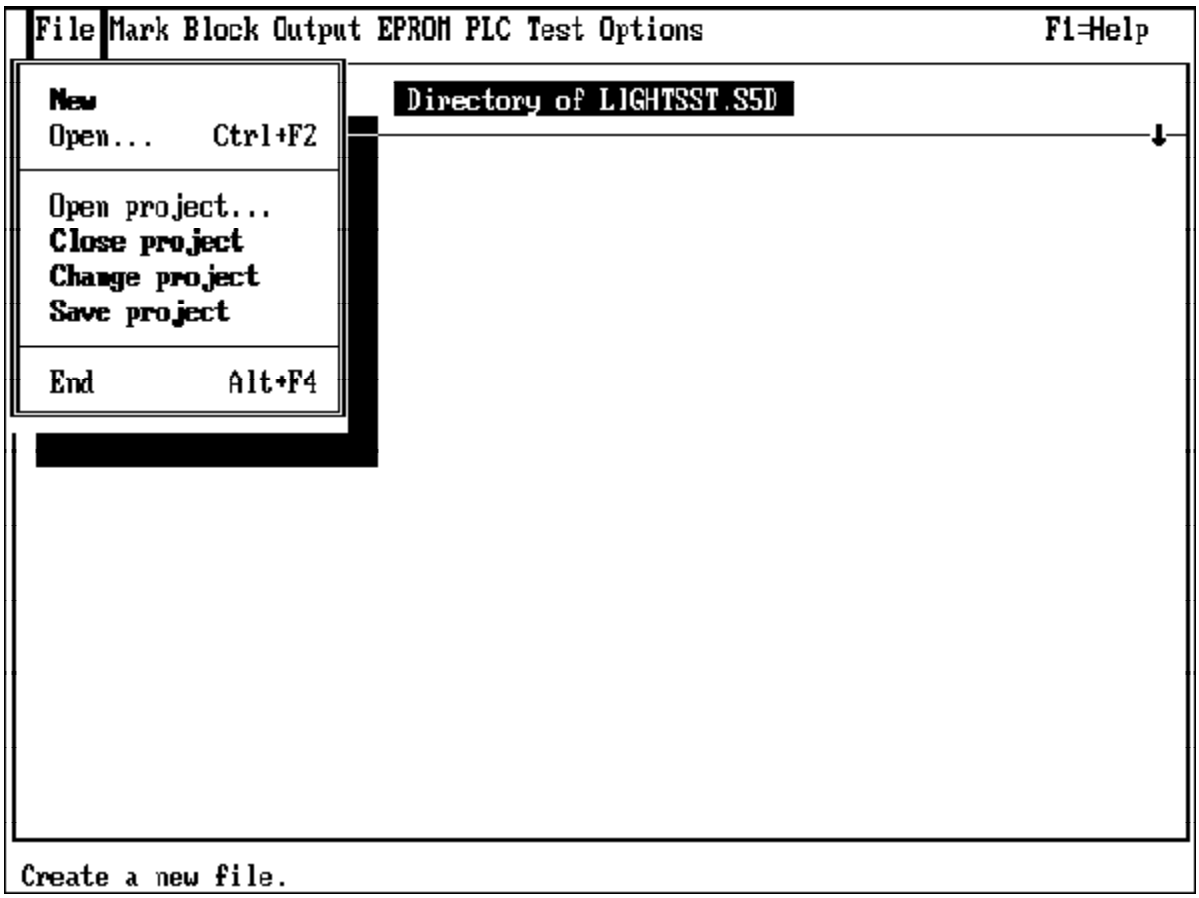

Fig. 7-2: The menu »File« in the directory.

7.2.1 Create a new file

You can create a new program file by selecting the menu command »New«. If another file has already been opened, it will be closed before the new file will be created. You will now see the empty directory on the screen. A filename has not been selected yet.

7.2.2 Open a file

After selecting the menu command »Open«, a file-selection dialog box will appear in which all existing »*.S5D« files are listed. You can now type the complete name (including the path) of the file to be loaded, or select the desired file from the list boxes »Files« resp. »Drives/Dir.:«. You can also open this file-selection dialog box with the hot key [Ctrl] + [F2].

If you want to read blocks from the PLC memory rather than from a file, you have to select »PLC« from the list box »Files«.

7.2.3 Open a project

You can open a new or an existing project by selecting the menu command »Open project« (if another project has already been opened, it will first be closed).

All settings and the names of all the files that belong to your project are stored in the project (file).

To create a new project, simply enter a new name in the file-selection dialog box that appears. In this case, the current filenames are entered into the project.

After the project has been opened, a window appears with the current settings. You can make these settings and the filenames valid by confirming the window.

7.2.4 Close a project

You can close the current project by selecting the menu command »Close project«.

All settings and the names of the files that had been valid before the project was loaded are restored.

7.2.5 Change a project

You can change the current project settings by selecting the menu command »Change project«.

7.2.6 Save a project

You can save the current project settings by selecting the menu command »Save project«.

7.2.7 Exit from the directory

You can leave the directory by selecting the menu command »End« resp. typing the hot key Alt + F4. You will return to the main menu of ACCON-PG.

7.3 Mark program blocks

You can mark or unmark the program blocks listed in the directory using the menu command »Mark«. Most of the menu commands in the menus »Block« and »Output« of the directory refer to the marked program block(s). If you want to e.g. transfer or delete several blocks, you can first mark these blocks and then call the corresponding function once.

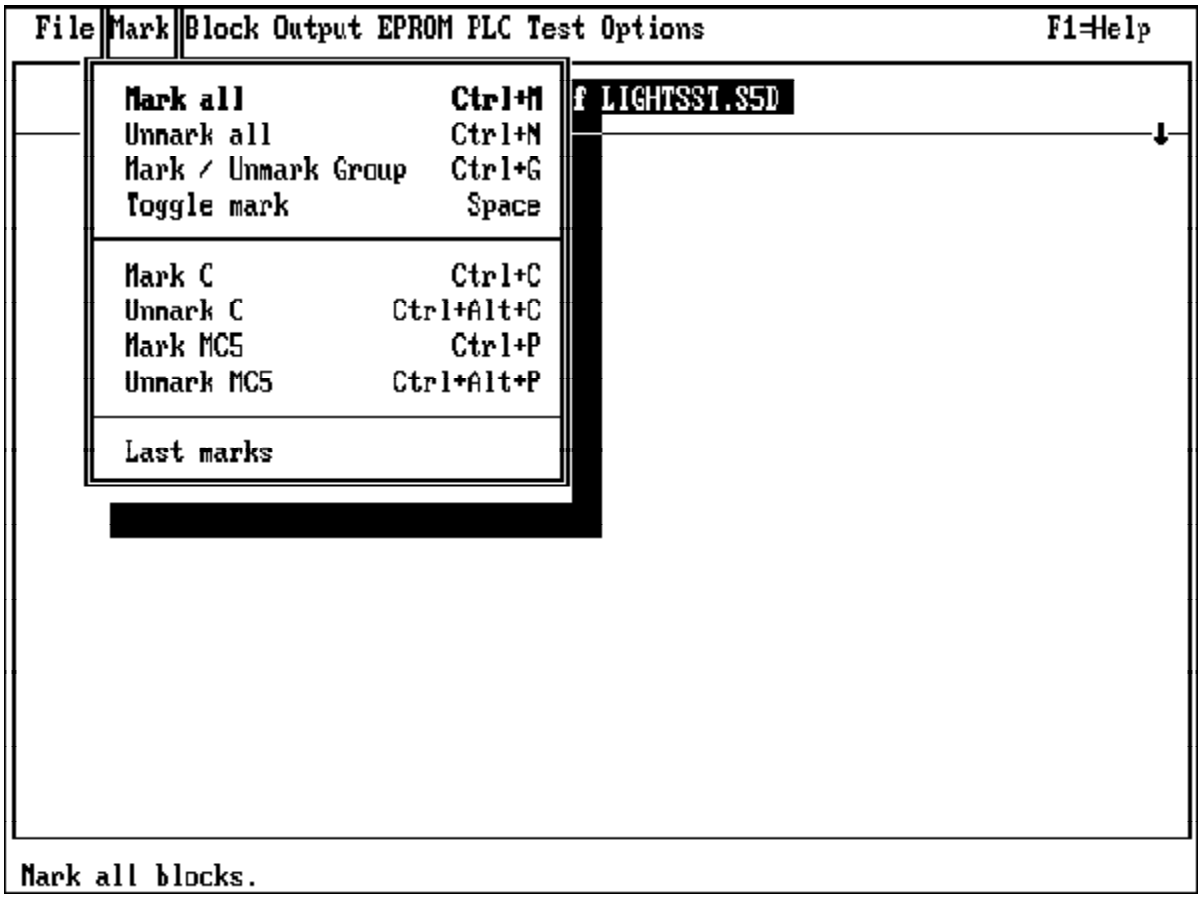

Fig. 7-3: The menu »Mark« of the directory.

7.3.1 Mark all blocks

You can mark all blocks listed in the directory with the menu command »Mark all« resp. with the hot key Ctrl + M. A tick is displayed before the name of each marked block. If an edit function is called now, it will be carried out with each marked block.

7.3.2 Unmark all blocks

You can unmark all blocks listed in the directory with the menu command »Unmark all« resp. with the hot key Ctrl + N. The tick displayed before the name of each marked block will be removed.

7.3.3 Marking/Unmarking a group of blocks

Selecting the menu command »Mark / Unmark group« resp. typing the hot key Ctrl + G causes all listed blocks of the type being currently selected (e.g. all program blocks, PBs) to be marked or unmarked for the following editing operations.

If e.g. an unmarked FB is selected, all FBs in the directory will get marked. If a marked DB is selected, all DBs in the directory will get unmarked.

7.3.4 Toggle block marks

Selecting the menu command »Toggle mark« resp. using the Spacebar causes the selected block to be marked or unmarked for the following operations. That means, the "marking state" of that block is inverted. Then, the marking bar goes on to the next block so that you can quickly and easily mark or unmark a whole group of blocks.

7.3.5 Mark all comment blocks

You can mark all comment blocks (i.e., all C blocks) with the menu command »Mark C« resp. with the hot key Ctrl + C. The "marking state" of single MC5 blocks (OB, PB, FB, FX, SB, DB and DX) is not changed by this operation.

7.3.6 Unmark all comment blocks

You can unmark all comment blocks (i.e., all C blocks) with the menu command »Unmark C« resp. with the hot key Ctrl + Alt + C. The "marking state" of single MC5 blocks (OB, PB, FB, FX, SB, DB and DX) is not changed by this operation.

7.3.7 Mark all program blocks

You can mark all program blocks (i.e., all MC5 blocks) with the menu command »Mark MC5« resp. with the hot key Ctrl + P. The "marking state" of single comment blocks is not changed by this operation.

7.3.8 Unmark all program blocks

You can unmark all program blocks (i.e., all MC5 blocks) with the menu command »Unmark MC5« resp. with the hot key Ctrl + Alt + P. The "marking state" of single comment blocks is not changed by this operation.

7.3.9 Restore the last marks

You can restore the state before the last marking operation with the menu command »Last marks«.

When you have just transferred a group of blocks to another file or to the PLC, you can restore the same marks and e.g. compare the same blocks to the blocks in another file.

7.4 Block operations

The menu »Block« contains functions for working with the blocks listed in the directory. You can load a selected file into the editor, or copy the selected block(s) to another file etc.

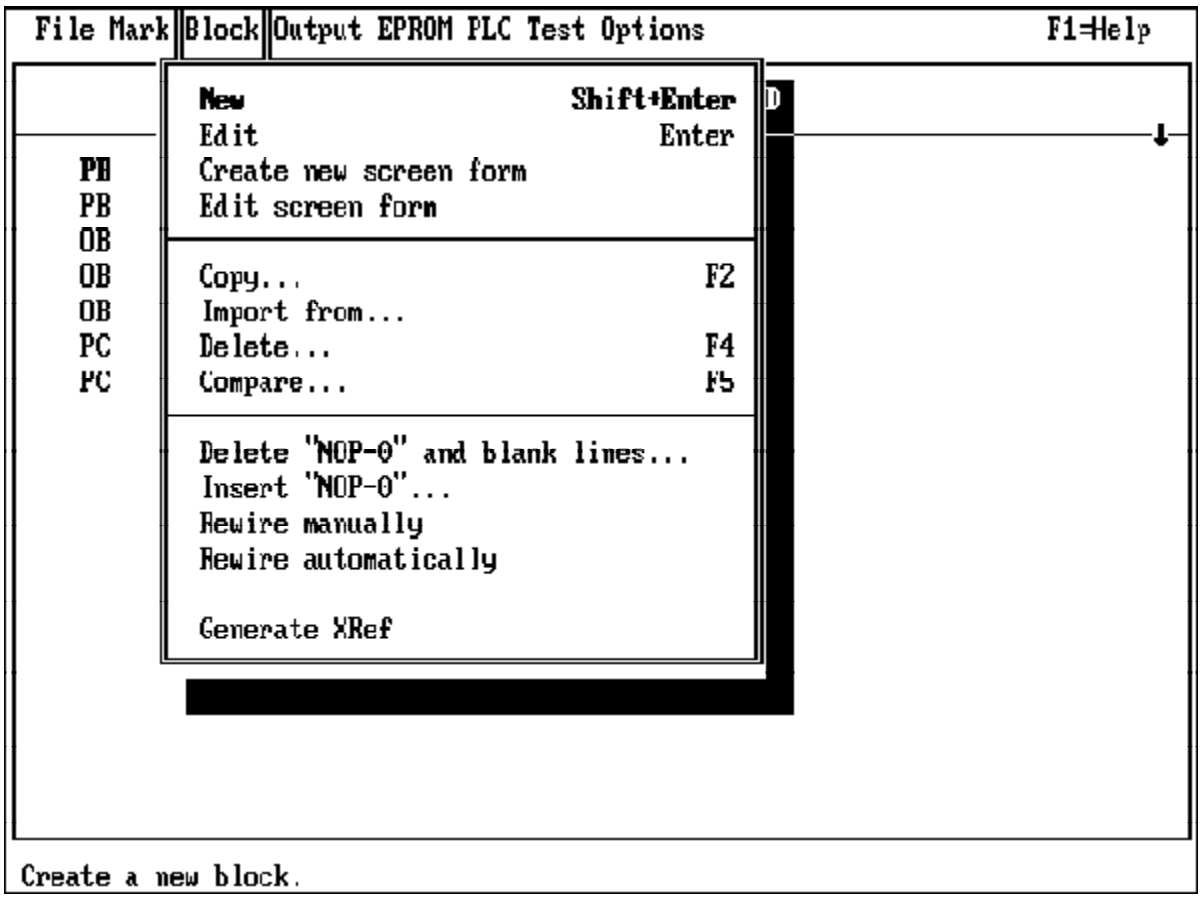

Fig. 7-4: The menu »Block« of the directory.

7.4.1 Creating a new block

Selecting the menu command »New« resp. typing the hot key Shift + ↵ causes a dialog to be opened in which you can specify the type and the number of the block to be created. If your entry is valid, the editor will be activated. If the specified block does already exist, you will be asked whether you want to edit the existing block or select another block. If a DOC block is to be created, you have to enter a "#" as the first character followed by up to 8 arbitrary characters.

The DOC block editor is described in detail in chapter 13.

7.4.2 Edit a block

Selecting the menu command »Edit« causes the selected block to be loaded into the editor. It is sufficient to select the block and then press ↵. The block has to be a MC5 block or a comment block.

7.4.3 Create a screen form DB

Selecting the menu command »Create new screen form« causes a dialog box to appear in which you can specify the data block and the type of the form DB to be created. In the next dialog box, you can perform the necessary settings. Use the F1 key to get help on a specific field. You will then get to the screen form DB editor.

You can get more information from the manuals for the PLC 135U resp. 155U, or from chapter 9.

7.4.4 Edit a screen form DB

Selecting the menu command »Edit screen form« loads the selected block into the screen form DB editor if the block is a screen form DB. ACCON-PG recognizes the type of the form DB automatically. If the block is not a form DB, an error message appears.

You can get more information from chapter 9.

7.4.5 Copying blocks

You can copy one or several selected resp. marked blocks to another file using the menu command »Copy...« resp. the hot key F2.

The file-selection dialog box »Destination file« will be opened in which you can specify the name of the file the blocks will be copied to. Use the key F3 to open a file-selection dilaog box. The box contains the push button [Options...] for specifying the parameters for the copying operation. The dialog box »Options block transfer« appearing now contains a radio button and a check box. Use the radio button to specify whether to copy the blocks with or without their corresponding comment blocks, or to copy only the comment blocks. Use the check box to specify whether the dialog box »New block number(s)« will appear before each block being copied. If the blocks are going to be duplicated within the current file, this dialog box will appear in every case, even if this check box is ticked off. The dialog box serves for assigning a new block number to a block. The number has to be confirmed.

If the block already exists in the destination file, a warning message appears. You will then have to decide whether to overwrite the existing block, to overwrite this block and all other blocks existing already, to leave the block unchanged, or to cancel the whole copying operation.

7.4.6 Importing blocks

The menu command »Import from...« enables you to select single blocks from another file or from the PLC memory and to copy them to the current file. A file-selection dialog box appears in which you have to select the source file from which the blocks will be imported. Finally, you will be asked to specify the block in the destination file which is to be inserted to the current project. This command is the counterpart of the menu command »Copy«.

7.4.7 Delete a block

You can delete the selected block resp. the marked blocks from the current file or the PLC memory with the menu command »Delete...« resp. the hot key [F4]. The dialog box »Delete blocks« will appear containing a radio button. Use this radio button to specify whether to delete the blocks with or without their corresponding comment blocks, or to delete only the comment blocks. After confirming the entries with »OK«, the selected blocks will be deleted without further precaution.

7.4.8 Compare blocks

You can compare the selected block resp. the marked blocks to the blocks of another file using the menu command »Compare...« or the hot key [F5].

The dialog box »Compare file« appears in which you can enter the name of the second file into the input field »Name«. The marked blocks will be compared to the blocks of the second file. The found differences will be displayed in a list that can be sent to the printer. The lines containing differences are disassembled (as far as necessary) and displayed (in STL form). That means:

- parameters of FB/FX definitions and calls are displayed in hex form

- with FB/FX calls, no names or parameter names are displayed
- targets of jump operations are displayed in hex form
- with FB/FX calls, different parameters are marked by an exclamation mark in the leftmost address column.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

 Compare file LIGHTSST.S5D to LIGHT1ST.S5D

 PB 10 in LIGHTSST.S5D                PB 10 in LIGHT1ST.S5D
Segment 1:
 0000 :  A   I 14.0                   0000 :  A   I 32.0
 0001 :  A   Q 18.0                   0001 :  A   Q 32.0
 0003 :  AN  Q 18.0                   0003 :  AN  Q 32.0

Segment 2:
 000B :  S   Q 18.0                   000B :  S   Q 32.0
 000C :  S   Q 18.1                   000C :  S   Q 32.1


---- Result of comparison of LIGHTSST.S5D and LIGHT1ST.S5D ----

In PB 10  : 5 difference(s).

          [ Cancel ]          [ Print ]          [ F1=Help ]

[Alt]  or  [F10] = Menu
```

Fig. 7-5: The result of a Compare operation

7.4.9 Delete NOP 0 and blank lines

Use the menu command »Delete NOP 0 and blank lines« to remove lines with NOP 0 operations and empty lines from the selected/marked blocks. This operation will make your program smaller and faster having still the same functionality. Note that the Siemens PG software is not able to display segments in LAD/CSF where these NOP 0s are missing; the software will automatically switch into STL mode.

You cannot destroy anything by executing this menu command. The NOP 0s can be inserted again.

In the appearing dialog box, you select whether you want to delete also blank lines and comment lines (lines containing a comment but not a command). Attention: these lines will be lost forever when executing the delete operation.

7.4.10 Insert NOP 0s

Use the menu command »Insert NOP 0s« to insert NOP 0 operations into the program text. This serves for compatibility with other programming systems which need these NOP 0s for translation into CSF/LAD mode. With ACCON-PG, you need not have these NOP 0s (so you get smaller and faster programs). On the other hand, you can insert the necessary NOP 0s if you want to be able to display a CSF/LAD segment (created by ACCON-PG) with e.g. the Siemens PG software.

7.4.11 Rewire manually

This menu command lets you rewire the marked blocks manually, e.g. replace I 3.4 by I 4.5 in all marked blocks. A dialog box is displayed in which you can enter up to 16 pairs of operands. Enter the operand to be replaced into the input field »Old operand«, and the new operand in the field right from it.

7.4.12 Rewire automatically

Use the menu command »Rewire automatically« to rewire the marked blocks according to two corresponding symbols files. For each operand to rewire, these files must contain the same symbolic name but different names for the absolute operand.

Example:

The first symbols file contains:

I 1.0 Temp 1

I 1.1 Temp 2

and the second symbols file contains:

I 10.0 Temp 1

I 10.1 Temp 2,

so each appearance of I 1.0 is replaced by I 10.0, and each appearance of I 1.1 is replaced by I 10.1 (in all marked blocks). The number of rewiring operations is not limited.

The currently active S5D file is used as the source file for this operation. The currently active symbols file is given as an initial value in the input field for the symbols source file. The S5D resp. symbols destination files must be specified by the user. You can choose the S5D source and destination file to be identical; thereby, you can rewire the current S5D file.

7.4.13 Creating an XREF list

The menu command »Generate XREF« lets you create a cross-reference list on all blocks of the current project. You need not mark any blocks. This list contains all occurences of all operands and is going to be stored in files with the extension ».QVL« resp. ».NXQ«. These files are also used for displaying the Cross-Reference List.

In any block editor (STL, LAD or CSF), you can view all occurences of an operand using the menu command »Search/XREF«. You can directly jump to such an occurence and return to the place where you came from.

7.5 The output functions

The menu »Output« contains commands for documenting your project.

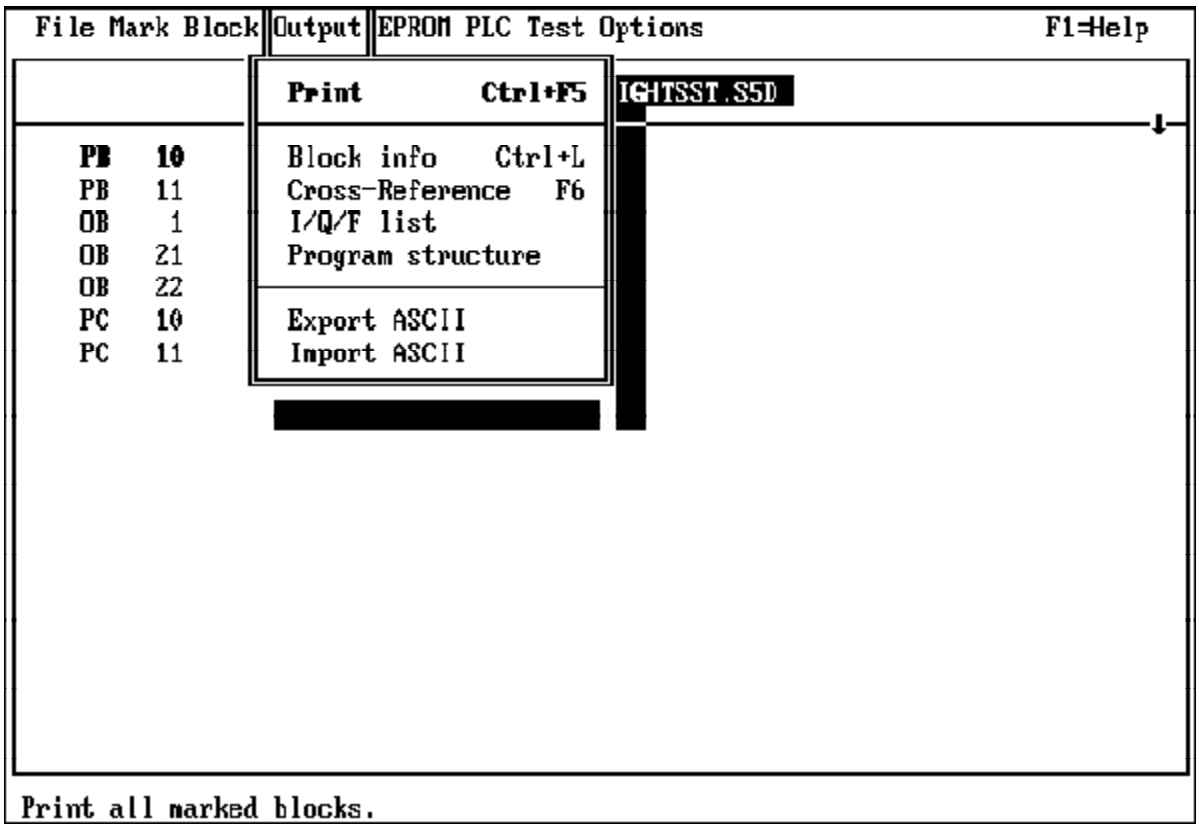

Fig. 7-6: The "Output" menu in the directory

7.5.1 Print a block

You can print the marked blocks of the current program file resp. the PLC using the menu command »Print« or the hot key Ctrl + F5. The current printer settings are used for the printing job.

7.5.2 Block list

The menu command »Block list« resp. the hotkey Ctrl + L gives you more information on the marked blocks, including block length, address (in the PLC memory), LIB number and the name (FBs only). If the symbolic support is turned on, the symbolic name and comment are also displayed (this may appear in the next line, depending on the video mode).

7.5.3 The Cross-Reference list

The menu command »Cross-Reference list« resp. the hot key F6 lets you create a cross-reference list on the marked blocks. This list is stored in files with the extension ».QVL« resp. ».NXQ«. These files are also used for the online XREF function. You can choose between a detailed Cross-Reference list and a short overview, and you can go to any occurence of an operand using the push button »Go to«. The push button »Search« lets you search for a specific operand.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

                    Cross-reference list

 ∫ PB   1  Inputs
 ∫ PB   1  I 14.0    : PB 10 (Sg 1,L 1)          A   I 14.0
 ∫ OB
 ∫ OB   2  Outputs
 ∫ OB   2  Q 18.0    : PB 10 (Sg 1,L 2)          A   Q 18.0
   PC   1              PB 10 (Sg 1,L 4)          AN  Q 18.0
   PC   1              PB 10 (Sg 2,L 11)         S   Q 18.0
                       PB 11 (Sg 1,L 1)          A   Q 18.0
                       PB 11 (Sg 1,L 7)          R   Q 18.0
                       PB 11 (Sg 3,L 18)         AN  Q 18.0
                       PB 11 (Sg 3,L 23)         S   Q 18.0
                       OB 21 (Sg 1,L 3)          S   Q 18.0
                       OB 22 (Sg 1,L 3)          S   Q 18.0
             Q 18.1  : PB 10 (Sg 2,L 12)         S   Q 18.1
                       PB 11 (Sg 1,L 2)          A   Q 18.1
                       PB 11 (Sg 1,L 8)          R   Q 18.1
                       PB 11 (Sg 2,L 14)         S   Q 18.1

             [ Cancel ] [ Print ] [ Search ] [ Go to ] [ F1=Help ]

[Alt]  or  [F10] = Menu
```

Fig. 7-7: The detailed Cross-Reference list

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

                          Cross-reference list

Inputs
I 14.0    : PB 10(  1,  1, )

Outputs
Q 18.0    : PB 10(  1,  2, ), PB 10(  1,  4, ), PB 10(  2, 11,*)
            PB 11(  1,  1, ), PB 11(  1,  7,*), PB 11(  3, 18, )
            PB 11(  3, 23,*), OB 21(  1,  3,*), OB 22(  1,  3,*)
Q 18.1    : PB 10(  2, 12,*), PB 11(  1,  2, ), PB 11(  1,  8,*)
            PB 11(  2, 14,*), PB 11(  3, 17, ), PB 11(  3, 22,*)
Q 18.2    : PB 11(  1,  6,*), PB 11(  2, 10, ), PB 11(  2, 15,*)

Flags
F 10.0    : PB 10(  1,  3,*), PB 10(  1,  5,*), PB 10(  2,  7, )
            OB 21(  1,  1, ), OB 21(  1,  2, ), OB 21(  1,  4,*)
            OD 22(  1,  1, ), OD 22(  1,  2, ), OD 22(  1,  4,*)

Timers

        [ Cancel ]        [ Print ]        [ F1=Help ]

[Alt]  or  [F10] = Menu
```

Fig. 7-8: The short overview

7.5.4 Creating an I/Q/F list

The menu command »I/Q/F list« lets you generate an I/Q/F list of the current file. You can see from this list which operands are used in the file and which operands are available for further use.

7.5.5 Examining the program structure

The menu command »Program structure« lets you generate a flowchart of the block calls in the current file. A dialog box appears in which you can specify the start block for the diagram, and whether to display also the data blocks in the diagram or not.

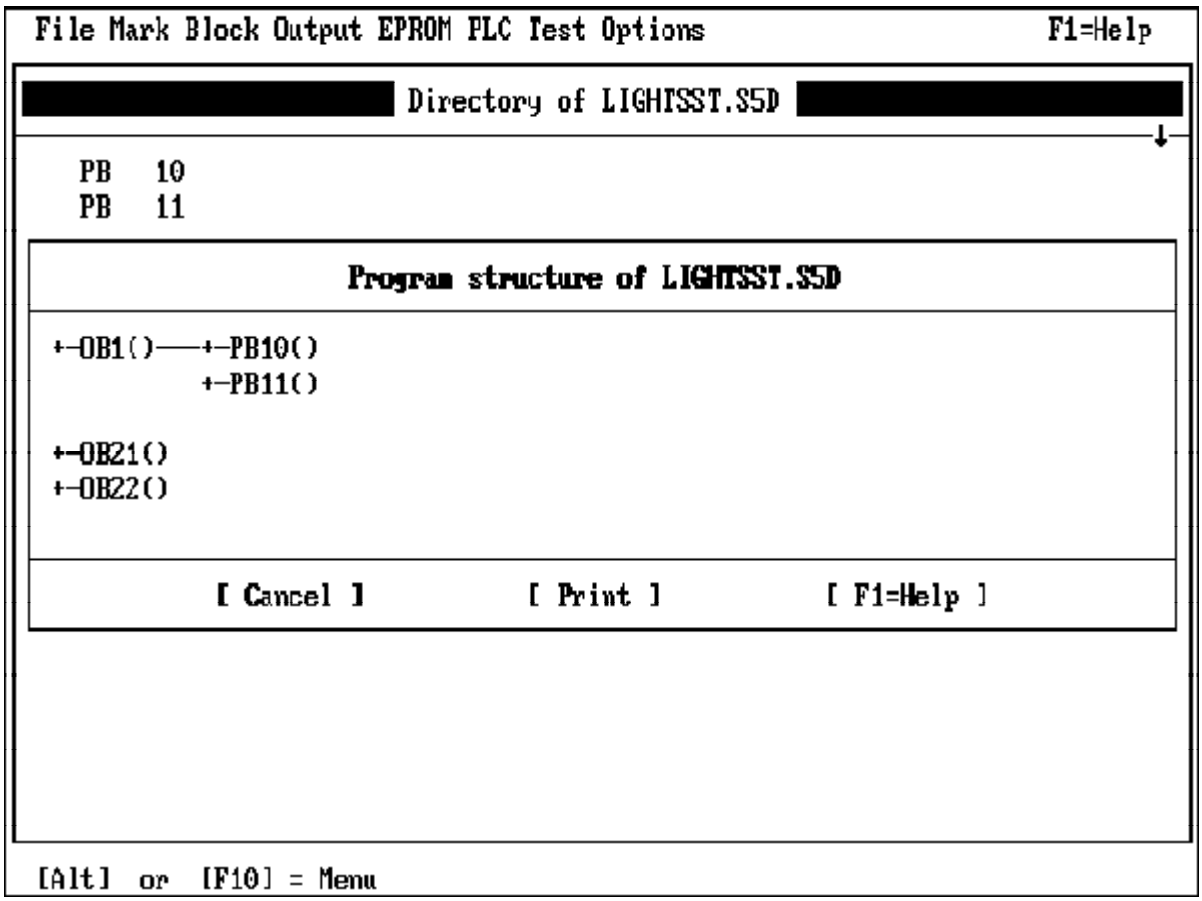

Fig. 7-9: Program structure.

7.5.6 Export ASCII

The menu command »Export ASCII« serves for writing the marked blocks to an ASCII file. This file can be modified using a text editor, e.g. to translate the comments into a foreign language.

7.5.7 Import ASCII

The menu command »Import ASCII« serves for reading an ASCII file generated using the menu command »Export ASCII«. From this file, the corresponding blocks are re-generated.

The structure of the ASCII file must not have been changed. The addresses generated with the command »Export ASCII« must not be specified. The parameter types of an FB or an FX must match.

7.6 EPROM operations

The functions concerning E(E)PROM modules are contained in the menu »EPROM«. You can transfer blocks from your control program to the EPROM submodule and vice versa.

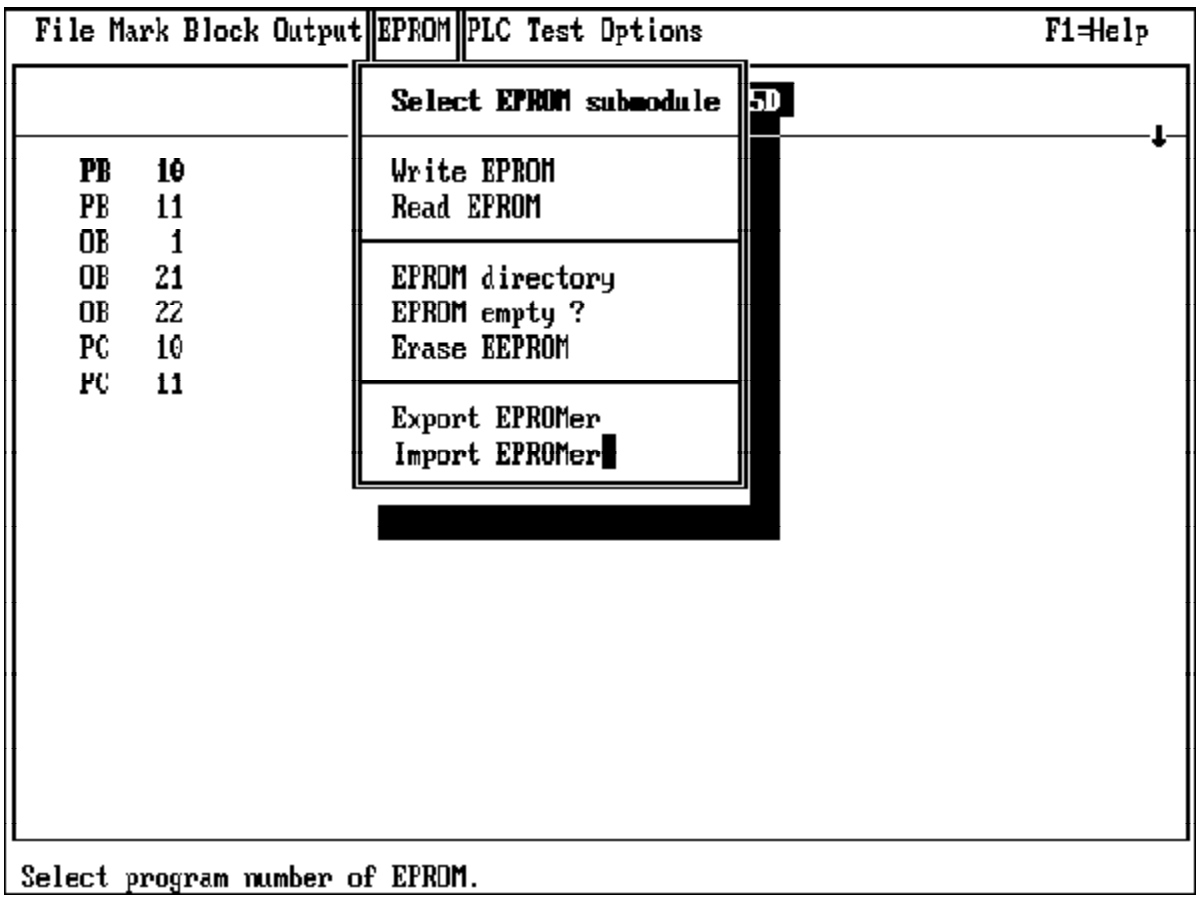

Fig. 7-10: The menu »EPROM«

Generally, these functions can be used only if the ACCON-EPROMer is properly connected to the PC and switched on.

7.6.1 Select EPROM submodule

The menu command »Select EPROM submodule« lets you select the program number of the desired EPROM submodule. ACCON-PG needs this program number to be able to execute the EPROM operations correctly because the various EPROM types must be treated specifically.

Furthermore, you have to specify whether the EPROM submodule is a »byte«, »word« or a »word/field« submodule. For the PLC 135U, you have to select »word«; for older PLCs (< 135U), you have to select »byte«; for the PLC 155U, you have to select »word/field« (i.e., the user data must be aligned to paragraphs).

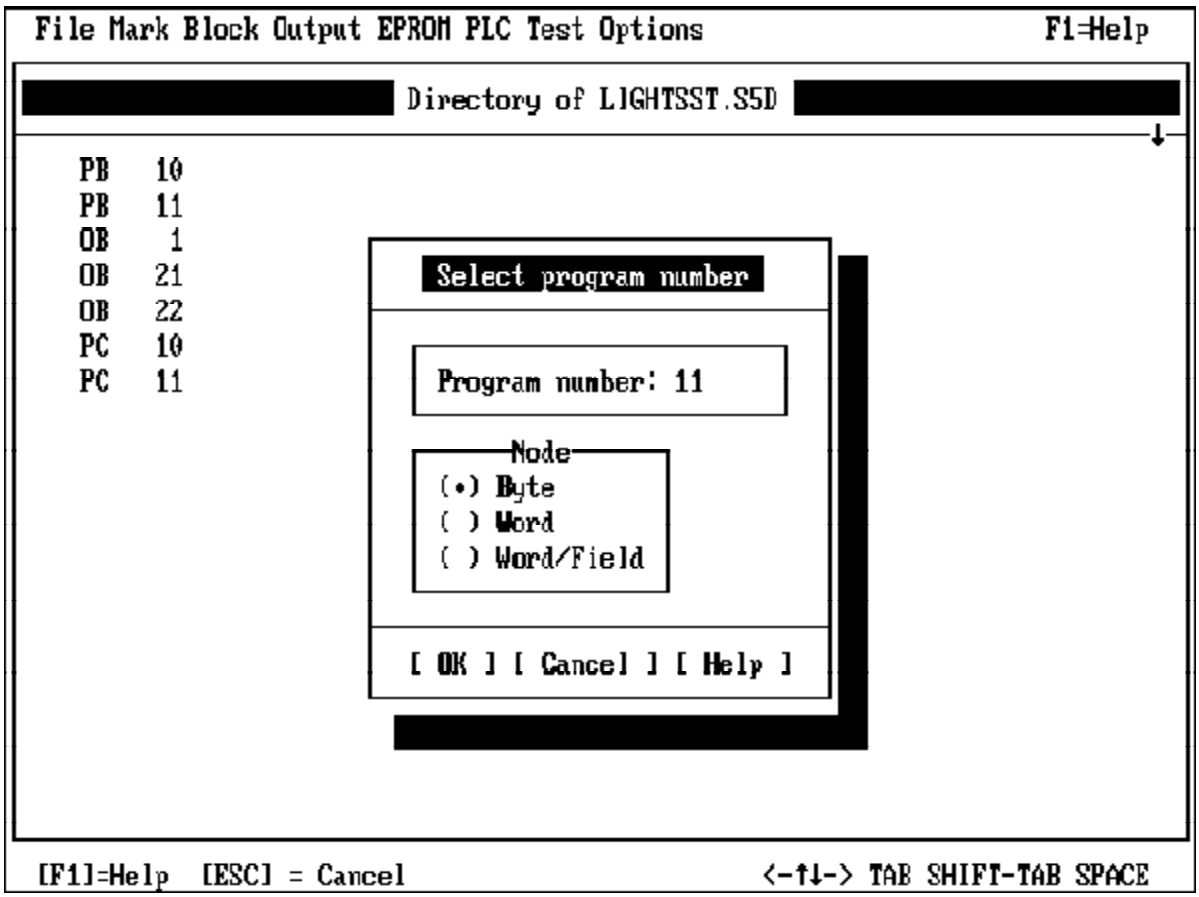

Fig. 7-11: Select an EPROM submodule

7.6.2 Write EPROM

The menu command »Write EPROM« lets you transfer the marked blocks to the ACCON-EPROMer which blows the EPROM submodule, i.e. writes the blocks to the EPROM submodule.

After the operation has been done completely, you get some statistics on the single block transfer operations.

7.6.3 Read EPROM

The menu command »Read EPROM« lets you copy blocks from the EPROM submodule plugged in the ACCON-EPROMer into the current file.

If the file contains a block with the same name as one of the blocks in the EPROM submodule, you will be asked whether the block in the file is to be overwritten or not.

7.6.4 EPROM directory

Select the menu command »EPROM directory« to get a list of the blocks in the EPROM submodule plugged in the ACCON-EPROMer. An example of an EPROM directory is given in the next figure.

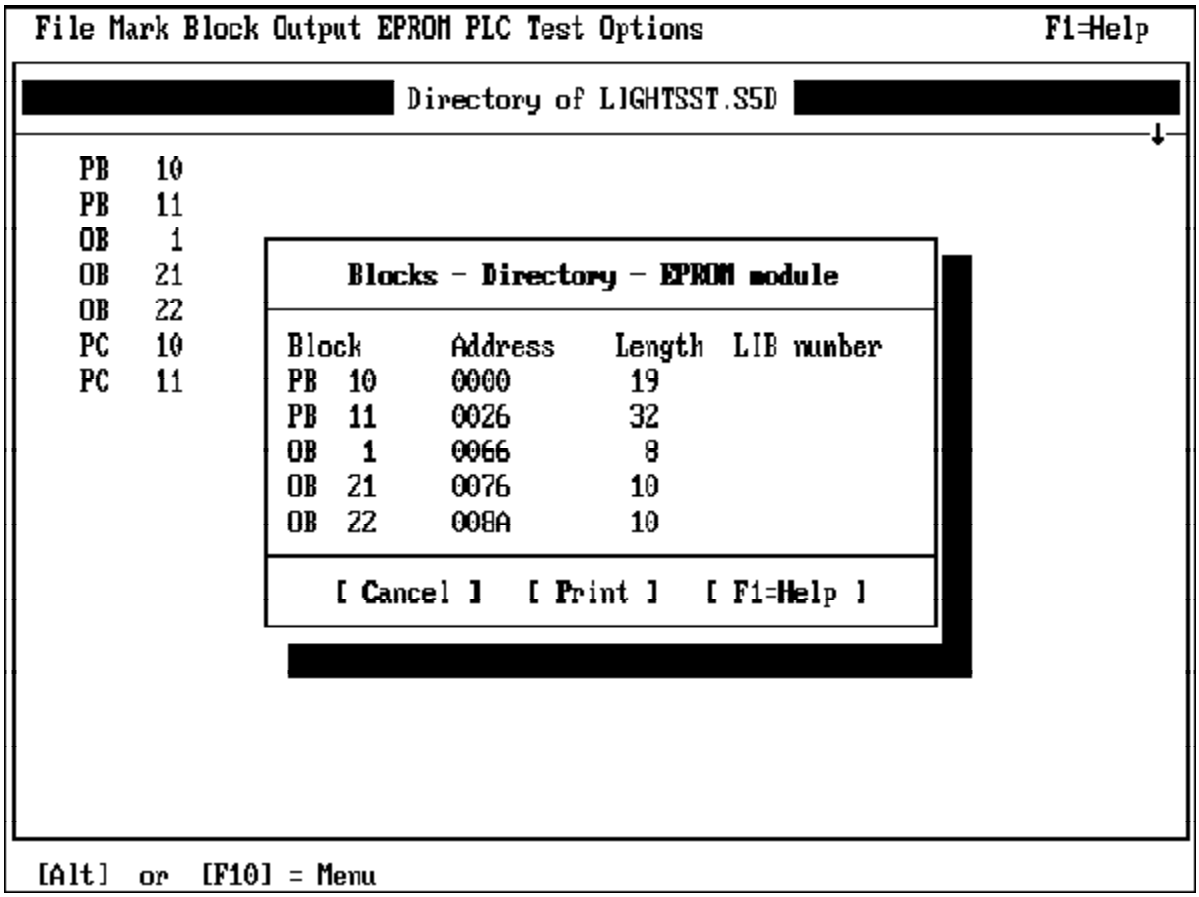

Fig. 7-12: An EPROM directory

7.6.5 EPROM empty?

Select the menu command »EPROM empty ?« to check whether the EPROM submodule plugged in the ACCON-EPROMer contains any blocks, or whether it has been erased completely.

The result of the check is given in a window which must be confirmed by the user.

7.6.6 Erase EEPROM

Select the menu command »Erase EEPROM« to erase all blocks in the EEPROM submodule plugged in the ACCON-EPROMer.

Attention: This operation functions only with EEPROM submodules, of course.

7.6.7 Export EPROMer

Select the menu command »Import EPROMer« to copy the marked blocks into an Intel-Hex file. This file can be used as an input file for the ACCON-EPROMer which writes the blocks to the EPROM submodule.

7.6.8 Import EPROMer

Select the menu command »Export EPROMer« to read blocks from an Intel-Hex file. This file should be a copy of the blocks contained in an EPROM submodule.

The blocks will be inserted into the current program file. If there are blocks with the same name in the program file as well as in the Intel-Hex file, you will be asked to specify whether to overwrite the block in the program file, or not.

7.7 PLC operations

The functions concerning the PLC (communications between ACCON-PG and the PLC, executing and testing the control program on the PLC) are contained in the menu »PLC«. See chapter 5 for more details.

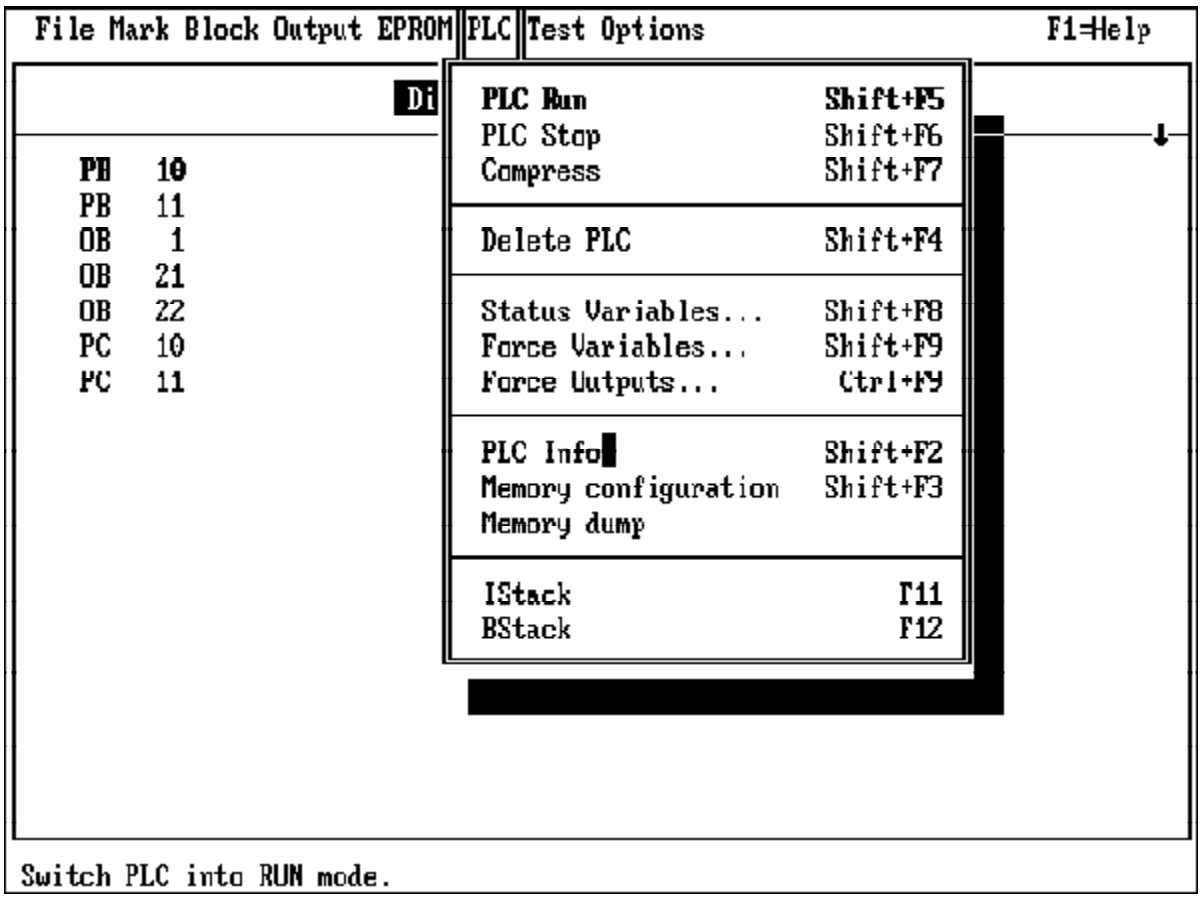

Fig. 7-13: The menu »PLC« in the directory.

7.8 Test functions

The menu »Test« contains functions for examining the PLC. You can use these functions to find out whether a program is executable by a specific CPU.

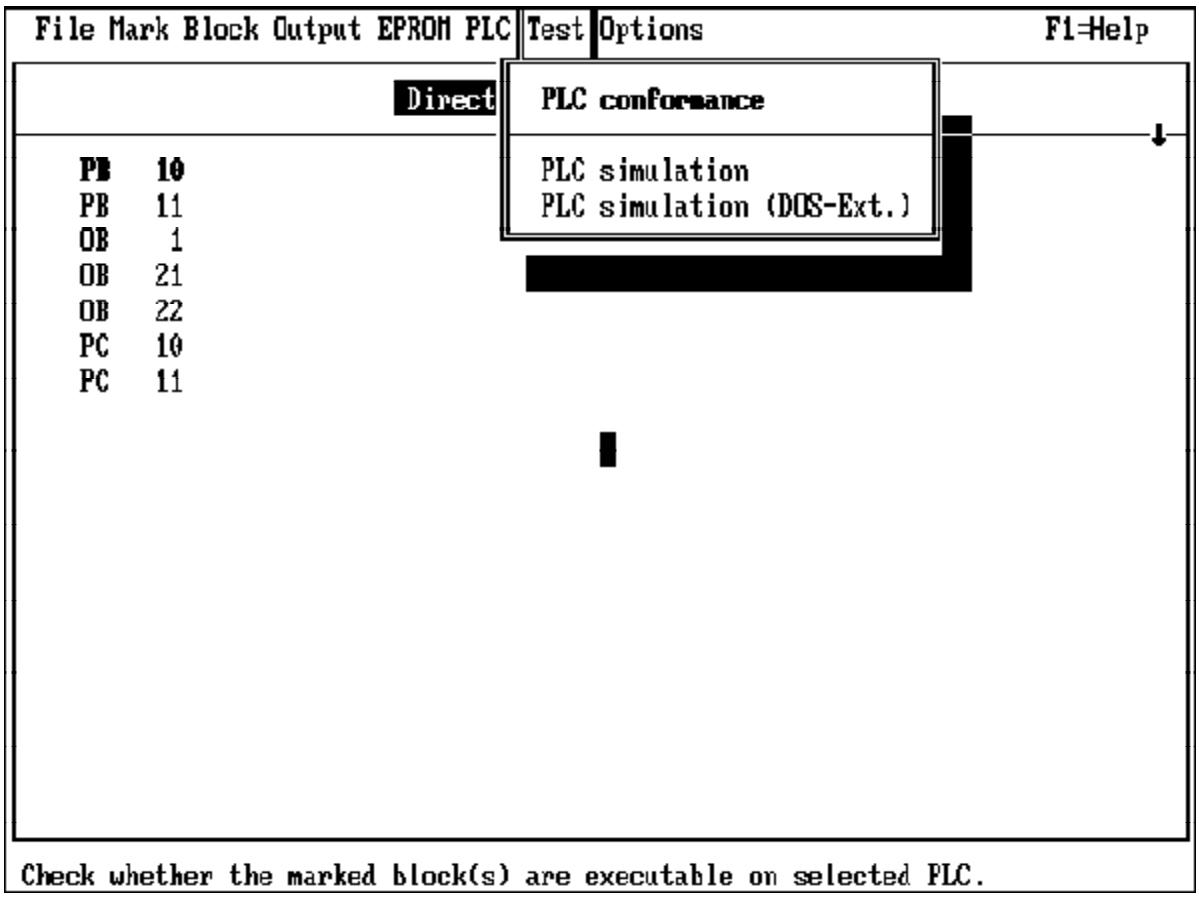

Fig. 7-14: The menu »Test« of the directory.

7.8.1 Trial run (PLC conformance)

This menu command lets you check whether the marked program blocks are executable on the selected PLC, whether all used commands are supported by the PLC and whether all used parameters are within the allowed range.

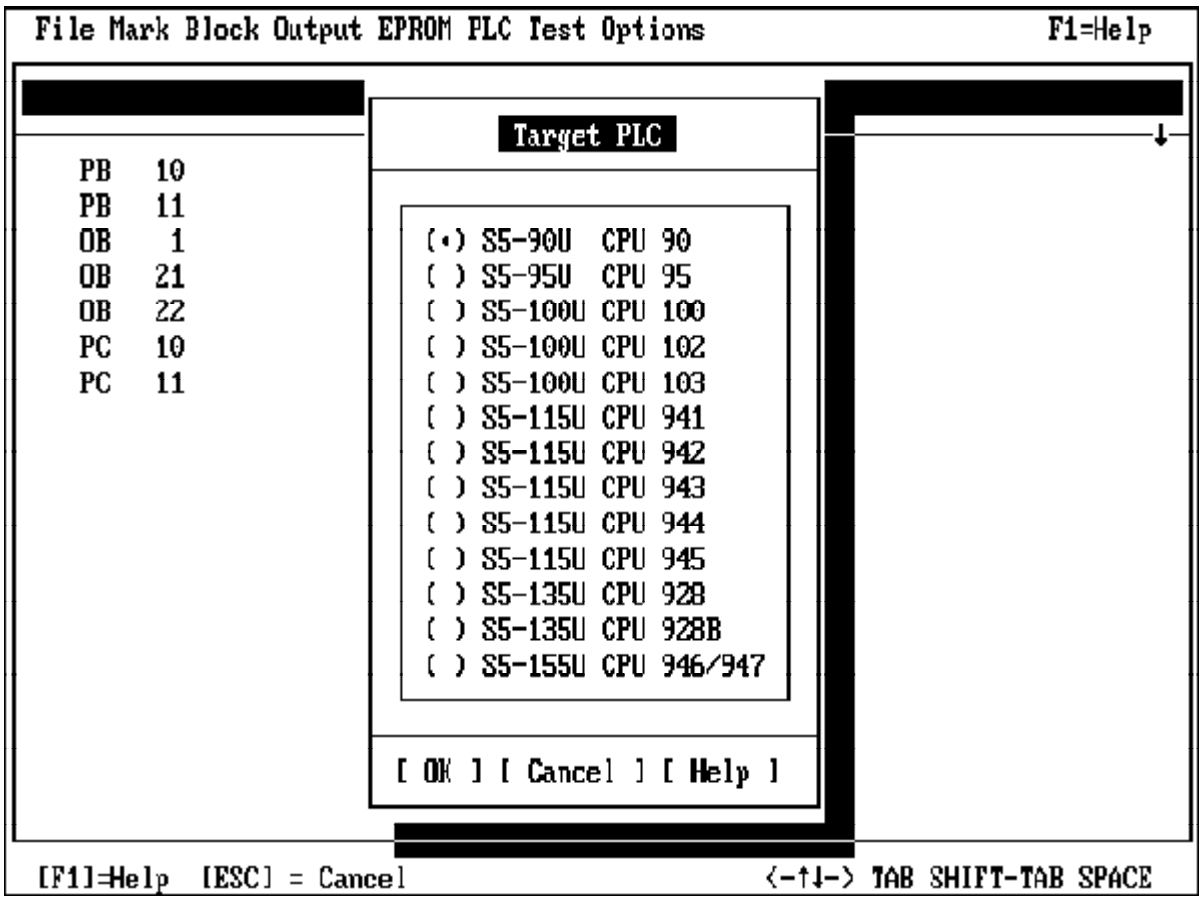

Fig. 7-15: Select a CPU for the trial run.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

                    Directory of LIGHTSST.S5D

                    Result of PLC trial run

Selected PLC: S5-90U  CPU 90

Block PB  10:Segment 2:
  Line   3, "SD  T 200     ": Parameter not in allowed range! (max.: 31)
  Line   4, "A   T 200     ": Parameter not in allowed range! (max.: 31)

Block PB  11:No error found.


Block OB   1:No error found.

Sum: 2 errors.
Memory required for all blocks: 59 words.

          [ Cancel ]          [ Print ]          [ F1-Help ]

[Alt]  or  [F10] = Menu
```

Fig. 7-16: Result of a trial run.

7.9 Options

The menu »Options« lets you adapt the user interface of ACCON-PG to your needs and wishes, and specify some program parameters.

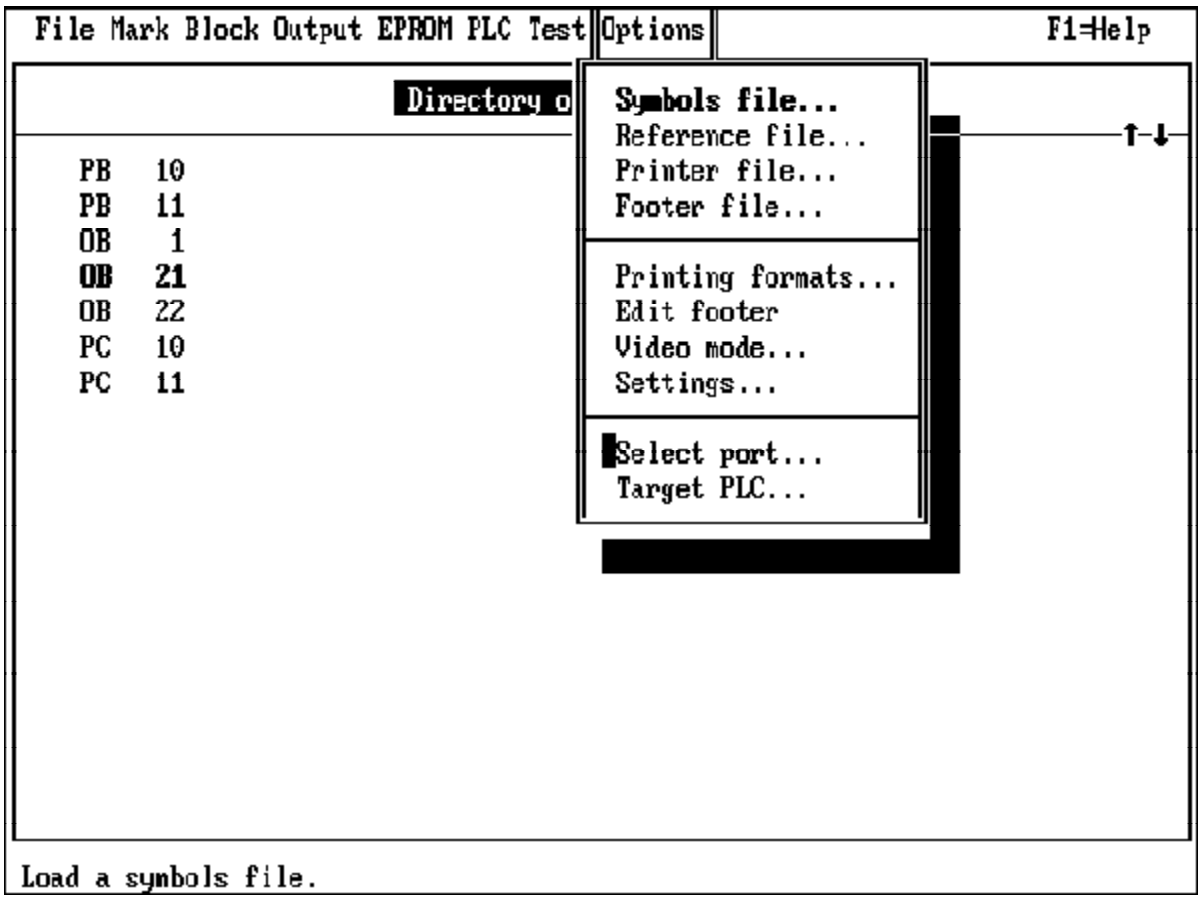

Fig. 7-17: The menu »Options« of the directory.

This includes

- selecting a symbols file,
- selecting a reference file,
- selecting a printer file,
- selecting a footer file,
- specifying the printing formats,
- editing a footer,
- specifying certain settings,
- selecting the serial port to which the PLC is connected.

These options are described in detail in chapter 6.

Chapter 8:

Programming in STL

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The STL editor is called by using the menu command »STL editor« and selecting a block from the directory (double-clicking on the block name, or pressing ↵ when the cursor bar is on the block name, or by selecting »Block/ Edit« when the cursor bar is on the block name).

When loading »PB 1« as shown in the example below, the STL editor will be displayed, as shown in fig. 8-1.

```
 Block Segment Edit TxtBlk Search Mode Options                    F1=Help
PB  10                                                  File: LIGHTSST.S5D
SEGMENT  1 of  2        Detect start of cycle          LIB=
     :A   I 14.0
     :A   Q 18.0
     :S   F 10.0
     :AN  Q 18.0
     :R   F 10.0
     :***

 [Alt]  or  [F10] = Menu   Ins            STL        6    17739420  0001:07
```

Fig. 8-1: The STL editor .

The various menu commands are explained in the following.

8.1 Block operations

The menu »Block« (shown in the figure below) of the STL editor enables you to save the block in the editor to the current program file or to another file, to edit the LIB number and to exit from the STL editor.

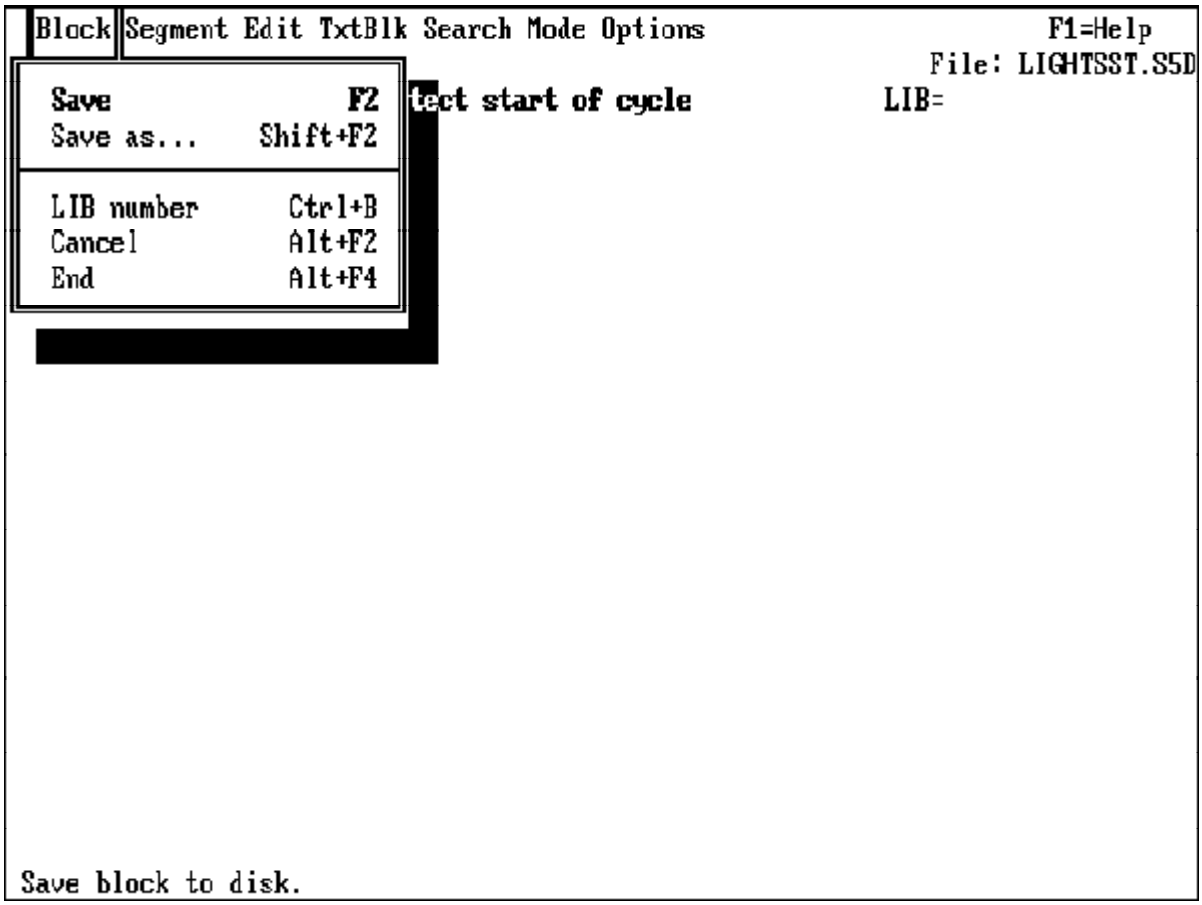

Fig. 8-2: The menu »Block«

8.1.1 Save a block

You can save the block in the editor to the current file resp. the PLC using the menu command »Save« resp. the hot key F2. If the current file does not yet have a name, the dialog box »Save file« appears in which you must specify the name of the file.

8.1.2 Save a block in a new file

You can save the block in the editor to a new file or to another file than the current file using the menu command »Save as« resp. the hot key Shift + F2. The dialog box »Save file« appears in which you must specify the name of the file.

You can select another directory or another drive from the drive / directory list box. If the specified file exists already, a dialog box with a corresponding warning message will appear. You can now decide whether to overwrite the existing file, or to cancel the operation. If the current block exists in the current file already, you will also get a corresponding warning message; so you can cancel the operation if necessary.

The directory provides for more efficient methods for transferring blocks.

8.1.3 Edit the LIB number

After selecting the menu command »LIB number« resp. typing the hot key Ctrl + B, the cursor is located behind the field »LIB=« in the top right corner of the screen where you can enter resp. edit the number of the library to be used. You can modify the LIB number according to your wishes. The number consists of digits only. The LIB number can also be edited after simply clicking on it.

8.1.4 Cancel editing

Selecting the menu command »Cancel« resp. typing the hot key Alt + F2 lets you exit from editing the current block. If the block resp. the file has been changed since it was last saved, a message box with a corresponding notice will appear. You can now cancel the operation, i.e. continue editing, or actually exit editing with a loss of the changes. The block need not be syntactically correct if you want to cancel editing.

8.1.5 End editing

You can leave the STL editor using the menu command »End« resp. the hot key Alt + F4. If the current block has been modified since it was last saved, a dialog box with a corresponding warning message will appear. You can now save the changes to the block, or cancel the operation.

8.2 Segment operations

The menu »Segment« provides for the functions shown in fig. 8-3 resp. described below.

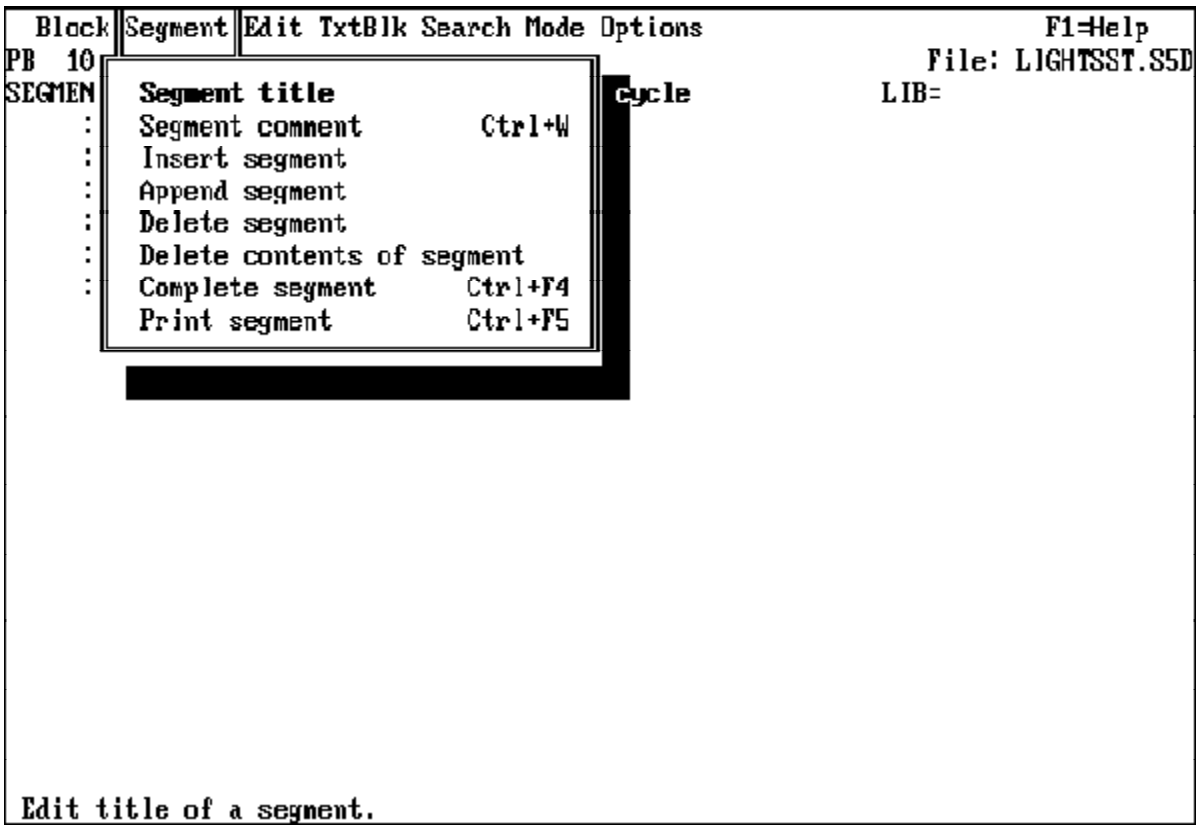

Fig. 8-3: The "Segment" menu

8.2.1 Enter the segment title

After selecting the menu command »Segment title«, the cursor will be located on the second line of the screen where you can enter the title of the current segment. The segment title can also be selected using the mouse by clicking with the left mouse button on the corresponding position.

8.2.2 Edit the segment comment

After selecting the menu command »Segment comment«, you will be in the comment editor where you can edit the comment of the current segment. You can also activate the segment comment editor by double-clicking with the left mouse button on the segment title, or by using the hot key Ctrl + W, or by clicking on the "COM" symbol in the toolbar (only if the toolbar is activated).

The segment comment editor is described in detail in chapter 13.

8.2.3 Insert a segment

Selecting the menu command »Insert segment« has the following effects: the current segment will be completed, and a new segment will be inserted before it.

A new segment can be inserted only if the syntax check of the current segment can be performed successfully, and if the total number of segments does not exceed 256.

8.2.4 Append a segment

Selecting the menu command »Append segment« has the following effects: the current segment will be completed, and a new segment will be inserted behind it.

A new segment can be inserted only if the syntax check of the current segment can be performed successfully, and if the total number of segments does not exceed 256.

8.2.5 Delete a segment

Selecting the menu command »Delete segment« will cause the current segment to be deleted without checking for correct syntax. You have to confirm the deletion before it is actually executed. You can also cancel the operation.

8.2.6 Delete the contents of a segment

Selecting the menu command »Delete segment« will cause the current segment to be deleted without checking for correct syntax. You have to confirm the deletion before it is actually executed. You can also cancel the operation.

8.2.7 Complete the current segment

Selecting the menu command »Complete segment« has the following effects: the current segment is checked for correct syntax, matching brackets, label definitions etc. The next segment will be opened (a new segment will be appended if necessary). All lines from the current line to the end of the segment resp. block (if the current segment is the last segment of the block) will be deleted (and copied to the clipboard so that they can be inserted directly into the next segment).

You can also access this function using the hot key Ctrl + F4.

8.2.8 Print a segment

Selecting the menu command »Print segment« resp. typing the hot key Ctrl + F5 will cause the current segment to be printed using the specified standard printer and the current printer settings. You can modify the formats used for printing using the menu command »Printing formats...« in the menu »Options«.

8.3 Edit blocks

The menu »Edit« of the STL editor (shown in fig. 8-3) contains numerous functions for editing STL blocks.

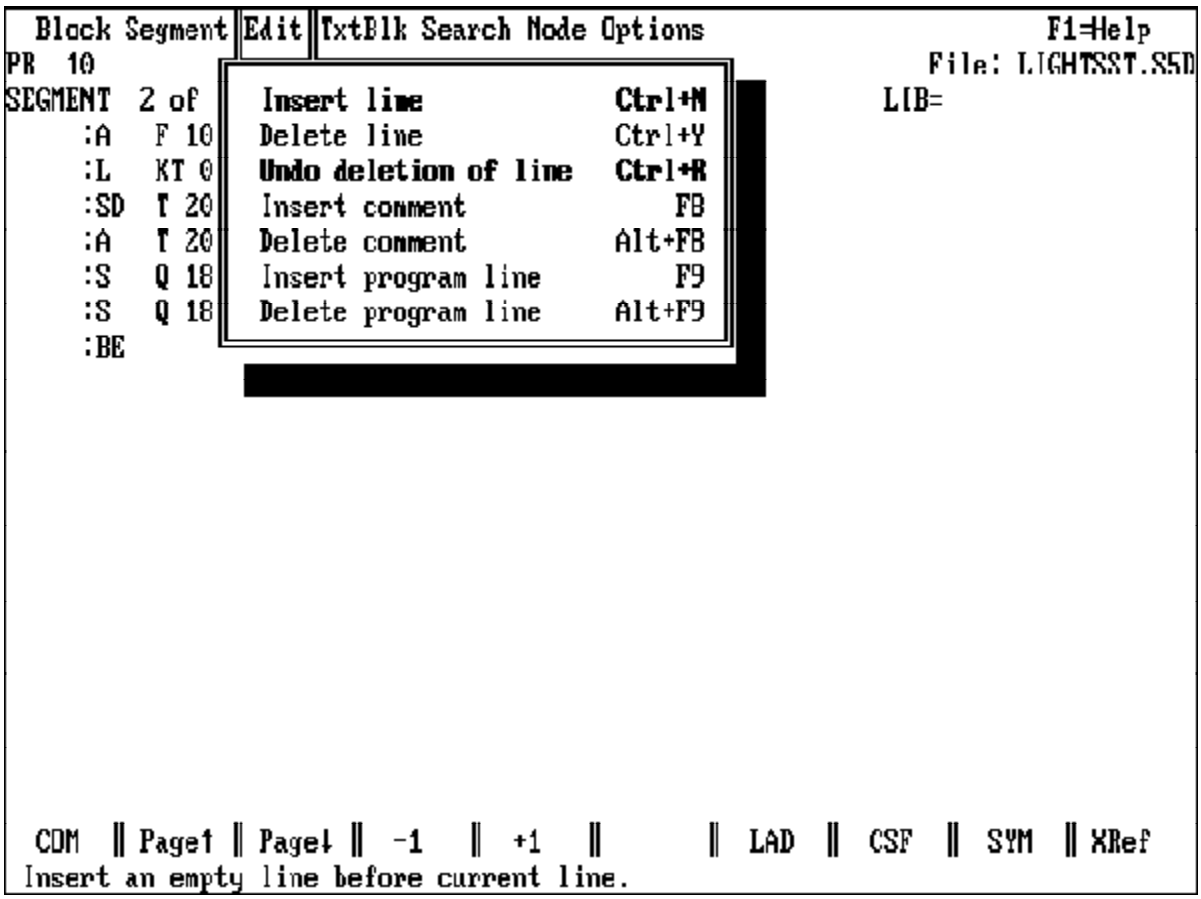

Fig. 8-4: The menu »Edit«.

8.3.1 Insert a line

The menu command »Insert line« can be used for inserting an empty line before the current line. If the line is part of a FB parameter definition, room will be made for another parameter. Inserting lines is not possible within a FB call.

You can also use the hot key Ctrl + N to insert lines.

8.3.2 Delete a line

Selecting the menu command »Delete line« causes the current line to be deleted, if this is allowed. You must not delete e.g. the line following a FB parameter definition, or delete a single line from the parameter list of a FB call.

When trying to delete the end of a segment, you will be asked whether you want to unify the current segment and the next segment.

You can also use the hot key Ctrl + Y to delete lines.

8.3.3 Undo the deletion of a line

Selecting the menu command »Undo deletion of line« causes the last deleted line to be inserted before the current line. The hot key Ctrl + R has the same effect.

8.3.4 Insert a comment line

The menu command »Insert comment line« serves for inserting an empty comment line. The comments from the current line to the end of the segment or block will be moved down one line, otherwise they will be unchanged. If the last line of the segment or block contains a comment, a message box will

appear and tell you that the last comment line will be deleted if you actually perform the insert operation. You can then confirm the deletion of the last line or cancel the operation.

You can also use the hot key F8 to insert comment lines.

8.3.5 Delete a comment line

The menu command »Delete comment line« serves for deleting the comment of the current line. The comments from the current line to the end of the segment or block will be moved up one line, otherwise they will be unchanged.

You can also use the hot key Alt + F8 to delete comment lines.

8.3.6 Insert a line of program text

The menu command »Insert program line« serves for inserting an empty program line. The program lines from the current line to the end of the segment or block will be moved down one line, otherwise they will be unchanged. Comment lines will also not be affected by this operation.

You can also use the hot key F9 to insert program lines.

8.3.7 Delete a line of program text

Selecting the menu command »Delete program line« causes the current program line to be deleted. The program lines from the current line to the end of the segment or block will be moved up one line, otherwise they will be unchanged. If the last line of the segment or block contains a comment, a

message box will appear and tell you that the last comment line will be deleted if you actually perform the delete operation. You can then confirm the deletion of the last comment line or cancel the operation.

You can also use the hot key Alt + F9 to delete the current program line.

8.4 Working with text blocks

The menu »TxtBlk« contains various functions for working with text blocks. The functions can be called using WordStar block commands (Ctrl + K resp. Ctrl + Q plus another key identifying the command).

Note:

The commands contained in this menu refer to text blocks rather than STEP 5 blocks. It should be clear which type of blocks is referred to, even if we do not explicitly write "STEP 5 blocks / program blocks" or "text blocks".

The menu »TxtBlk« is shown in fig. 8-5.

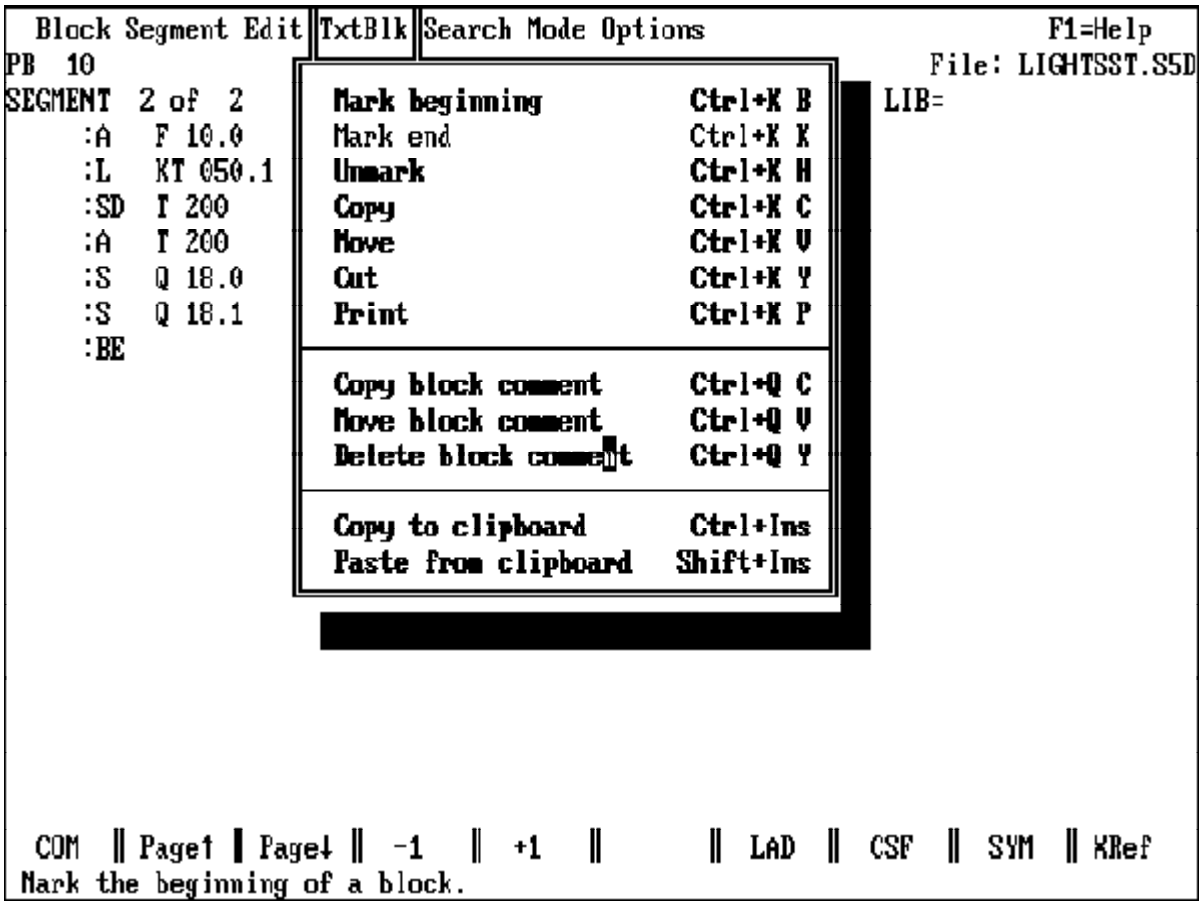

Fig. 8-5: The menu »TxtBlk«.

8.4.1 Mark the beginning of a block

Selecting the menu command »Mark beginning« resp. typing the hot key Ctrl + K, B lets you define the current line to be the beginning of a text block. A marked block is displayed using a special color, depending on the currently selected palette.

If the end of the block has not yet been specified or the specified end of the block is located before the beginning of the block, the end of the current segment resp. block resp. file is taken as the end of the block for the present.

You can mark blocks across several segments only if the first and the last segment of the marked block are marked completely.

If the current line is a part of a FB call, the first line of the FB call is marked as the beginning of the block.

8.4.2 Mark the end of a block

Selecting the menu command »Mark end« resp. typing the hot key Ctrl + K, K lets you define the current line to be the end of a text block.

If the beginning of the block has not yet been specified or the specified beginning of the block is located behind the end of the block, the beginning of the current segment resp. block is taken as the beginning of the block for the present.

If the current line is a part of a FB call, the last line of the FB call is marked as the end of the block.

8.4.3 Unmark blocks

Selecting the menu command »Unmark« resp. typing the hot key Ctrl + K, H causes the current block marks to be deleted.

8.4.4 Copy blocks

Selecting the menu command »Copy« resp. typing the hot key Ctrl + K, C causes a copy the current block to be inserted before the current line. This will not be case if the current line is located within the marked block, or if it is a part of a FB call.

The marked block itself is not affected by the operation.

Blocks containing more than one segment can be copied only via the clipboard.

8.4.5 Move blocks

Selecting the menu command »Move« resp. typing the hot key Ctrl + K, V causes the marked block to be removed from its original position and to be inserted before the current line. This can be done only if the current line is not contained in the marked block and is not part of a FB call.

Blocks containing more than one segment cannot be moved.

8.4.6 Cut blocks

Selecting the menu command »Cut« resp. typing the hot key Ctrl + K, Y causes the marked block to be deleted without asking for confirmation.

The last deleted block is contained in the clipboard. By selecting the menu command »Paste from clipboard«, this block can be re-inserted.

Blocks containing more than one segment cannot be deleted.

8.4.7 Print blocks

Selecting the menu command »Print« resp. typing the hot key Ctrl + K, P causes the marked block to be printed.

Blocks containing more than one segment cannot be printed.

You can modify the formats used for printing using the menu command »Printing formats...« in the menu »Options«.

8.4.8 Copy block comment

Selecting the menu command »Copy block comment« resp. typing the hot key Ctrl + Q, C causes a copy of the comment part of the marked block to be inserted before the current line. The program part of the block is not copied. Comments at the insert position will be overwritten without warning.

The marked block itself is not affected by the operation.

This function does not work with blocks containing more than one segment.

8.4.9 Move block comment

Selecting the menu command »Move block comment« resp. typing the hot key Ctrl + Q, V causes the comment part of the marked block to be removed from its original position and to be inserted before the current line. The program part of the block is not moved. Comments at the insert position will be overwritten without warning.

This function does not work with blocks containing more than one segment.

8.4.10 Delete block comment

Selecting the menu command »Delete block comment« resp. typing the hot key Ctrl + Q, Y causes the marked block to be deleted without asking for confirmation.

This function does not work with blocks containing more than one segment.

8.4.11 Copy a block to the clipboard

Selecting the menu command »Copy to clipboard« resp. typing the hot key Ctrl + Ins lets you copy the marked block to the clipboard. The block contained in the clipboard can be inserted anywhere in the text at any time. The contents of the clipboard remain unchanged until you copy another block to the clipboard (using either the command »Copy to clipboard« or the command »Cut«), or until you leave the STL editor.

If a block containing more than one segment is copied to the clipboard, the corresponding segment titles and comments are copied with it.

8.4.12 Insert a block from the clipboard

Selecting the menu command »Paste from clipboard« resp. typing the hot key Shift + Ins lets you insert the block contained in the clipboard at the current cursor position. The contents of the clipboard remain unchanged and can therefore be inserted many times at different positions in the text.

Blocks containing more than one segment can be inserted only at the first line of a segment.

8.5 Search/Replace text and goto

The menu »Search« contains functions for searching and replacing parts of the program text, and for positioning the cursor on a specific location within the text. Note that you can mark up to 10 locations in the text and access these locations with a hotkey. Use the hotkey Ctrl + K, 0 … 9 to mark a location, resp. the hotkey Ctrl + Q, 0 … 9 to go to the corresponding location.

The following figure shows the menu »Search«.

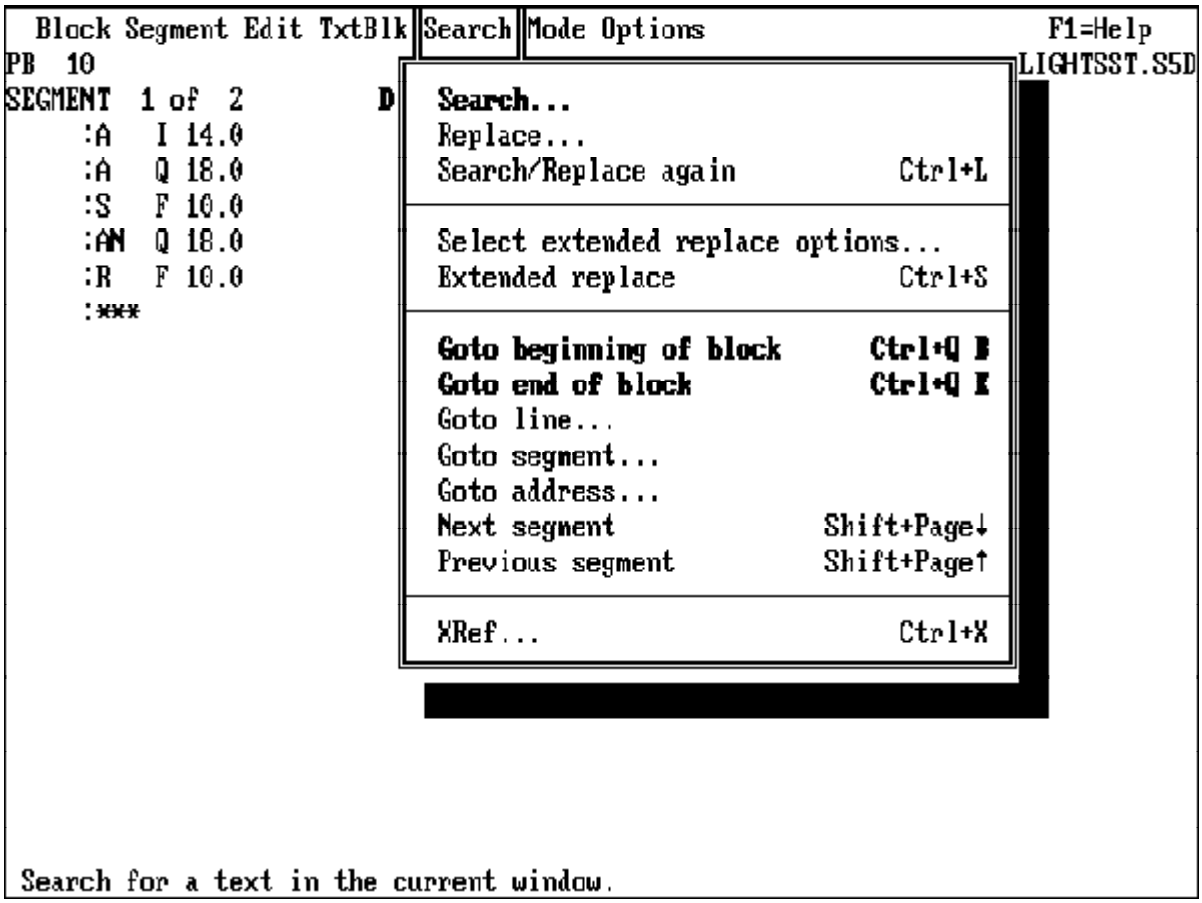

Fig. 8-6: The menu »Search«.

8.5.1 Search for a string

After selecting the menu command »Search...«, the dialog box »Search text« shown in figure 8-7 will be opened. The components of this dialog box are described in the following.

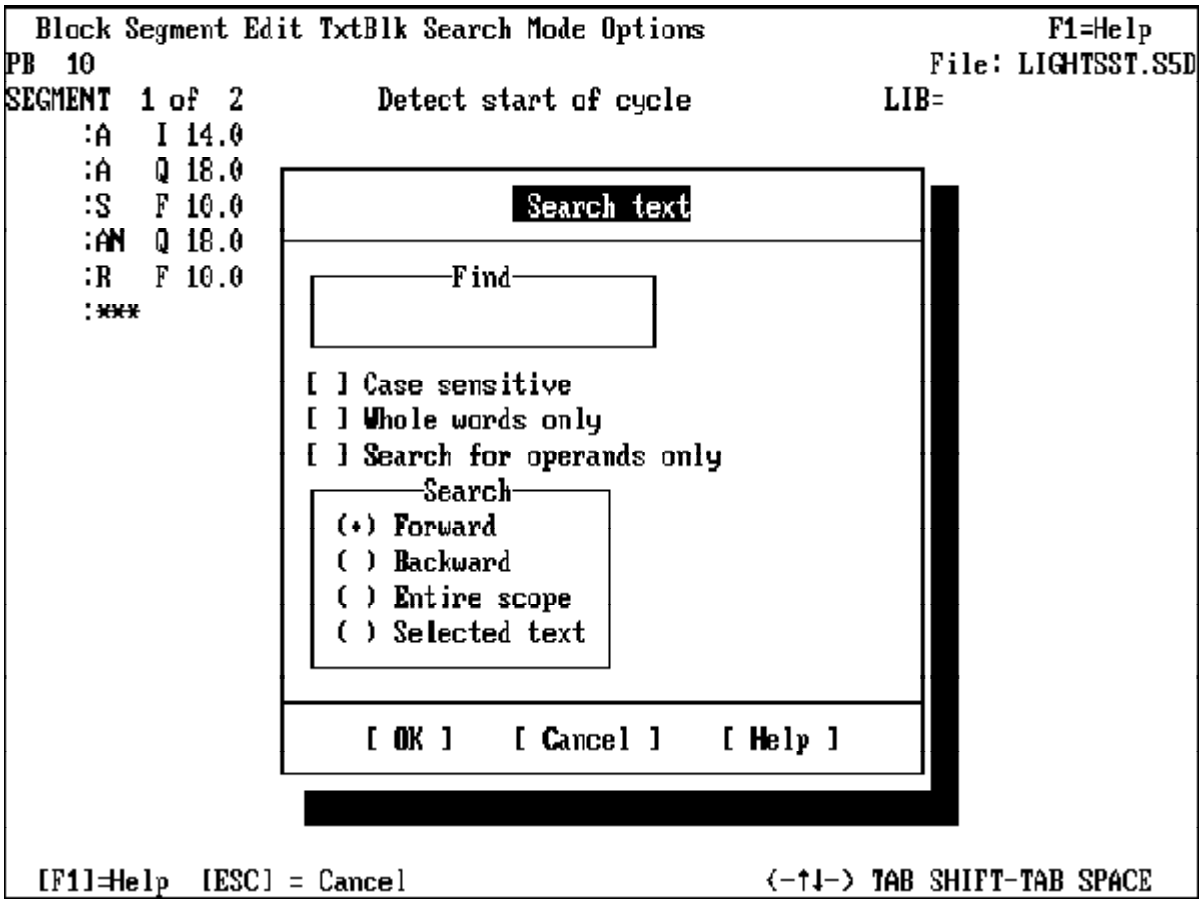

Fig. 8-7: The dialog box »Search text«.

Search string

The character or string to search for has to be specified in the text input field »Find«. You can search for a symbolic operand by entering a hyphen as the first character, e.g. »-Stop« (only possible with a symbols file being selected). Watch carefully for correct spelling.

Case-sensitive search

The check box »Case sensitive« can be used to specify whether to differentiate uppercase from lowercase letters when searching.

If you want to search e.g. for the string 'Fb' with the check box »Case sensitive« ticked off, the following parts of the text would be found: 'FB', 'Fb', 'fB' and 'fb'. If the check box is ticked, only the string 'Fb' is found.

Whole words only

The check box »Whole words only« can be used to specify whether to search only for whole words, i.e. the string must have delimiter characters (space, punctuation marks) on both sides, or to search also for words containing the search string as a part.

If you want to search e.g. for the string 'O' with the check box »Whole words only« ticked off, the following parts of the text would be found: 'On', 'Off' and 'O'. If the check box is ticked, only the string 'O' is found.

Search for operands only

The check box »Search for operands only« can be used to specify whether to search only for operands. Matching strings other than operands will be ignored. You need not care about the spelling of the operand (upper/ lowercase, spaces) as the search string will be formatted automatically.

If this check box is ticked, the two other check boxes will have no effect.

Search direction

The radio button »Search« can be used to specify those parts of the texts to be searched. There are four available options: you can search forward, backward, in the whole text (from the beginning of the text) or in the marked block only (from the beginning of the block).

8.5.2 Search for and replace a text string

After selecting the menu command »Replace...«, the dialog box »Replace text« shown in figure 8-8 will be opened. The components of this dialog box resemble the components of the dialog box »Search text« and are therefore described here without too many details.

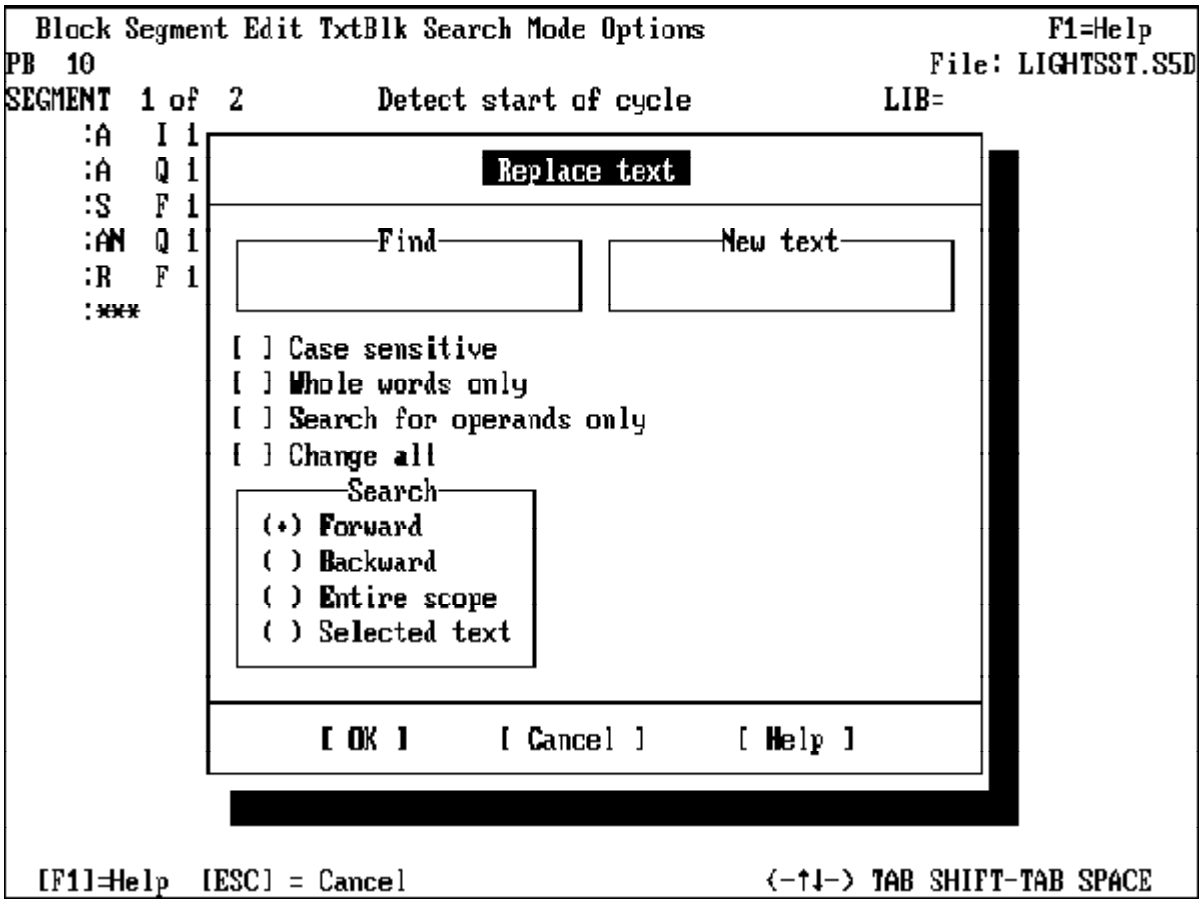

Fig. 8-8: The dialog box »Replace text«.

Search string

The character or string to search for has to be specified in the text input field »Find«.

Replace string

The new character or string has to be specified in the text input field »New text«. If the replace string is not specified, i.e. it is equal to the empty string, each occurence of the search string is going to be deleted.

Case-sensitive search

The check box »Case-sensitive« can be used to specify whether to differentiate uppercase from lowercase letters when searching.

If you want to search for and replace the string e.g. 'Fb' with the check box »Case-sensitive« ticked off, the following parts of the text would be found and replaced: 'FB', 'Fb', 'fB' and 'fb'. If the check box is ticked, only the string 'Fb' is found and replaced.

Whole words only

The check box »Whole words only« can be used to specify whether to search for and replace only whole words, i.e. the search string must have delimiter characters (space, punctuation marks) on both sides, or to search for and replace also words containing the search string as a part.

If you want to search for and replace e.g. the string 'O' with the check box »Whole words only« ticked off, the following parts of the text would be found and replaced: 'On', 'Off' and 'O'. If the check box is ticked, only the string 'O' is found and replaced.

Search for operands only

This check box has the same effects as described in the former section (»Search«). The replace string is not affected by the state of this check box but treated as ordinary text. If this ordinary text is not a valid operand, a syntax error will occur after replacing.

Search direction

The radio button »Search« can be used to specify those parts of the texts to be searched. There are four available options: you can search forward, backward, in the whole text (from the beginning of the text) or in the marked block only (from the beginning of the block).

Replace all occurences

If the check box »Change all« is ticked, all occurences of the search string will be replaced by the replace string; otherwise only the first occurence will be replaced. Each changed line will be checked for correct syntax before leaving the line. If the line is found to be erroneous, the search and replace operation is cancelled, and the cursor is positioned on the erroneous line.

8.5.3 Search / Replace again

The menu command »Search / Replace again« resp. the hot key Ctrl + L lets you search for resp. replace the next occurence of the specified search string. Which action will be carried out, depends on the last action. The same options are used for the search process.

If a search string has not yet been specified, the dialog box »Search text« (see fig. 8-7) appears.

8.5.4 Set options for Extended Replace operation

Use this menu command to specify the options for the "extended replace" operation. This includes the text file with the search and replace texts, the area of the text to be searched and the interpretation of the search text.

Extended replace means that several texts are replaced by some other texts simultaneously. The search and replace texts are contained in a control file in ASCII text format. The structure of such a file must be as follows:

- Each line contains a search text and the corresponding replace text separated by a tabulator (TAB character)..
- The search text starts with the beginning of the line and ends with the tabulator.

- The replace text starts directly after the tabulator and ends with the end of the line.
- Both texts must not be longer than 20 characters, extra characters will be ignored.

8.5.5 Extended Replace operation

Use this menu command resp. type the hotkey Ctrl + S to execute the "extended replace" operation. See the menu command above for details.

8.5.6 Goto the beginning of a block

When selecting the menu command »Goto beginning of block« resp. typing the hot key Ctrl + Q, B, the cursor will be located on the first line of the marked block. If there is no marked block, the menu command is not accessible.

8.5.7 Goto the end of a block

When selecting the menu command »Goto end of block« resp. typing the hot key Ctrl + Q, K, the cursor will be located on the last line of the marked block. If there is no marked block, the menu command is not accessible.

8.5.8 Goto line

When selecting the menu command »Goto line«, a dialog box will appear in which you can enter the number of the line to go to. After the current line has been checked for correct syntax successfully, the cursor is located on the

desired line. If the specified line is not contained in the current segment, the whole segment is checked for correct syntax. If it contains errors, you will not be able to leave it.

8.5.9 Goto segment

When selecting the menu command »Goto segment«, a dialog box will appear in which you can enter the number of the segment to go to. After the current line and the current segment have been checked for correct syntax successfully, the cursor will be located at the beginning of the desired segment. If the current segment contains errors, you will not be able to leave it.

8.5.10 Goto address

When selecting the menu command »Goto address«, a dialog box will appear in which you can enter the desired address (as a word). After the current line and the current segment have been checked for correct syntax successfully, the cursor is located on the line with the specified address. If the current segment contains errors, you will not be able to go to the desired position. This function is accessible even when addresses are currently not displayed.

The address must be entered as a hexadecimal number.

8.5.11 Goto next segment

When selecting the menu command »Next segment« resp. typing the hot key Shift + Page↓, the cursor is located on the beginning of the next segment. This can be done only if the current line and the current segment have been checked for correct syntax successfully. If the current segment contains errors, you will not be able to leave it.

8.5.12 Goto previous segment

When selecting the menu command »Previous segment« resp. typing the hot key Shift + Page↑, the cursor is located on the beginning of the previous segment. This can be done only if the current line and the current segment have been checked for correct syntax successfully. If the current segment contains errors, you will not be able to leave it.

8.5.13 XREF

You can call this command via the menu, or by selecting the toolbar symbol "XREF", or by typing the hotkey Ctrl + X. A dialog box appears where you can select the desired operation. You can view the list of the occurences of a certain operand and go to any of these occurences if there is a reference list which is up-to-date. You can generate a reference list with the menu command »Block/Generate XREF« in the directory. Use the option »Automatically update XREF« to keep the reference list up-to-date; it will be updated each time you save your changes in a block editor.

Select "Destination block" to go directly to a specific block, or "Origin block" to return to the block from which you first called the XREF function.

8.6 Examining the control program in the status mode

If you are working on the PLC rather than a program file, the menu »Status« is available from which you can start resp. stop a status block scan, set the PLC into »Run« or »Stop« mode, or compress the PLC.

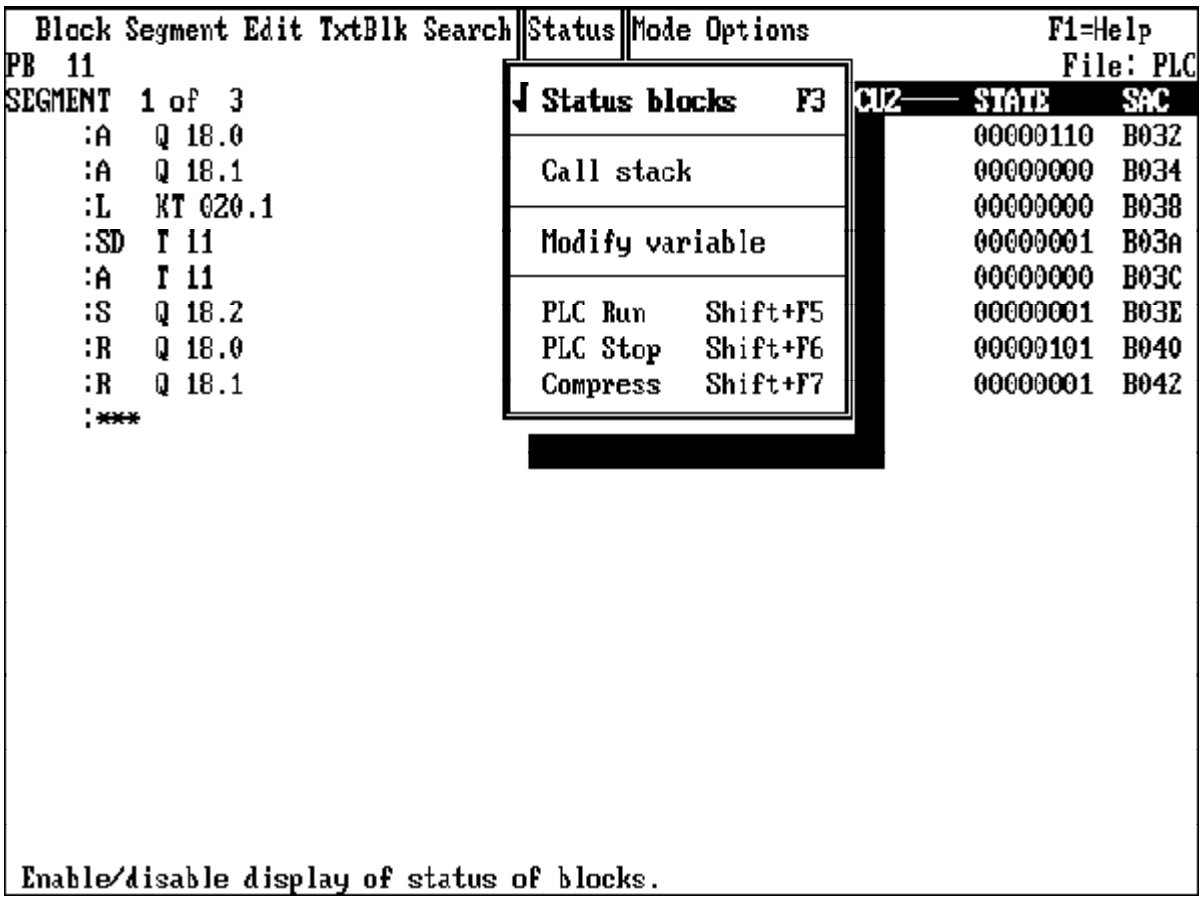

Fig. 8-9: The menu »Status«.

8.6.1 Start/Stop a status scan

Selecting the menu command »Status blocks« resp. typing the hot key F3 starts resp. stops the status scan. The status scan starts in the line the cursor is located on, and it ends in the last statement line of the screen, or with a special delimiting statement, e.g. a jump operation, or when the maximum number of status scans has been reached.

If the message "Block not executed" or "Statement not executed" appears during a status scan, the possible reasons can be:

- the PLC is in »Stop« mode
- the connection between PC and PLC is interrupted
- the PLC has been switched off
- the block is not executed due to a conditional call
- the block is not executed due to a jump operation.

8.6.2 Call stack

After selecting this menu command, the dialog box »Call stack« is displayed. You can specify a sequence of block calls. The status blocks display will be activated ONLY if the block being in the editor is called via exact this sequence of calls.

An example:

The block in the editor be the FB 10. The FB 10 be called from the OB 1 and from the PB 10. Let's specify the call sequence "PB 10". The status block display will show only those executions of the FB 10 which have been initiated from the PB 10.

This simplifies the debugging of complex applications.

8.6.3 Modify variable

The menu item »Modify variable« lets you inspect and edit the current value of an operand via a dialog box. Only word operands of type IW, QW, FW, RS, T and C are allowed.

8.6.4 Run PLC

The menu item »Run PLC« resp. the hot key Shift + F5 will execute a cold resp. a warm restart on the PLC.

8.6.5 Stop PLC

The menu item »Stop PLC« resp. the hot key Shift + F6 will set the PLC into the »Stop« mode.

8.6.6 Compress PLC

The menu item »Compress PLC« resp. the hot key Shift + F7 will compress the PLC memory.

8.7 Representation mode and symbolic editor

The menu »Mode« allows you to select another representation (programming) mode, if the current line and the current segment are syntactically correct, and if the current segment can be represented in the desired mode.

The menu »Mode« is shown in the next figure.

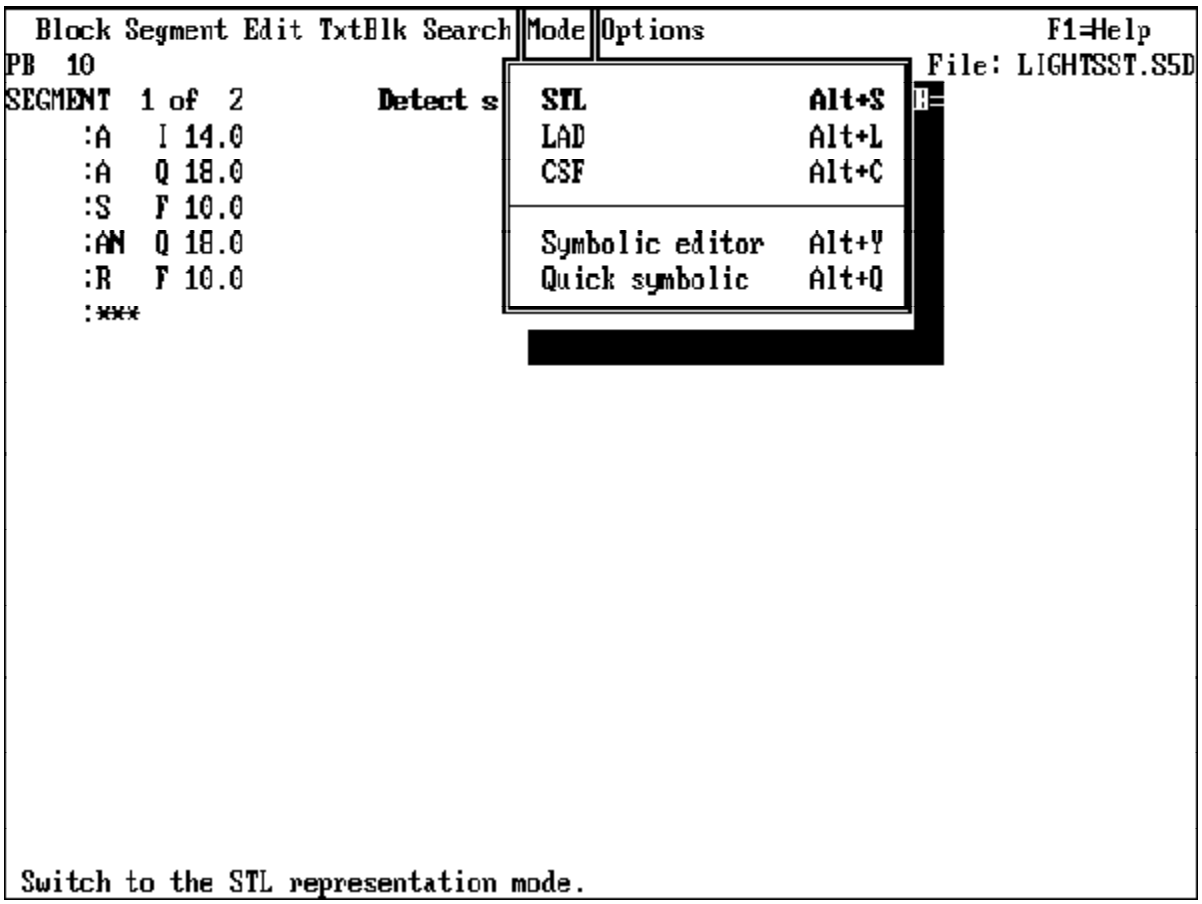

Fig. 8-10: The menu »Mode«.

8.7.1 Select the STL editor

The menu command »STL« has no effect as you are already in the STL editor.

8.7.2 Select the LAD editor

After selecting the menu command »LAD« resp. typing the hot key Alt + L resp. clicking on the toolbar symbol "LAD", you will activate the LAD (ladder diagram) editor. This cannot be done only if the current segment is not representable in LAD mode. This is the case for DB and DX blocks, and for the first segment of a FB or a FX.

Chapter 10 tells you everything about the LAD editor.

8.7.3 Select the CSF editor

After selecting the menu command »CSF« resp. typing the hot key Alt + C resp. clicking on the toolbar symbol "CSF", you will activate the CSF (control system flowchart) editor. This cannot be done only if the current segment is not representable in CSF mode. This is the case for DB and DX blocks, and for the first segment of a FB or a FX.

Chapter 11 tells you everything about the CSF editor.

8.7.4 Select the symbolic editor

After selecting the menu command »Symbolic editor« resp. typing the hot key Alt + Y resp. clicking on the toolbar symbol "SYM", you will activate the symbolic editor. If the current block has been changed since it was last saved, a dialog box with a corresponding message will appear. You can then decide whether to save the current block, or to cancel the operation.

If a symbols file has been specified in the current project settings or selected in »Options/Symbols file«, this file will be loaded into the editor automatically. The type of the file to be loaded (DT or SEQ) can be specified in the dialog box »Settings« with the option »Load symbols file«.

Chapter 12 tells you everything about the symbolic editor.

8.7.5 Select the quick edit mode of the symbolic editor

After selecting the menu command »Quick symbolic« resp. typing the hot key Alt + Q, you will activate the quick edit mode of the symbolic editor. The quick mode differs from the standard mode in the following point: in the quick edit mode, ACCON-PG lists all operands referenced in the current segment. This allows you to assign operands to symbols very conveniently.

A symbols file must be selected otherwise the quick edit mode is not accessible.

Chapter 12 tells you everything about the quick edit mode of the symbolic editor.

8.8 Options

The menu »Options« serves for modifying the settings which determine the appearance and the behaviour of ACCON-PG.

The menu »Options« is shown in the following figure.

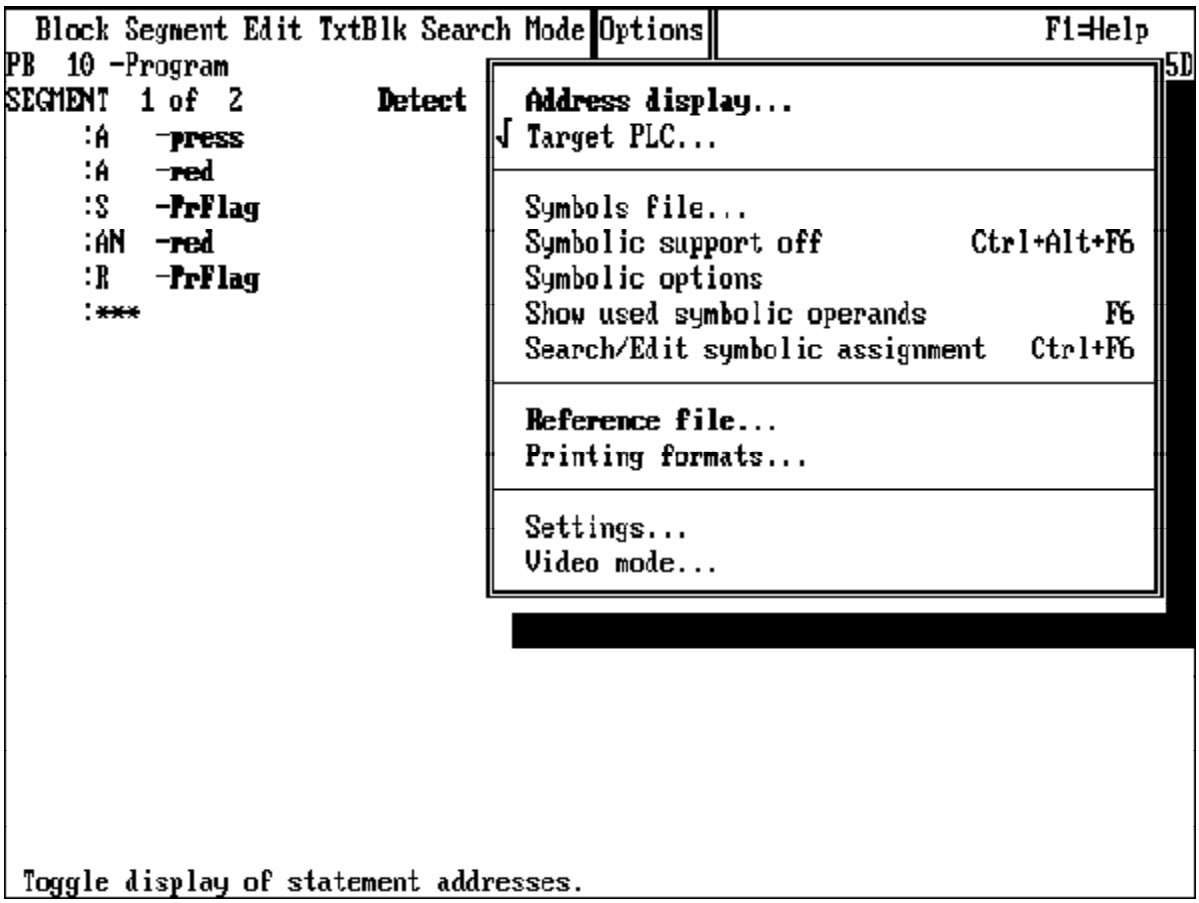

Fig. 8-11: The menu »Options« of the STL editor.

8.8.1 Display addresses

The menu command »Address on/off...« lets you specify the way in which addresses are displayed. A dialog box is displayed in which you can choose whether to output addresses as bytes, as words or to output no addresses at all.

If you choose to display addresses in the STL editor, they will appear at the left border of the screen.

When switching to the LAD editor or the CSF editor, you will automatically disable the display of addresses, i.e. when switching back to STL, no addresses will be displayed.

8.8.2 Select the target PLC

The menu command »Target PLC...« lets you specify the PLC you want to program. This command is the same as described in chapter 6.

8.8.3 Load a symbols file

After selecting the menu command »Symbols file«, a file-selection dialog box appears in which you can select a symbols file to be loaded. Symbolic operands will be displayed in the following. You can select the names for the DT file and the SEQ file independently, e.g. an SEQ filename according to Siemens filename conventions, and an arbitrary name for the DT file.

8.8.4 Enable/Disable symbolic support

Selecting the menu command »Symbolic support on/off« resp. typing the hotkey Ctrl + Alt + F6 enables resp. disables the display of symbolic operands. The title of this menu command depends on whether the function

is currently enabled, or not. If the symbolic support is enabled, an absolute operand will be replaced by the symbolic name (only if) specified in the symbols file.

The menu commands described below are accessible only if the symbolic support is active.

8.8.5 Symbolic options

This menu command invokes a dialog box for manipulation of the way in which (symbolic) operands are displayed. This menu commands is accessible only if the symbolic support is active.

Always show symbolic operands (CSF/LAD)

In CSF/LAD mode, symbolic operands are displayed only if the current symbols file does not contain symbols longer than 8 characters, and if the file has been saved with the option "Symbol length <= 8" activated.

If this option is ticked, symbolic operands are displayed even if they are longer than 8 characters (they are cut). If this option is not ticked, the symbolic assignment of the operand under the cursor is displayed in the first line of the editor.

In STL mode, this option is irrelevant.

Only operands from symbols file

Use this checkbox to specify whether ACCON-PG accepts only operands for which there is a symbolic assignment in the current symbols file. When entering an operand without an assignment, you will be prompted automatically for entering a symbolic assignment for the new operand.

Show symbolic and / or absolute operands

This radio button lets you configure the display of symbolic operands in the block editors.

- absolute operands: the absolute operand will be displayed in any case (e.g. I 1.2, FY 12).
- symbolic operands: the symbolic operand will be displayed if existing. Otherwise, the absolute operand will be displayed.
- both: in a 132-column video mode, both operands are displayed in STL mode. In an 80-column mode, the symbolic operand is favoured. In LAD/CSF, this option is irrelevant.

Note: of course, you can always enter an operand as an absolute or as a symbolic operand, just as you want.

Show the symbolic comment

This radio button lets you specify whether to display the STL comments or the symbolic comments in the right part of the screen. In a 132-column video mode, both comments can be displayed on one screen, but the symbolic comment cannot be edited. This option has no influence in LAD/CSF.

8.8.6 Show the used symbolic operands

Selecting the menu command »Show used symbolic operands« resp. typing the hot key F6 gives you a list of the symbolic names used in the current segment. A window appears displaying the absolute and the symbolic operands plus the symbolic comments line per line.

8.8.7 Show/Edit the symbolic assignment

Selecting the menu command »Search/Edit symbolic assignment« resp. typing the hot key Ctrl + F6 gives you the current absolute and the symbolic operand plus the symbolic comment in a window. You can edit the symbolic name and comment.

8.8.8 Select a reference file

The menu command »Reference file...« lets you specify a file from which to take the comments and data formats when working on the PLC. When working with comments on the PLC and saving your project, you will be asked whether to store the changed comments in the reference file.

8.8.9 Printing formats

Selecting the menu command »Printing formats« causes a dialog box to be opened where you can perform the following settings:

- page width
- when to perform a form feed
- whether and how to print line numbers
- the representation mode used for printing
- whether and how to print comments
- how to print operands
- how to print the segment comment
- whether to print a list of the symbolic names
- whether to print symbolic operands in bold type
- whether to print a footer.

8.8.10 Settings

Selecting the menu command »Settings...« causes a dialog box to be opened which is described in chapter 6.6.

8.8.11 Select a video mode

Selecting the menu command »Video mode...« lets you switch to another video mode supported by the video adapter installed in your computer. ACCON-PG supports the extended video modes available on SVGA adapters, in which e.g. the symbolic and the line comment can be displayed simultaneously on one STL screen. In the status mode, either the symbolic or the line comment can be displayed in addition to the normal status display.

Chapter 9:

The DB Editor

Overview

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Usually, the data block editor of ACCON-PG is used for editing data blocks (DB, DX). There is a further type of DBs used for configuring PLCs running in multi-processor mode (PLC 135U and PLC 155U), the so-called screen form DBs (or simply form DBs).

9.1 Editing data blocks

The data block editor can be accessed from the directory via »Block«/»Edit« resp. »Block«/»New« if the selected block is a DB or a DX (extended data block).

Each data item is edited in a line of its own. The data format for each line is stored in a separate block, the so-called format block. For a DB, the format block is a DV; for a DX, the format block is a DVX. The format of the data is simply a kind of view on the data; changing the format of a data item does not change the binary representation of the item. The only exception to this are floating-point numbers because of a normalization. That means that a data type conversion into floating-point format (KG) and back will change the binary representation of an item. Therefore, the value of the item is changed!!

If a format block does not exist, you are prompted for specifying a data format you want to use for displaying the data. This is e.g. the case when working on the PLC rather than on a program file. A reference file can be used as a substitute for the data format block. You can select a reference file via »Options«/»Select reference file...«.

When creating a new DB, e.g. the »DB 10«, the DB editor appears as shown in fig. 9-1.

```
  Block Edit TxtBlk Search Mode Options                          F1=Help
DB  10                                                   File: LIGHTSST.S5D
                                                        LIB=
   0:

* [Alt]  or  [F10] = Menu   Over          STL        1    1B741276  0001:01
```

Fig. 9-1: The data block editor.

The menu commands are explained below. Since many commands are the same as in the STL editor, only the differences are described.

9.1.1 Block operations

Using the block operations, you can save the data block being in edited, save it to another file, edit the block title or the block comment, print the data block, edit the LIB number or exit from the editor. The menu »Block« is shown in the next figure.

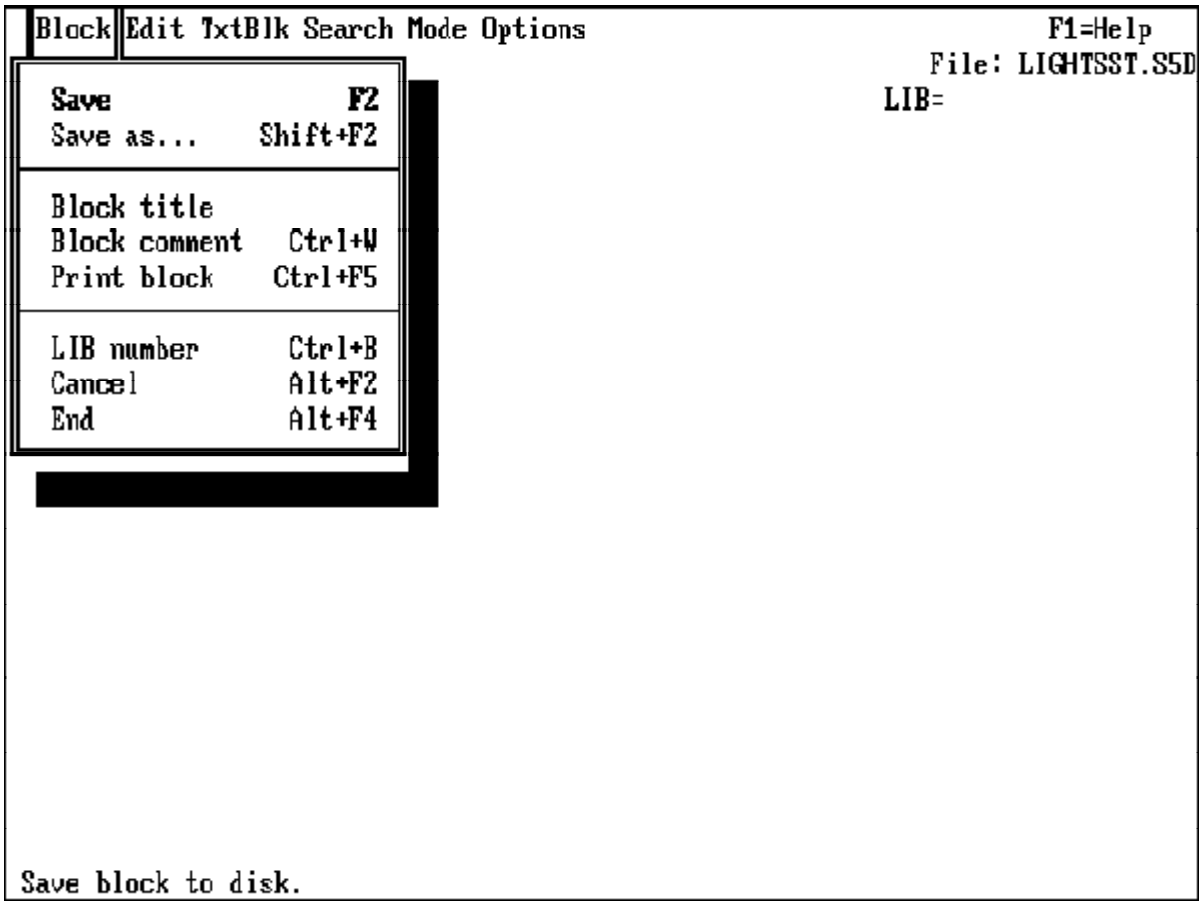

Fig. 9-2: The menu »Block«

9.1.1.1 Edit the block title

By selecting the menu command »Block title«, you can locate the cursor in the top line of the editor where you can assign a title to the data block. You can also select this line with the mouse.

The block title corresponds with the segment title of ordinary program blocks.

9.1.1.2 Edit the block comment

By selecting the menu command »Block comment«, you can activate the comment editor. You can also activate the comment editor with the mouse by double-clicking on the block title or clicking on the toolbar item »COM«, or by using the hotkey Ctrl + W.

The block comment corresponds with the segment comment of ordinary program blocks. See chapter 13 for details.

9.1.1.3 Print a data block

The menu command »Print block« resp. the hotkey Ctrl + F5 lets you print the current data block. You can modify contents and form of the printer output with the menu command »Printing formats ...« of the menu »Options«.

9.1.2 Edit data blocks

The menu »Edit« shown in the next figure contains numerous operations for editing data blocks.

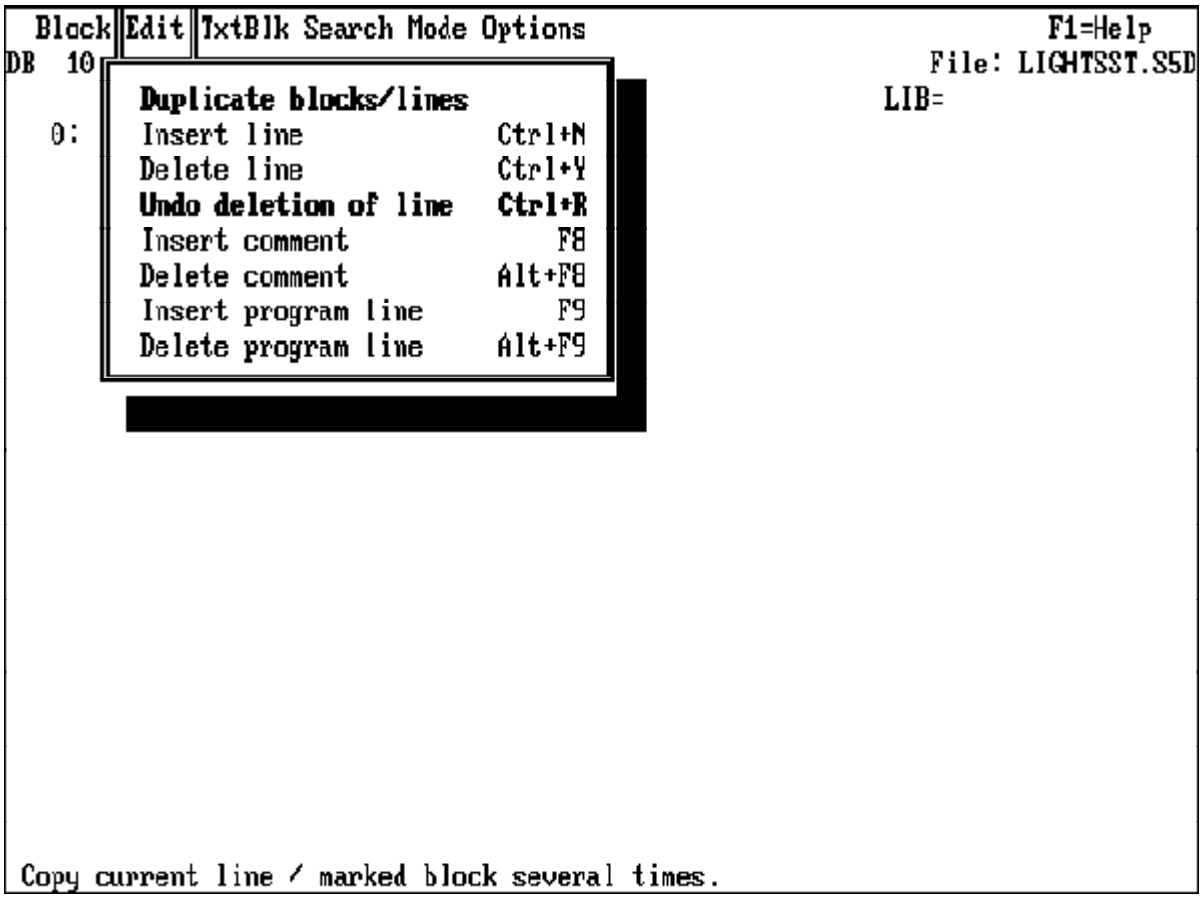

Fig. 9-3: The menu »Edit«

9.1.2.1 Duplicate lines

The menu command »TtxBlk/Duplicate lines« or the toolbar symbol »Fill« lets you fill the data block. The dialog box »Fill DB« appears where you can enter the number of copies of the marked block to be inserted at the current cursor position. If there is no marked block, the current line will be duplicated instead.

9.1.3 Text block operations

All operations of the menu »TxtBlk« work as described in chapter 8 (STL editor).

9.1.4 Searching operations

The menu »Search« shown in the next figure contains the search commands known from the STL editor.

Note that you can mark up to 10 locations in the text and access these locations with a hotkey. Use the hotkey Ctrl + K, 0 … 9 to mark a location, resp. the hotkey Ctrl + Q, 0 … 9 to go to the corresponding location.

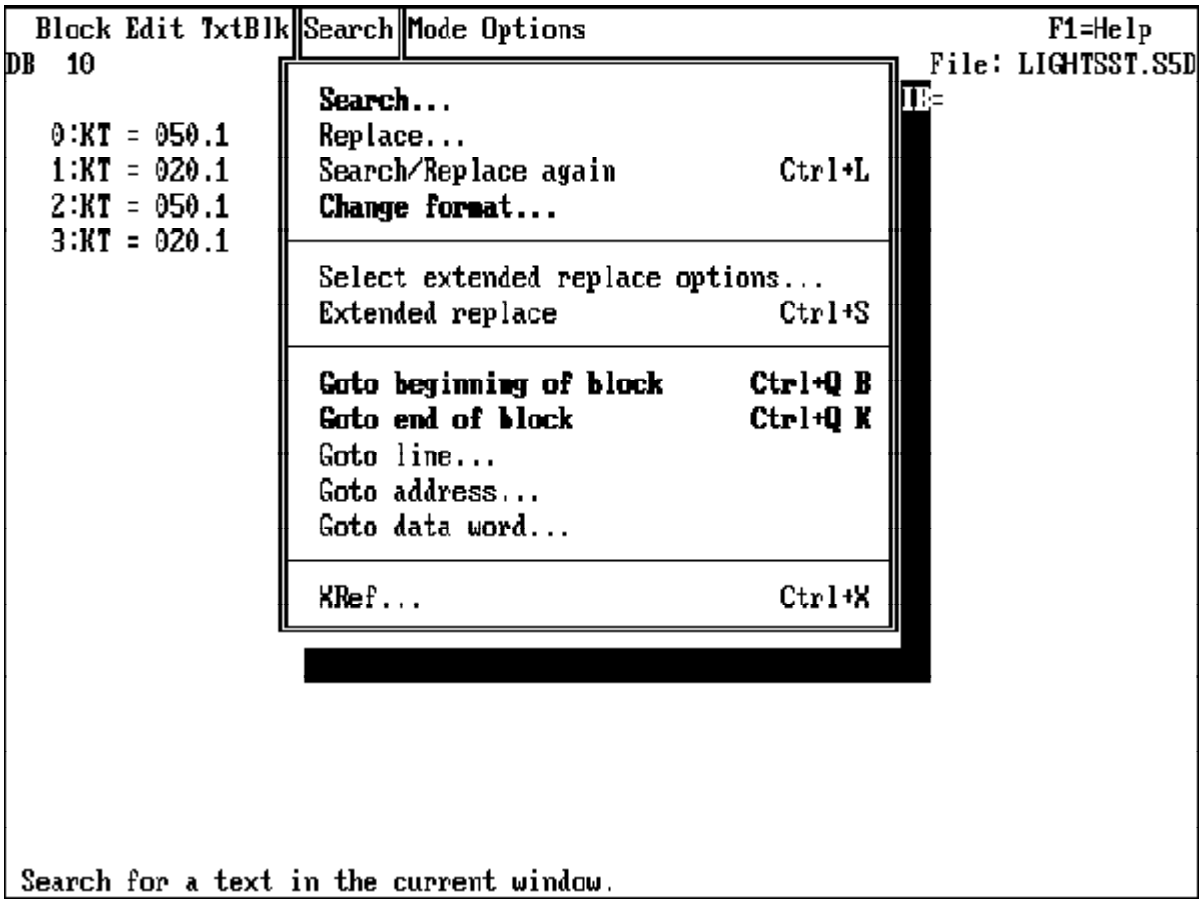

Fig. 9-4: The menu »Search«

9.1.4.1 Change data format in block

After selecting the menu command »Change Format...«, the dialog box »New format« shown in figure 9-5 appears where you can select one of the formats being offered. After confirming, all lines of the marked block will be displayed using the new format. This menu command is available only when a block is marked.

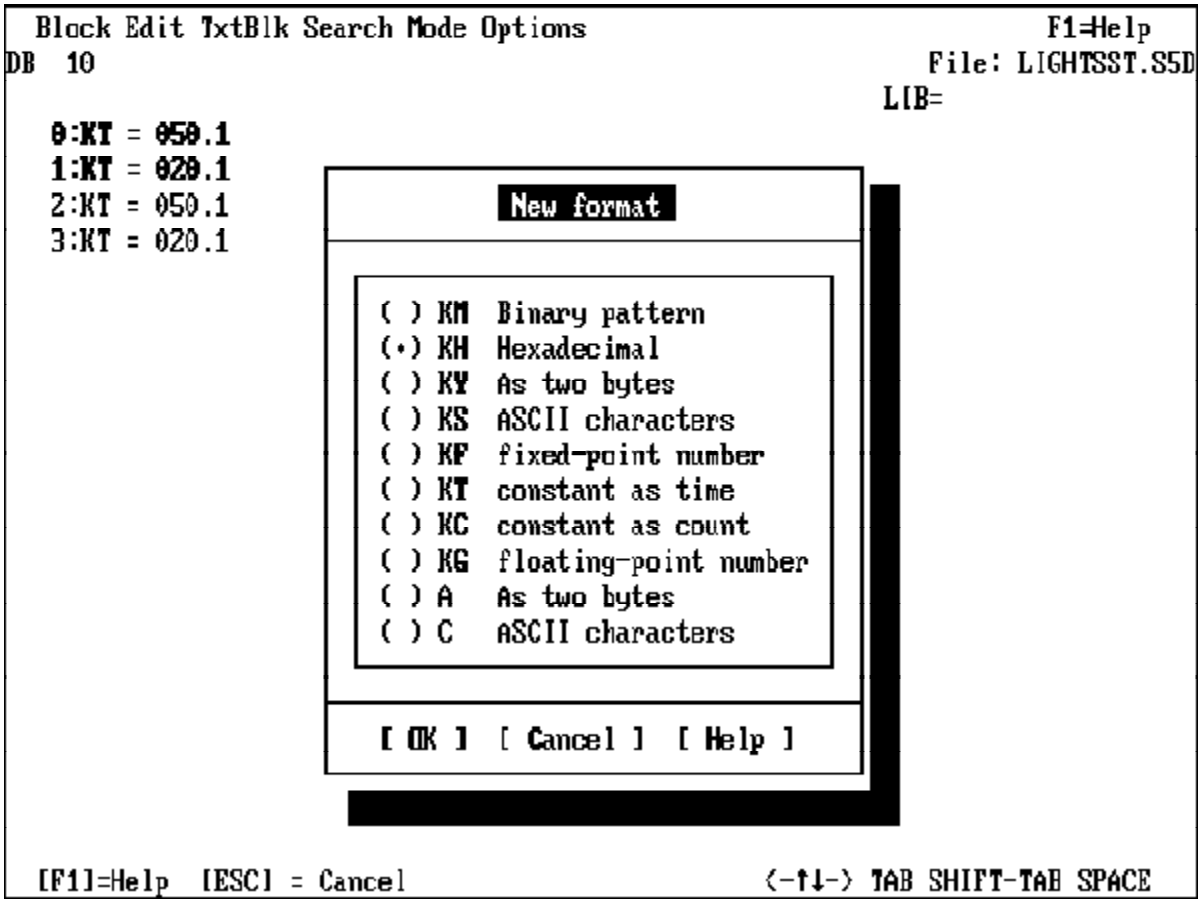

Fig. 9-5: The dialog box »New format«

9.1.4.2 Goto data word

After selecting the menu command »Goto data word...«, a dialog box appears where you can enter the decimal number of the data word to go to. You can leave the current line only if it is syntactically correct.

9.1.5 The menu mode

The menu »Mode« lets you select another programming mode which will not be used until you load a program block into the editor. You can also avtivate the symbolic editor.

9.1.6 Options

The menu »Options« shown in the next figure lets you configure ACCON-PG as you know from chapter 6.

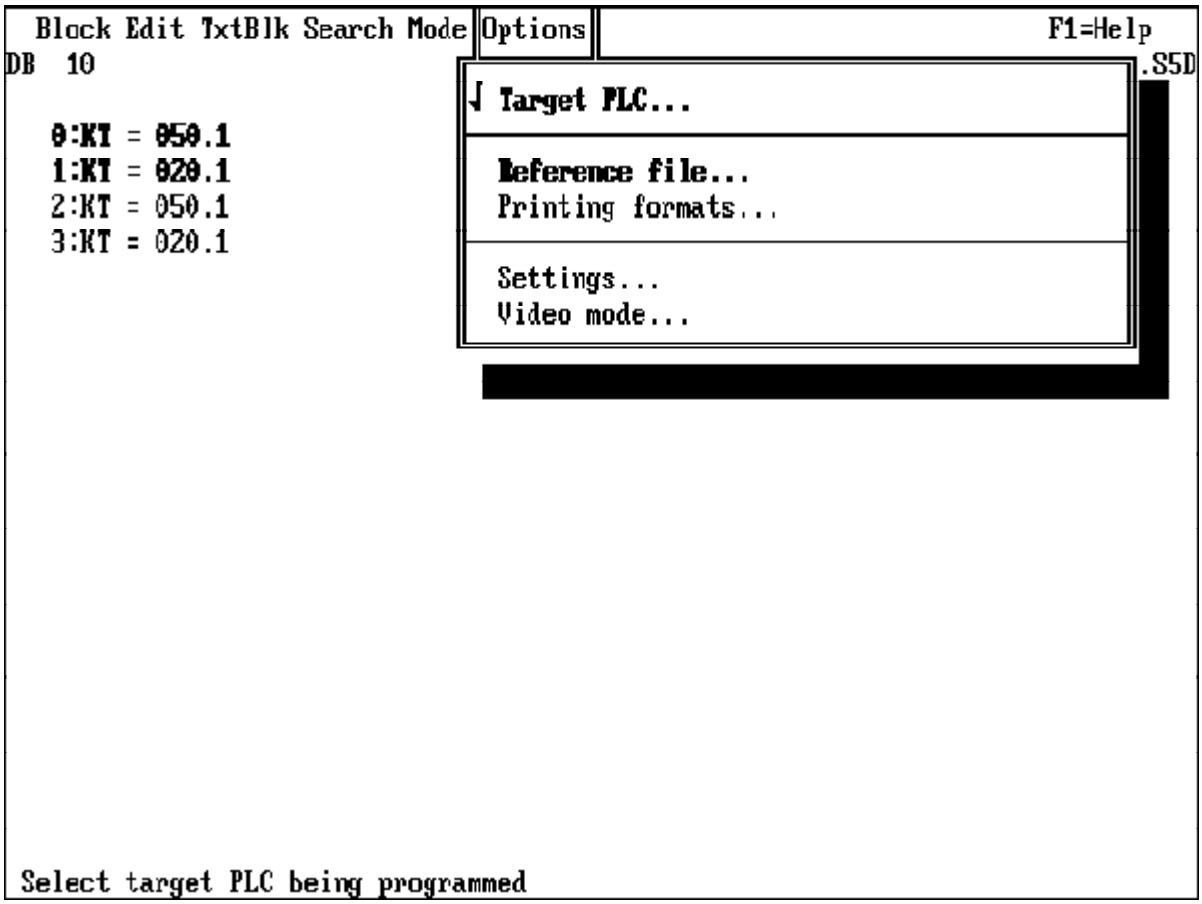

Fig. 9-6: The menu »Options« of the DB editor

9.2 Screen form DBs

The dialog box shown in the figure below appears after selecting the menu command »Block«/»Create new screen form« in the directory. Enter the name and the type of the data block to create.

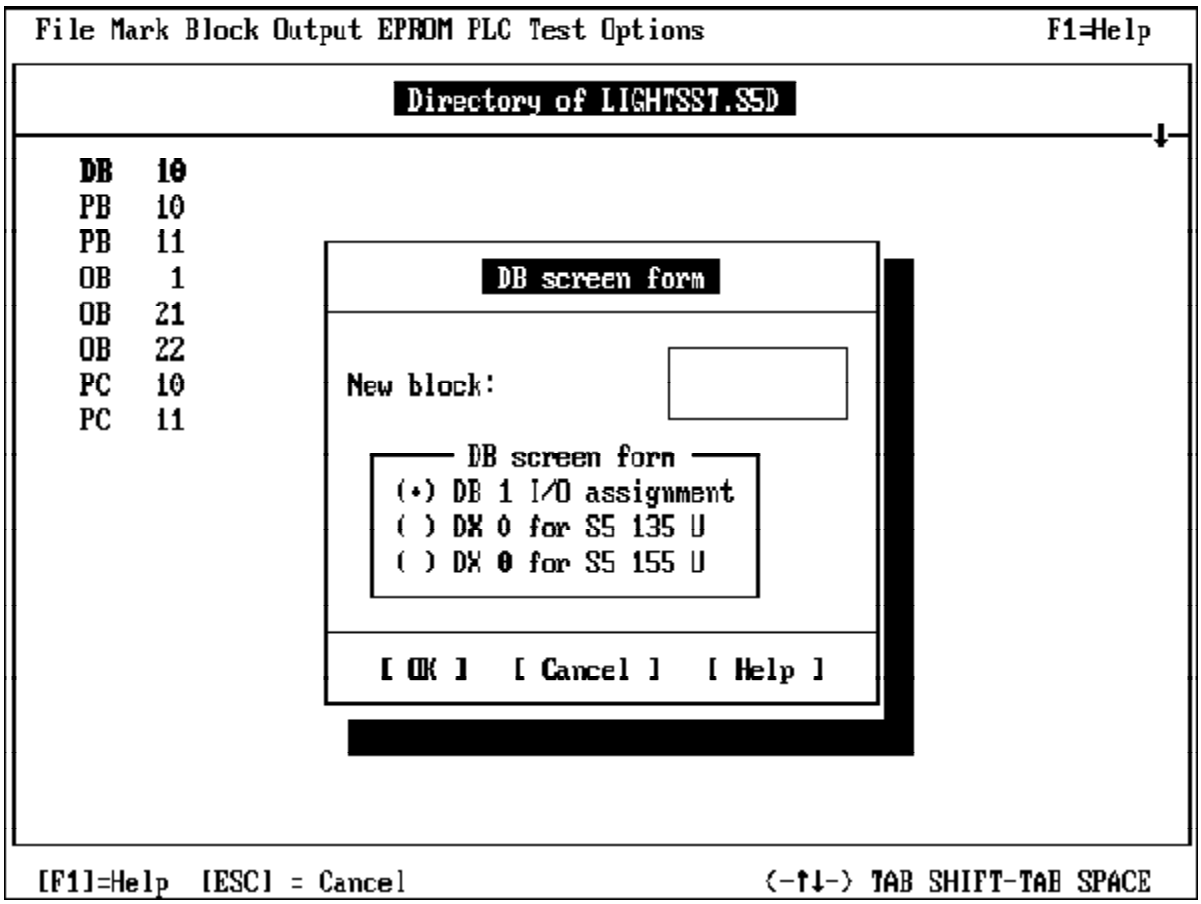

Fig. 9-7: The dialog box »DB screen form«

There are three different types of screen form DBs described below. In short, form DBs are used for configuring the system behaviour, e.g. in multi-processor mode or interrupt processing. For more details, consult your PLC manual.

9.2.1 DB1 screen form

When selecting a new or an existing screen form DB of the type DB1 form, the following screen appears.

```
 File Edit                                                    F1=Help

Digital inputs    :

Digital outputs   :

IPC flag inputs   :

IPC flag outputs  :

Number Timer Cells:

 [Alt]  or  [F10] = Menu   Over
```

Fig. 9-8: The editor for a DB1 screen form

Enter the decimal values separated by commas. For digital inputs / outputs, the valid range is 0..127, for interprocessor communication (IPC) flag inputs / outputs it is 0..255, for the timer cell length it is 0..256.

Note: The entered values will not be checked for validity until you try to save them.

9.2.2 DX0 screen form for PLC 135U

When selecting a new or an existing screen form DB of the type DX0 form for the PLC 135U, the following screen appears.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

   DX 0 : param. ass. (S5 135U, CPU 928, R processor)   DB 11

 Restart after power up
 (•) warm restart                [X] synchronize multiprocessor restart
 ( ) cold restart                [ ] block transfer of IPC flags
                                 [X] addressing error monitoring

 Cycle time monitoring           R proc.: 1-400
  15       x 10 MS               CPU 928: 1-600

 No. of timer cells              R proc.: 0-128
  256                            CPU 928: 0-256

 Precision float. point arith.   Process int. servicing
 (•) 16 bit mantissa             (•) level-triggered
 ( ) 24 bit mantissa (o. CPU 928) ( ) edge-triggered

   [ OK ]   [ Page 2 ]   [ Default ]   [ Cancel ]   [ Help ]

[F1]=Help  [ESC] = Cancel                  (-↑↓-) TAB SHIFT-TAB SPACE
```

Fig. 9-9: Dialog box (Page 1) of DX0 form for PLC 135U

Select the push button »Page 2« to open a second dialog box.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

     DX 0 : param. ass. (S5 135U, CPU 928, R processor)   DB 11

  System stop if event occurs and error OB does not exist:

  [X] address. error (OB 25)          [X] cycle error (OB 26)
  [ ] acknowl. error (OB 23,24)       [X] timer err. (OB 33)
  [X] command code err. (OB 27,29,30) [X] controller err. (OB 34)
  [X] runtime error (OB 19,31,32)     [ ] Interface error (OB 35)

                  Interruptability of user program
   (•) all interrupts at block bounds
   ( ) all interrupts at operation bounds
   ( ) only process interrupts at operation bounds
   ( ) only proc. and controller ints. at op. bounds
   ( ) time int. f. OB 10 - OB X (ent. X bel.) cont./proc.: op. bo.

   Max. OB for time int. (s.a.)

     [ OK ]    [ Page 1 ]    [ Default ]    [ Cancel ]    [ Help ]

[F1]=Help  [ESC] = Cancel                  (-↑↓-) TAB SHIFT-TAB SPACE
```

Fig. 9-10: Dialog box (Page 2) of DX0 form for PLC 135U

Perform the settings according to your needs. You should consult the PLC manual for details.

Use the push buttons »Page x« to switch between the two dialog boxes. Use the push button »Default« to set the values of the various parameters (of the active dialog box) to their default values.

9.2.3 DX0 screen form for PLC 155U

When selecting a new or an existing screen form DB of the type DX0 form for the PLC 155U, the following screen appears.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

                DX 0 : param. ass. (S5 155U)   DB 11

 DB      Mode                      Restart after power up
 PB      (•) 150 U                 (•) warm restart
 PB      ( ) 155 U                 ( ) cold restart
 OB                                ( ) manual start
 OB      No. of timer cells
 OB      256
 PC                                Warm restart procedure
 PC      Cycle time monitoring     (•) warm restart
         20       x 10 MS          ( ) cold rest. with memory

         process int. input byte 0 (only in 155U mode):

                                   Priority
         [X] process int.          2

           [ OK ]  [ Page 2 ]  [ Default ]  [ Cancel ]  [ Help ]

[F1]=Help  [ESC] = Cancel                  (-↑↓-) TAB SHIFT-TAB SPACE
```

Fig. 9-11: Dialog box (Page 1) of DX0 form for PLC 155U

Select the push button »Page 2« to open a second dialog box.

```
File Mark Block Output EPROM PLC Test Options                    F1=Help

          DX 0 : param. ass. (S5 155U)   DB 11

DB   time interrupts:                  Priority
PB   [X] time int. servicing           1
PB
OB   Basic clock                       Clock pulse process.
OB   10     x 10 MS                    (•) factor 1, 2, 5, 10
OB                                     ( ) factor 1, 2, 4, 8
PC
PC
     hardware process int. (only in 155U mode):
                                       Priority
     [ ] system interrupt A/B          2
     [ ] system interrupt E            2
     [ ] system interrupt F            2
     [ ] system interrupt G            2

     [X] synchronize multiprocessor restart
     [ ] block transfer of IPC flags

       [ OK ]  [ Page 1 ]  [ Default ]  [ Cancel ]  [ Help ]

[F1]=Help  [ESC] = Cancel                  <-↑↓-> TAB SHIFT-TAB SPACE
```

Fig. 9-12: Dialog box (Page 2) of DX0 form for PLC 155U

Perform the settings according to your needs. You should consult the PLC manual for details.

Use the push buttons »Page x« to switch between the two dialog boxes. Use the push button »Default« to set the values of the various parameters (of the active dialog box) to their default values.

Chapter 10:

Programming in LAD

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LAD is the abbreviation of LAdder Diagram. This representation mode requires a special editor provided by ACCON-PG. The symbols of the ladder diagram are closely related to the symbols used in circuit diagrams (NO contacts, NC contacts, coils etc.).

You can activate the LAD editor from the main menu by selecting the menu command »LAD editor« in the menu »Programming« or by typing the hot key [Alt] + [L]. This opens the directory where you can select a block and load it into the LAD editor (by double-clicking on the block name, or by pressing the [↵] key when the cursor bar is on the name of desired block, or by using the menu item »Block/Edit«).

When entering »PB 11« as in our example, the LAD editor appears as shown in fig. 10-1.

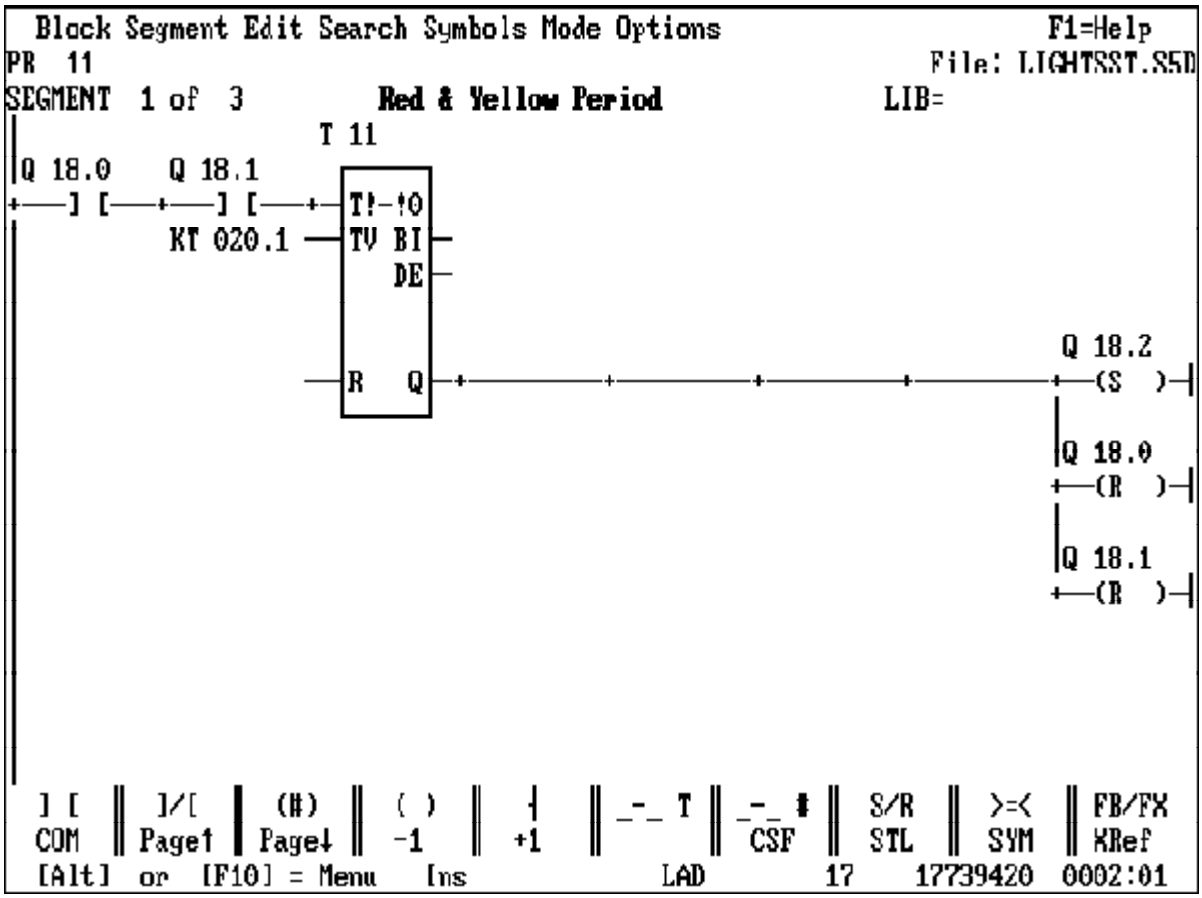

Fig. 10-1: The LAD editor.

10.1 Create a ladder diagram

The first line of the LAD editor contains the names of the current block and the current file, the second line contains the name of the current segment and the LIB number. You can see the "power rail" at the left border of the screen.

In fig. 10-1, the tool bar is displayed. As already mentioned, you can switch the tool bar on resp. off using the menu command »Settings« in the menu »Options«.

If a program file or the PLC containing a PB 11 (as an example) has already been opened, the block (the PB 11) will be loaded into the editor. If you have not opended a file, or the file does not contain a PB 11, this block will be created now.

DB or DX blocks are not representable in LAD mode on principle. In regard of FB and FX blocks, all segments are representable except for the first one.

Blocks are not representable in LAD mode if they contain at least one element which is not representable in LAD mode. If a block e.g. calls a PB, the whole segment is representable in LAD mode if and only if there is no other symbol in the segment. When you select a block from the directory which cannot be represented in LAD mode, you will get a corresponding message, and the STL editor will be activated automatically.

Segments containing conditional block calls are representable in LAD mode if block calls are executed as special output symbols.

If a segment has been created and programmed in LAD mode, it will always be representable in LAD mode.

10.1.1 Enter LAD symbols

You have already entered the block name and are in the LAD editor. The elements of a ladder diagrams are the following:

The AND operation is called »NO contact« in LAD mode. The corresponding hot key is Ctrl + A.

The AND-NOT operation is called »NC contact« in LAD mode. The corresponding hot key is Ctrl + N.

The OR operation is represented as a parallel connection in LAD mode, i.e. you can generate an OR operation by linking a parallel branch with the current branch.

You can insert a symbol when the cursor is on a valid position. Enter the hot key of the desired symbol, or select it from the menu »Symbols« or via the tool bar, if you are using a mouse and if the tool bar is currently available. To insert a symbol via the tool bar, proceed as follows: locate the cursor on the insert position and click on the desired symbol in the tool bar.

If there is enough room for the selected symbol, it will be inserted; otherwise you will get a corresponding message. You need not expand the segment, since ACCON-PG will do this for you if necessary.

When the selected symbol appears, the cursor is located behind the inserted symbol, so that another symbol can be inserted. The ???????? above the symbol designate an operand which can be entered now. The cursor can be located on the first operand which has not yet been entered by typing the hot key Ctrl + ↵

10.1.2 Enter an operand

When the cursor is located on one of the question marks, you can edit the operand name by typing the corresponding letters, e.g. ‘I4.5’. You can simply overwrite the first question mark, the other ones will be deleted automatically. The input field is displayed inverse or emphasized by another color, depending on the selected palette.

When editing an operand, the following editing keys are available:

Del	Delete character under cursor.
←	Delete character to the left.
Ins	Insert character before the cursor.
Ctrl + Y	Delete whole operand.
Esc	Exit from editing the operand, restore status quo.
Home	Goto beginning of operand field.
End	Goto end of operand field.

Use the cursor keys to move the cursor within the input field, and the ↵ key to confirm your entry. If the entered operand is valid, the cursor will be positioned on the next operand of another symbol that has not yet been specified (only if the option »Automatic cursor movement« of the menu »Options« has been ticked). Keys which are useless for editing operands are locked.

10.1.3 Enter further symbols resp. a parallel branch

To be able to insert further symbols at the first rung, the cursor has to be located on a position valid for inputting symbols. In regard of the first created rung, the valid positions are all characters between the two symbols -[ ]- and -( )-.

When entering the first symbol of a segment, the rung covers the whole width of the screen. The symbol appears at the left border, and an output at the right border of the rung. Further symbols can be inserted in that branch or paralleled.

If the cursor is located on an already existing symbol, this symbol will be overwritten, and no other symbol will be inserted. When the cursor is located at the right or left side of the symbol -[ ]-, you can insert another symbol.

To create a parallel branch, locate the cursor on the first line of the screen below the symbol that is to be paralleled. If you want to create a parallel branch within an existing branch, locate the cursor on the desired position below that branch and enter the desired symbol. ACCON-PG will create the link to the above branch automatically (see fig. 10-2).

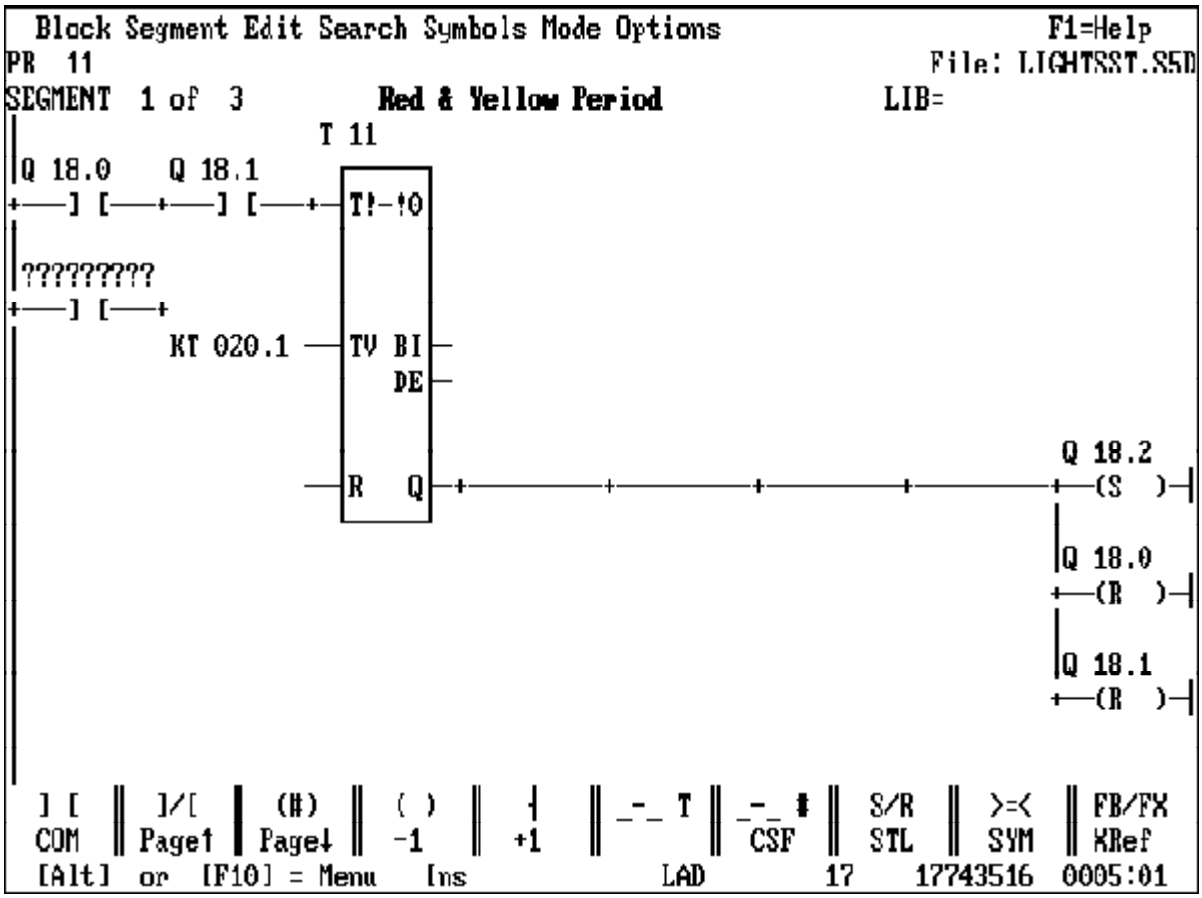

Fig. 10-2: A parallel branch.

You can complete a parallel branch by selecting the menu command »Complete parallel branch« from the menu »Edit«, or by typing the hot key Ctrl + P.

After completing the parallel branch, the link to the branch above will be created automatically, and the cursor will be located on the first operand that has not been entered yet.

You can also create a vertical link between two nodes by pressing the key [↑].

Parallel branches cannot be created "across" complex symbols, i.e. complex symbols cannot be inserted above or below a parallel branch. You cannot open a second parallel branch if the first branch has not yet been completed. In the branching mode, the cursor will not leave the open branch even if you want to locate it somewhere else.

10.1.4 Enter complex symbols

Complex symbol can usually be entered just like ordinary symbols. The »????????« can be treated as usual. The operand directly above the complex symbol designates the operand to be activated (with a timer, this could be e.g. ‘T 6’).

A compare symbol can be inserted only in the first column of the LAD editor.

As you already know, complex symbols cannot be inserted above or below a parallel branch.

10.1.5 Special output symbols

The output symbols appearing in the last column can be modified, i.e. converted to one of the following symbols:

+—( )—|	corresponds to an assignment.
+—(S)—|	corresponds to a Set operation.
+—(R)—|	corresponds to a Reset operation.
+—(CU)—|	corresponds to an Up Counter .
+—(CD)—|	corresponds to a Down Counter.
+—(Sx)—|	x=P,E,D,S,F.: start the timer as specified.
+—(JC)—|	corresponds to a conditional jump. The block designated by the operand will be called. Valid operands are program blocks PB, organization blocks OB and sequence blocks SB.

The outputs can be modified by entering the corresponding keys in the input field. The entry must be completed with ↵.

The following sections deal with the various menu commands available in the LAD editor.

10.2 Block operations

The menu »Block« (shown in the figure below) of the LAD editor enables you to save the current block or to another file, to edit the LIB number and to exit from the LAD editor.

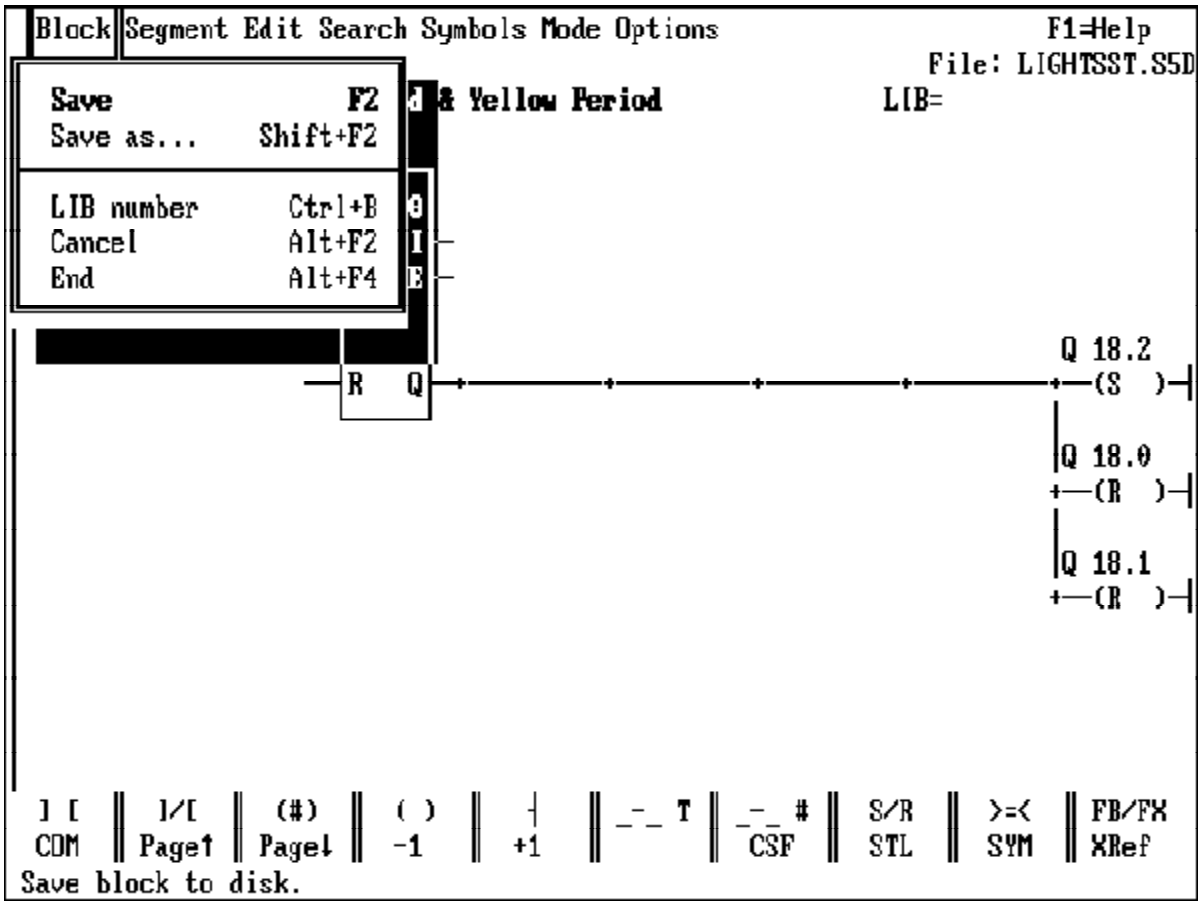

Fig. 10-3: The menu »Block«.

10.2.1 Save a block

You can save the block in the editor to the current file resp. the PLC using the menu command »Save« resp. the hot key F2. If the current file does not yet have a name, the dialog box »Save file« appears in which you must specify the name of the file.

10.2.2 Save a block to another file

You can save the block in the editor to a new file or to another file than the current file using the menu command »Save as« resp. the hot key Shift + F2. The dialog box »Save file« appears in which you must specify the name of the file.

You can select another directory or another drive from the drive / directory list box. If the specified file exists already, a dialog box with a corresponding warning message will appear. You can now decide whether to overwrite the existing file, or to cancel the operation. If the current block exists in the current file already, you will also get a corresponding warning message; so you can cancel the operation if necessary.

The directory provides for more efficient methods for transferring blocks.

10.2.3 Edit the LIB number

After selecting the menu command »LIB number« resp. typing the hot key Ctrl + B resp. clicking on the LIB number field, the cursor is located behind the field »LIB=« in the top right corner of the screen where you can enter resp. edit the number of the library to be used. You can modify the LIB number according to your wishes. The number consists of digits only.

10.2.4 Cancel editing

Selecting the menu command »Cancel« resp. typing the hot key Alt + F2 lets you exit from editing the current block. If the block resp. the file has been changed since it was last saved, a message box with a corresponding notice will appear. You can now cancel the operation, i.e. continue editing, or actually exit editing with a loss of the changes. The block need not be syntactically correct if you want to cancel editing.

10.2.5 End editing

You can leave the LAD editor using the menu command »End« resp. the hot key Alt + F4. If the current block has been modified since it was last saved, a dialog box with a corresponding warning message will appear. You can now save the changes to the block, or cancel the operation.

10.3 Segment operations

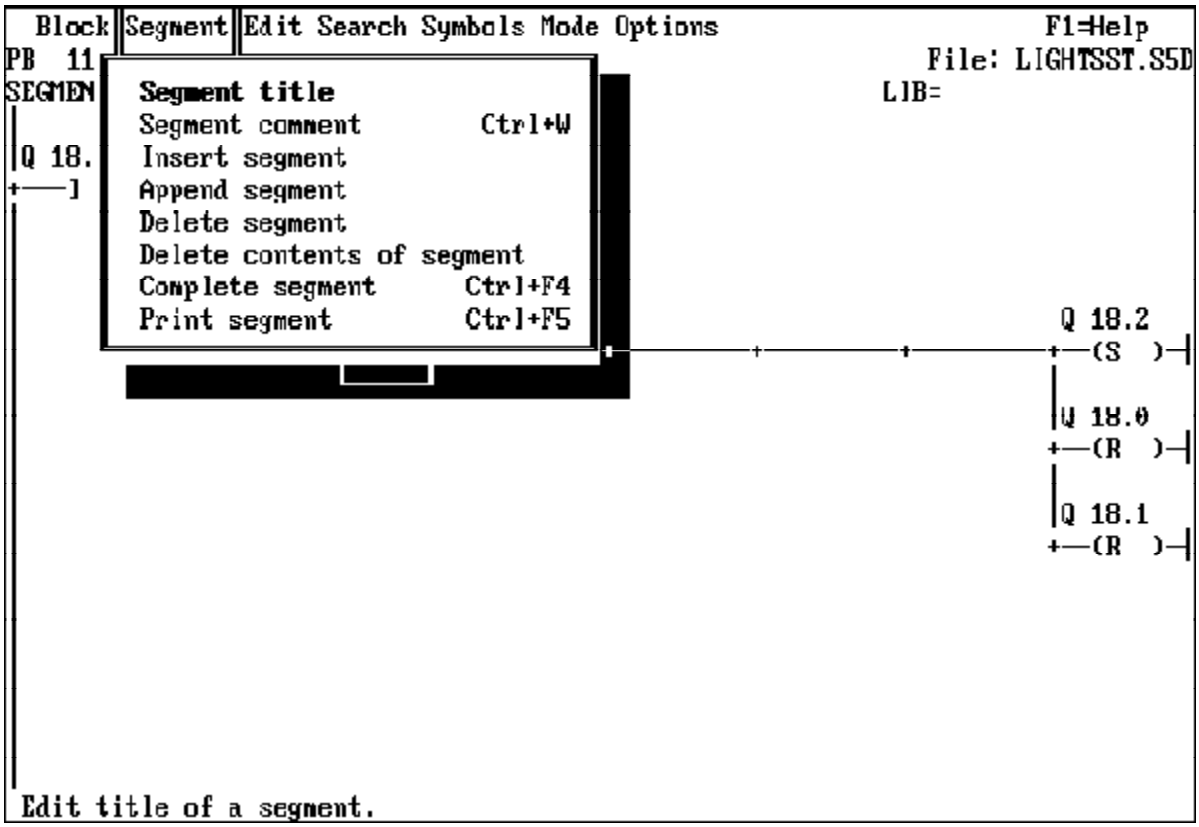

Fig. 10-4: The "Segment" menu

10.3.1 Enter the segment title

After selecting the menu command »Segment title«, the cursor will be located on the second line of the screen where you can enter the title of the current segment. The segment title can also be selected using the mouse by clicking with the left mouse button on the corresponding position. Press the ↵ key to complete your entry and to leave the input field.

10.3.2 Edit the segment comment

After selecting the menu command »Segment comment«, you will be in the comment editor where you can edit the comment of the current segment. You can also activate the segment comment editor by double-clicking with the left mouse button on the segment title, or by using the hot key Ctrl + W, or by clicking on the "COM" symbol in the toolbar (only if the toolbar is activated).

This menu command is described in detail in chapter 13.

10.3.3 Insert a segment

Selecting the menu command »Insert segment« has the following effects: the current segment will be completed, and a new segment will be inserted before it.

A new segment can be inserted only if the syntax check of the current segment can be performed successfully, and if the total number of segments does not exceed 256.

10.3.4 Append a segment

Selecting the menu command »Append segment« has the following effects: the current segment will be completed, and a new segment will be inserted behind it.

A new segment can be inserted only if the syntax check of the current segment can be performed successfully, and if the total number of segments does not exceed 256.

10.3.5 Delete a segment

Selecting the menu command »Delete segment« will cause the current segment to be deleted without checking for correct syntax. You have to confirm the deletion before it is actually executed. You can also cancel the operation.

10.3.6 Delete the contents of a segment

Selecting the menu command »Delete contents of segment« will cause the contents of the current segment to be deleted without checking for correct syntax. You have to confirm the deletion before it is actually executed. You can also cancel the operation.

10.3.7 Complete the current segment

Selecting the menu command »Complete segment« has the following effects: the current segment is checked for undefined operands etc. The next segment will be opened (a new segment will be appended if necessary).

You can also access this function using the hot key Ctrl + F4.

10.3.8 Print a segment

Selecting the menu command »Print segment« resp. typing the hot key Ctrl + F5 will cause the current segment to be printed using the specified standard printer and the current printer settings. You can modify the formats used for printing using the menu command »Printer options...« in the menu »Options«.

10.4 Edit operations

The menu »Edit« contains the block editing commands.

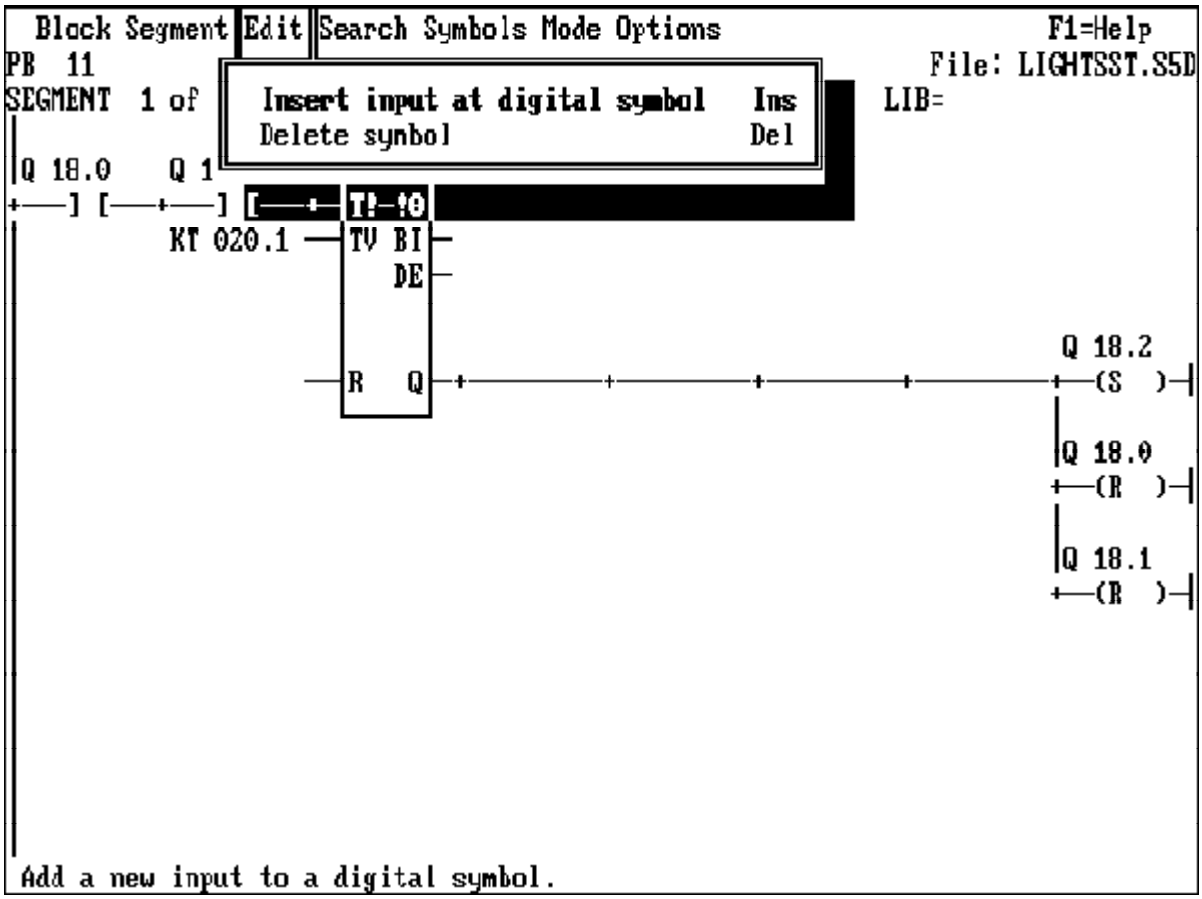

Fig. 10-5: The menu »Edit«.

10.4.1 Complete parallel branch

You can complete a parallel branch by selecting the menu command »Complete parallel branch«, or by typing the hot key Ctrl + P, or by positioning the cursor on a position valid for completing and pressing ↑.

After completing the parallel branch, the link to the branch above will be created automatically, and the cursor will be located on the first operand that has not been entered yet.

This menu command is visible only in branching mode (if a parallel branch has been opended).

See also 10.1.1 (»Enter LAD symbols«).

10.4.2 Insert input at a digital symbol

Selecting the menu command »Insert input at digital symbol« resp. typing the hot key Ins adds a further input to the current digital symbol (e.g. an arithmetic symbol).

10.4.3 Delete symbol

Selecting the menu command »Delete symbol« resp. typing the hot key Del deletes the symbol under the cursor. You can delete every symbol except for the last symbol in the segment.

10.5 Search/Replace text and goto

The menu »Search« contains functions for searching and replacing operands, and for positioning the cursor on a specific location within the program.

The following figure shows the menu »Search«.

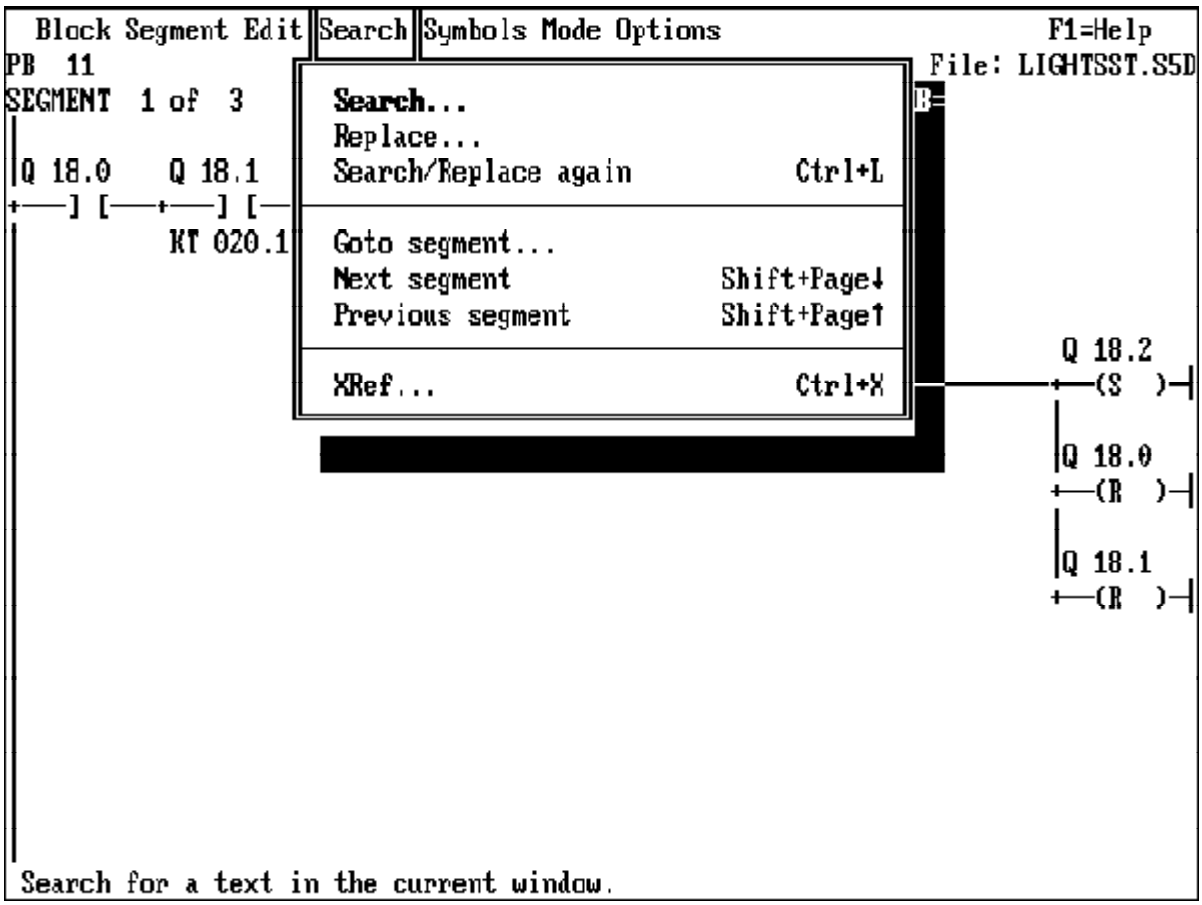

Fig. 10-6: The menu »Search«.

10.5.1 Search for a string

After selecting the menu command »Search...«, the dialog box »Search text« shown in figure 10-7 will be opened. In LAD mode, only operands can be searched for. Therefore, the entered search string has to be a valid operand; otherwise you will get a corresponding error message. The components of the dialog box »Search text« are described in the following.

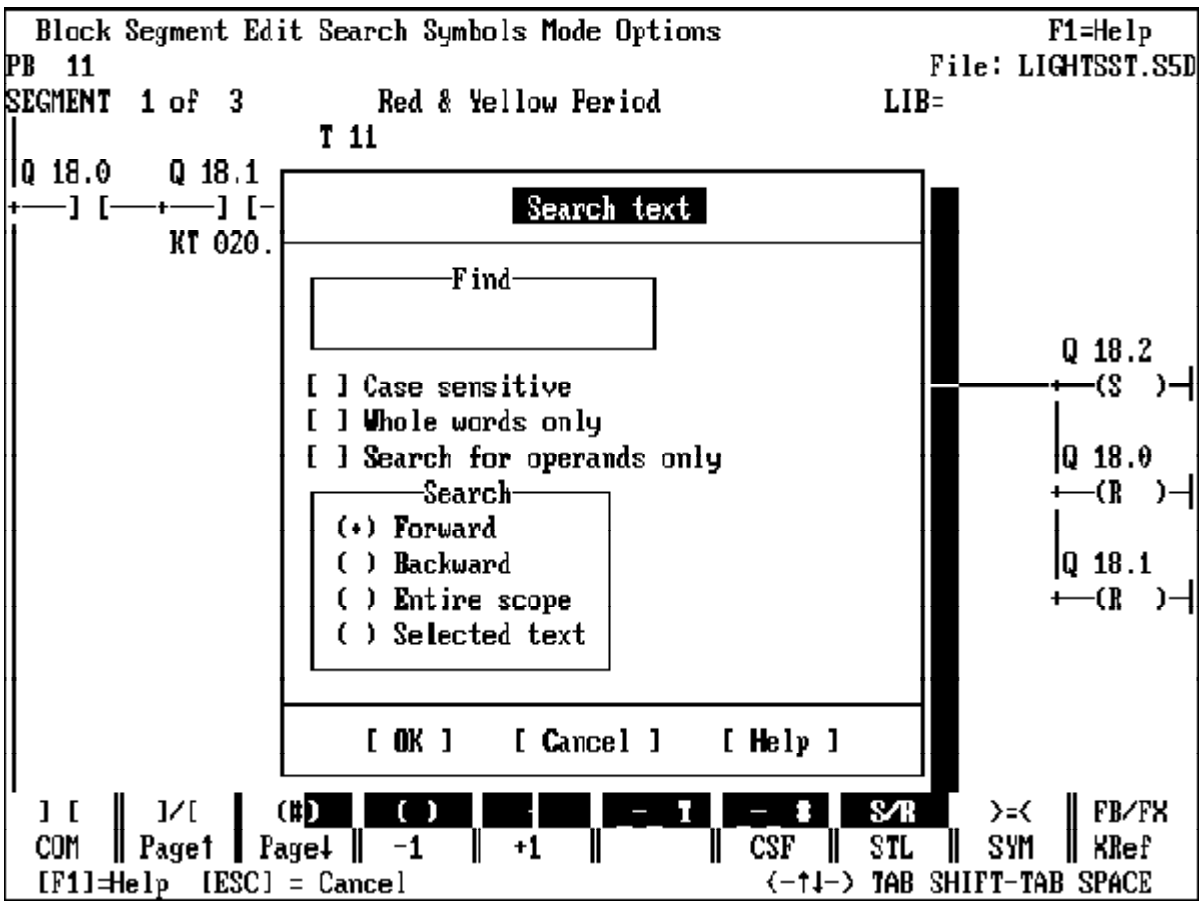

Fig. 10-7: The dialog box »Search text«.

Search string

The operand to search for has to be specified in the text input field »Find«.

Case-sensitive search

The check box »Case sensitive« has no effect in LAD mode.

Whole words only

The check box »Whole words only« has no effect in LAD mode.

Search for operands only

The check box »Search for operands only« is always ticked in LAD mode.

If this check box is ticked, the state of the two other check boxes will be ignored.

Search direction

The radio button »Search« can be used to specify those parts of the texts to be searched. There are four available options: you can search forward, backward, in the whole text (from the beginning of the text) or in the marked block only (from the beginning of the block).

10.5.2 Search for and replace a text string

After selecting the menu command »Replace...«, the dialog box »Replace text« shown in figure 10-8 will be opened. The components of this dialog box resemble the components of the dialog box »Search text« and are therefore described here without too many details.

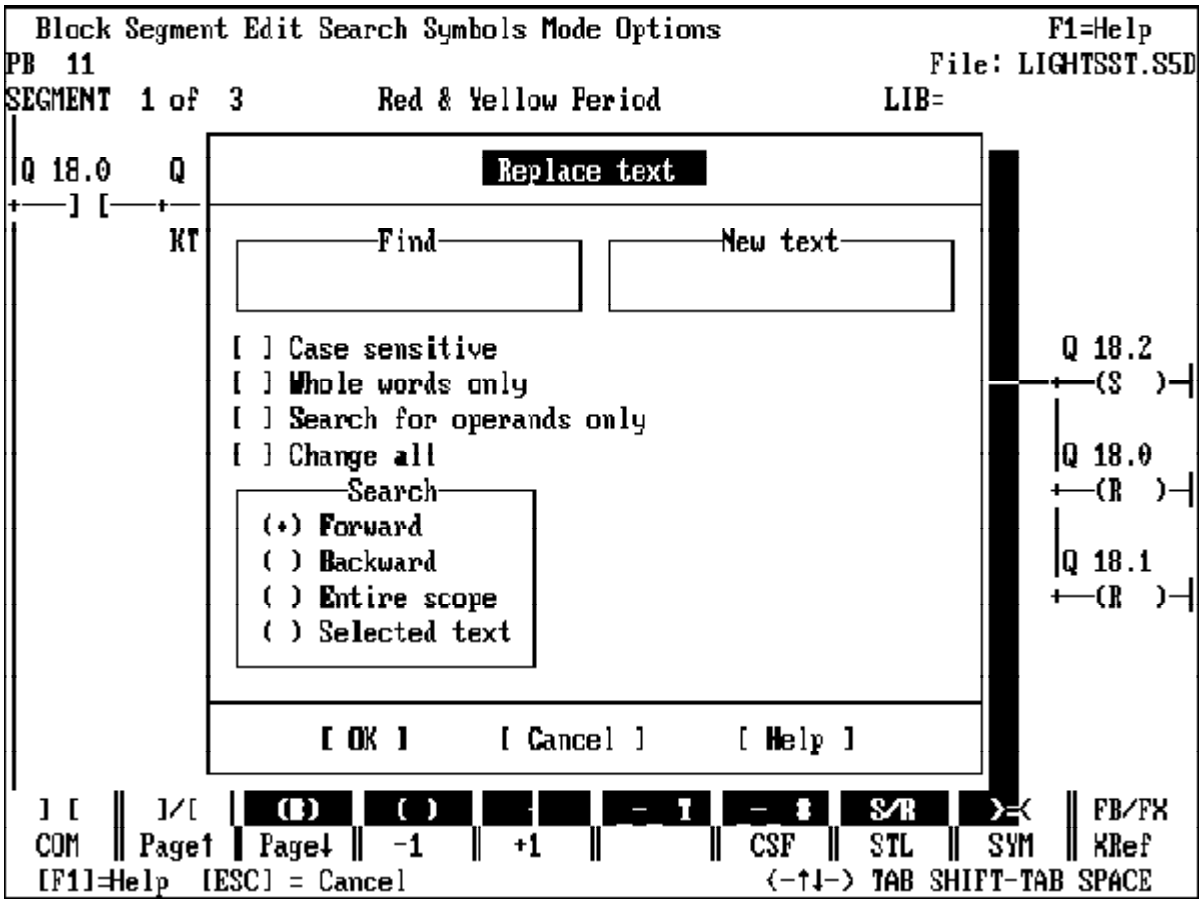

Fig. 10-8: The dialog box »Replace text«.

Search string

The operand to search for has to be specified in the text input field »Find«.

Replace string

The new operand has to be specified in the text input field »New text«.

Case-sensitive search

The check box »Case sensitive« has no effect in LAD mode.

Whole words only

The check box »Whole words only« has no effect in LAD mode.

Search for operands only

The check box »Search for operands only« is always ticked in LAD mode.

Search direction

The radio button »Search« can be used to specify those parts of the texts to be searched. There are four available options: you can search forward, backward, in the whole text (from the beginning of the text) or in the marked block only (from the beginning of the block).

Replace all occurences

If the check box »Change all« is ticked, all occurences of the search string will be replaced by the replace string; otherwise only the first occurence will be replaced. Each changed operand will be checked for correct syntax before leaving it. If the operand is found to be erroneous, the search and replace operation is cancelled, and the cursor is positioned on the erroneous operand.

10.5.3 Search / Replace again

The menu command »Search / Replace again« resp. the hot key Ctrl + L lets you search for resp. replace the next occurence of the specified search string. Which action will be carried out, depends on the last action. The same options are used for the search process.

If a search string has not yet been specified, the dialog box »Search text« (see fig. 10-7) appears.

10.5.4 Goto segment

When selecting the menu command »Goto segment«, a dialog box will appear in which you can enter the number of the segment to go to. If the current segment contains undefined operands, you will not be able to leave it.

10.5.5 Goto next segment

When selecting the menu command »Next segment« resp. typing the hot key Shift + Page↓ resp. clicking on the tool bar symbol "+1", the cursor is located at the beginning of the next segment.

10.5.6 Goto previous segment

When selecting the menu command »Previous segment« resp. typing the hot key Shift + Page↑ resp. clicking on the tool bar symbol "-1", the cursor is located at the beginning of the previous segment.

10.5.7 XREF

You can call this command via the menu, or by selecting the toolbar symbol "XREF", or by typing the hotkey Ctrl + X. A dialog box appears where you can select the desired operation. You can view the list of the occurences of a certain operand and go to any of these occurences if there is a reference list which is up-to-date. You can generate a reference list with the menu command »Block/Generate XREF« in the directory. Use the option »Automatically update XREF« to keep the reference list up-to-date; it will be updated each time you save your changes in a block editor.

Select "Destination block" to go directly to a specific block, or "Origin block" to return to the block from which you first called the XREF function.

10.6 LAD symbols

The menu »Symbols« shown below contains all LAD symbols.

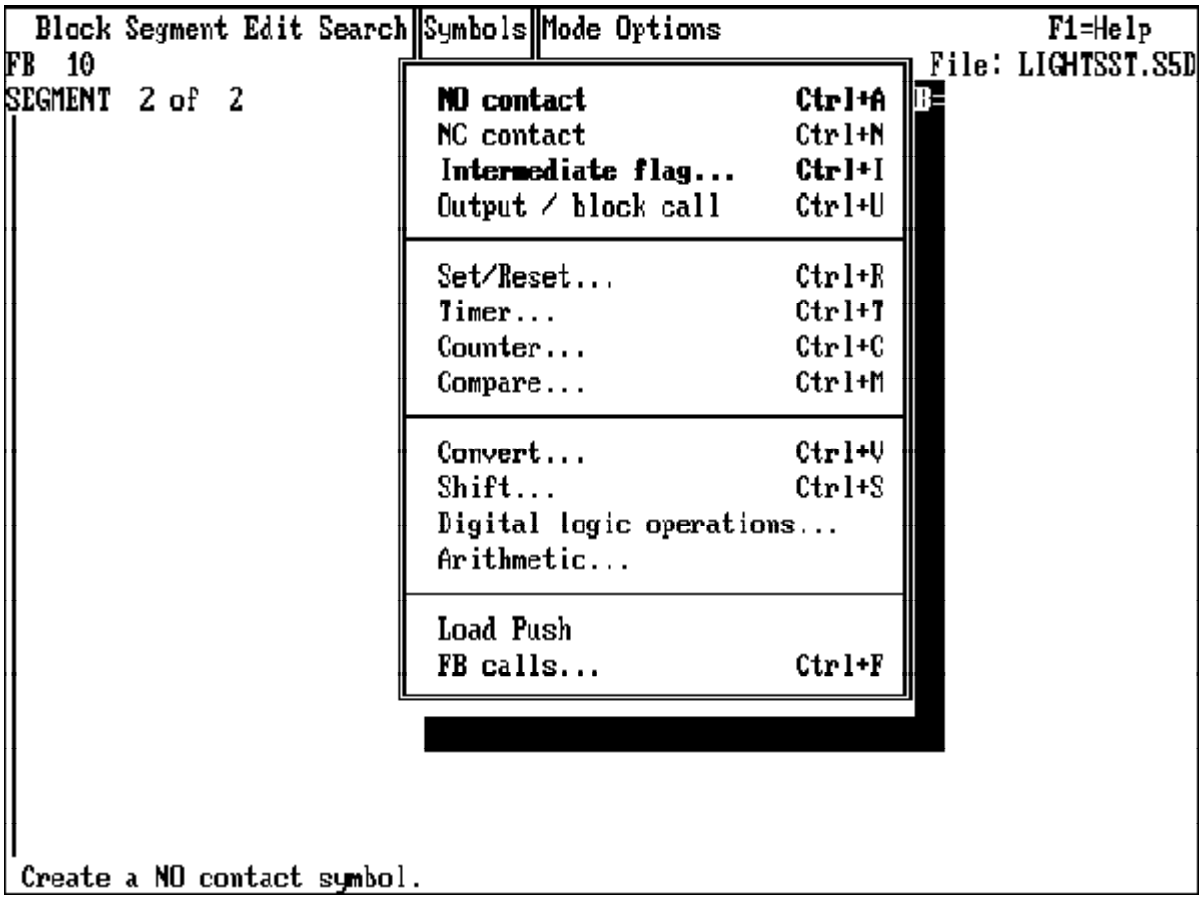

Fig. 10-9: The menu »Symbols«.

10.6.1 NO contacts

You can use this menu command resp. the hot key Ctrl + A to insert a NO contact symbol at the current cursor position. If the position is not valid, you will get a corresponding error message. If the cursor is located on a NC

contact symbol or an intermediate flag symbol, this symbol will be replaced by a NO contact symbol. To be able to insert the first symbol into a segment, the cursor must be located on the power rail.

You can also insert a NO contact by clicking on the tool bar symbol »][«.

10.6.2 NC contacts

You can use this menu command resp. the hot key Ctrl + N to insert a NC contact symbol at the current cursor position. If the position is not valid, you will get a corresponding error message. If the cursor is located on a NO contact symbol or an intermediate flag symbol, this symbol will be replaced by a NC contact symbol.

You can also insert a NC contact by clicking on the tool bar symbol »]\[«.

10.6.3 Intermediate flag

You can use this menu command resp. the hot key Ctrl + I to insert an intermediate flag symbol at the current cursor position. If the position is not valid, you will get a corresponding error message. A dialog box lets you select a normal intermediate flag, or a negating intermediate flag.

You can also insert an intermediate flag by clicking on the tool bar symbol »(#)«.

10.6.4 Output / Block call

If the current segment is empty, you can use this menu command resp. the hot key Ctrl + U to insert a symbol for an unconditional block call. In this case, a dialog box appears in which you can choose between activating a data block and calling a (program) block.

If the current segment contains symbols, you can add another output to a symbol. New outputs can be added below existing outputs at the right side of a symbol. You can also use this method for assigning an output to a complex symbol which does not possess an output yet.

You can also insert a NO contact by clicking on the tool bar symbol »()«.

10.6.5 Set/Reset symbols

You can use this menu command resp. the hot key Ctrl + R to insert a Set or a Reset symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. After selecting this menu command, the dialog box shown in fig. 10-10 appears:

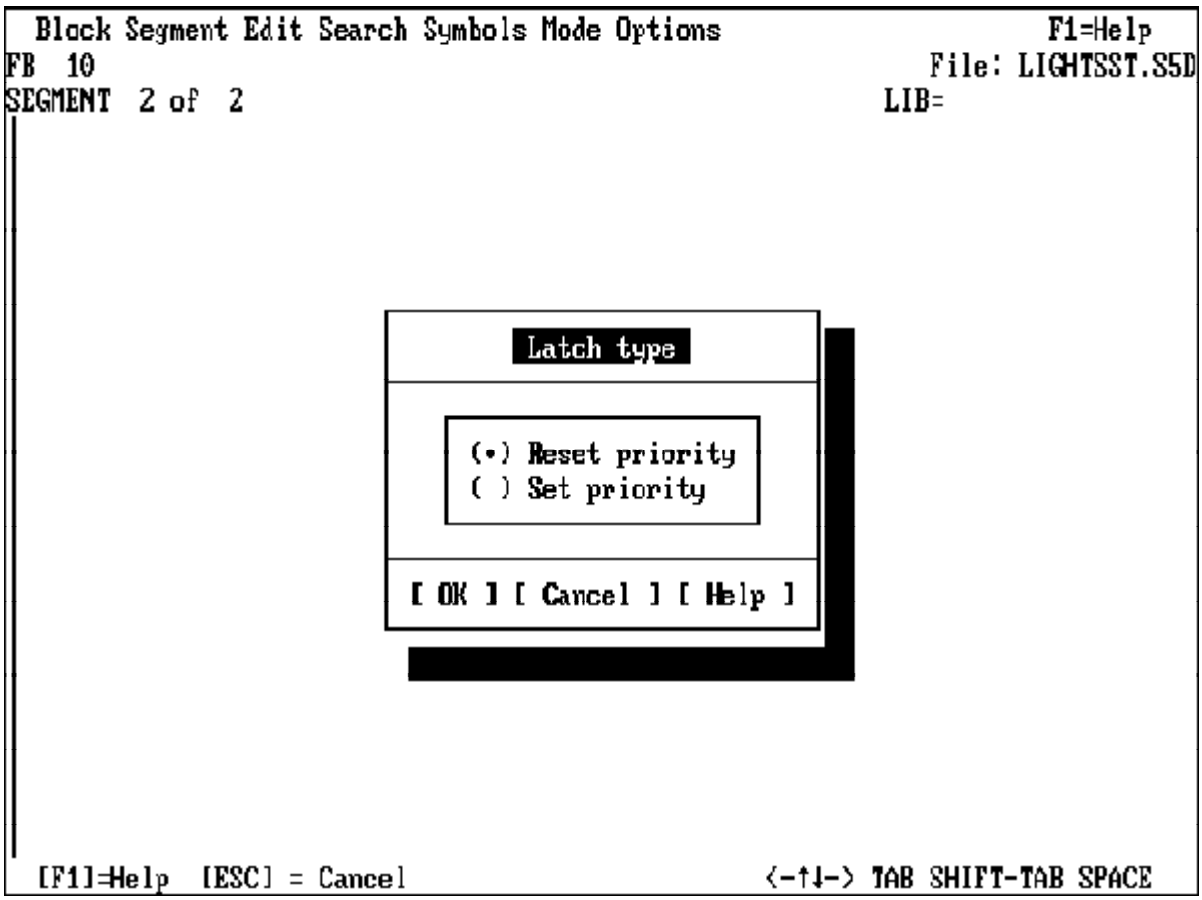

Fig. 10-10: The dialog box for selecting the type of a Set/Reset operation.

Here you can select the type of the Set/Reset operation. You can either select Set priority or Reset priority for the RS flip-flop. You can change the priority of an existing Set/Reset symbol by positioning the cursor on the symbol and selecting this menu command resp. typing the hot key.

Reset priority

When both inputs of the flip-flop are "1", the flip-flop will be reset, i.e. its output will be "0".

Set priority

When both inputs of the flip-flop are "1", the flip-flop will be set, i.e. its output will be "1".

You can also insert a NO contact by clicking on the tool bar symbol »S/R«.

10.6.6 Timer

You can use this menu command resp. the hot key Ctrl + T to insert a timer symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. After selecting this menu command, the dialog box shown in fig. 10-11 appears:

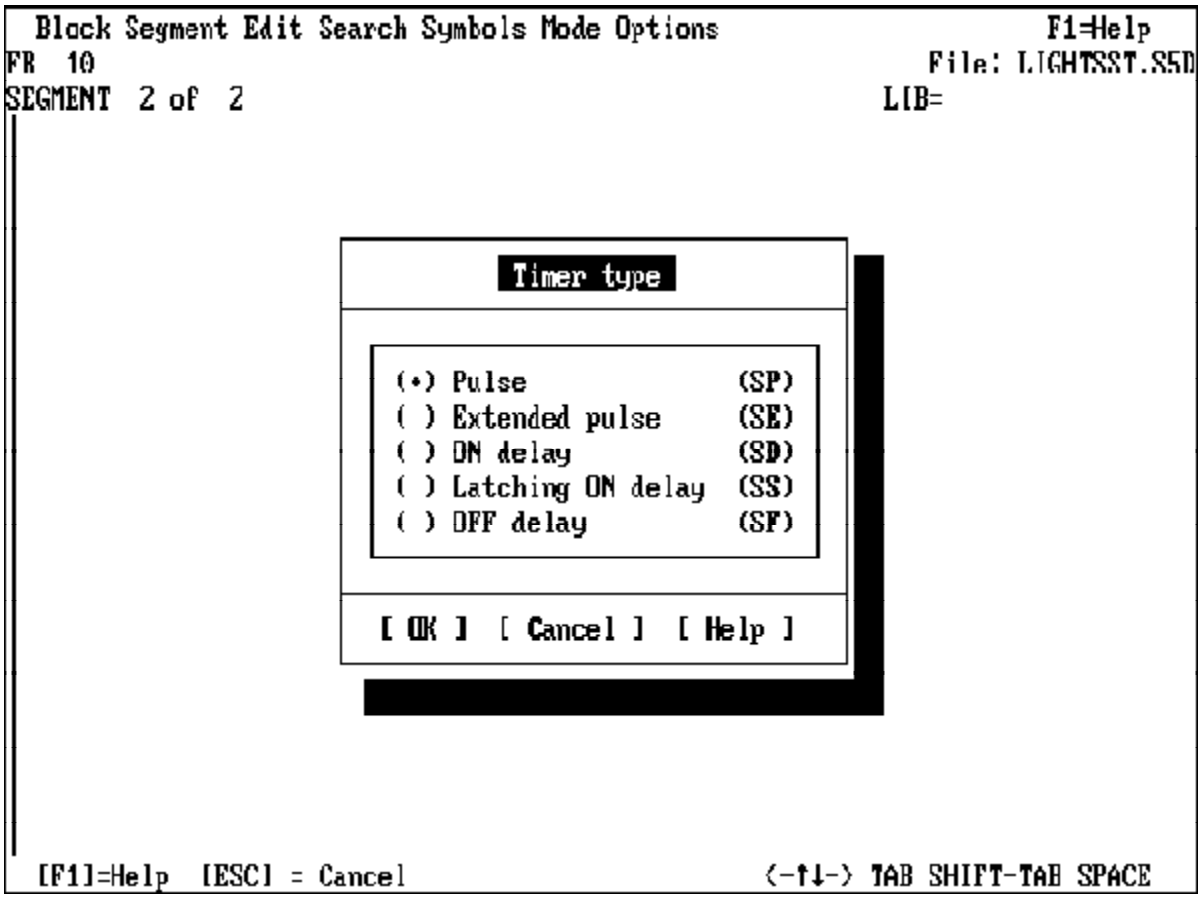

Fig. 10-11: The dialog box selecting the type of a timer.

You can choose between 5 timer types:

Pulse (SP)

When the Start input changes its state from »0« to »1«, the timer is started. The binary output is set to »1« while the timer is running. It runs as long as the Start input state remains "1"; if it changes to "0" while the timer runs, the timer will be reset.

Extended pulse (SE)

When the Start input changes its state from »0« to »1«, the timer is started. Independently of the duration of the input signal, the binary output will be "1" during the programmed time. A short and a long start pulse will result in "1" signals of the same duration at the output.

ON delay (SD)

When the Start input changes its state from »0« to »1«, the timer is started. After the programmed time has elapsed, the binary output will be set to "1", but only if the input signal is still "1".

Latching ON delay (SS)

When the Start input changes its state from »0« to »1«, the timer is started. After the programmed time has elapsed, the binary output will be set to "1", no matter if the input signal is still "1". Before starting the timer again, it has to be reset first.

OFF delay (SF)

When the Start input changes its state from »0« to »1«, the binary output of the timer is set to "1". When the Start input changes its state from »1« to »0«, the timer is started. The binary output remains "1" until the programmed time has elapsed. Then it will be set to "0".

You can change the type of a timer by positioning the cursor on the timer symbol and selecting this menu command again.

You can also insert a timer by clicking on the tool bar symbol »_-_ T«.

10.6.7 Counter

You can use this menu command resp. the hot key Ctrl + C to insert a counter symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. After selecting this menu command, the dialog box shown in fig. 10-12 appears:

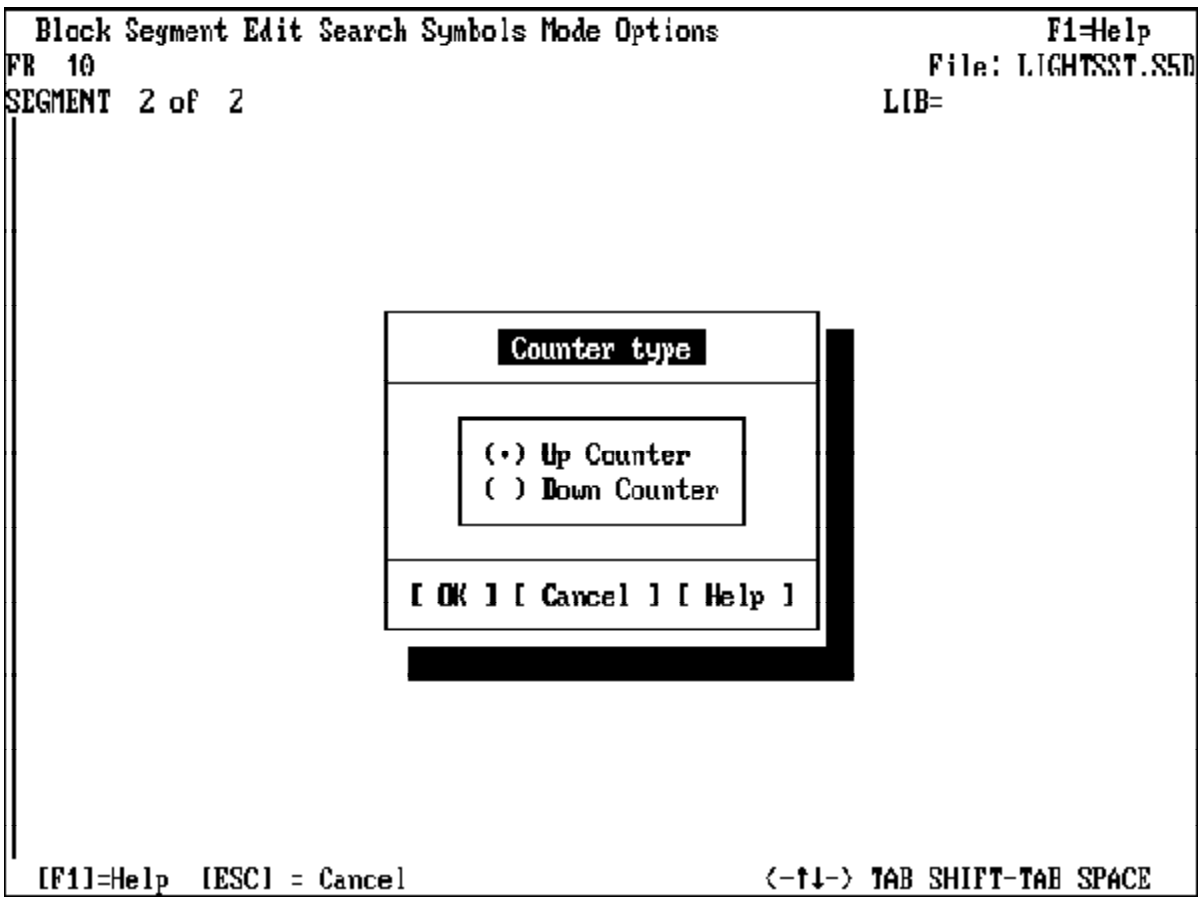

Fig. 10-12: The dialog box for selecting the type of a counter.

You can now select the desired counter type using the mouse, or the cursor keys plus the ↵ key.

Up counter

An up counter is incremented each time when its Count-up input CU changes from "0" to "1". If the counter value reaches 999, it will no longer be incremented. There is no simple means for determining a counter value of 999, like a flag (carry).

Down counter

A down counter is decremented each time when its Count-down input CD changes from "0" to "1". If the counter value reaches 0, it will no longer be decremented. There is no simple means for determining a counter value of 0, like a flag (carry).

You can change the type of a counter by positioning the cursor on the counter symbol and selecting this menu command again.

You can also insert a counter by clicking on the tool bar symbol »_-_ #«.

10.6.8 Compare

You can use this menu command resp. the hot key Ctrl + M to insert a compare operation symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. A compare operation symbol can be inserted only in the first column of the LAD editor, due to its inputs expecting word operands. After selecting this menu command, the dialog box shown in fig. 10-13 appears:

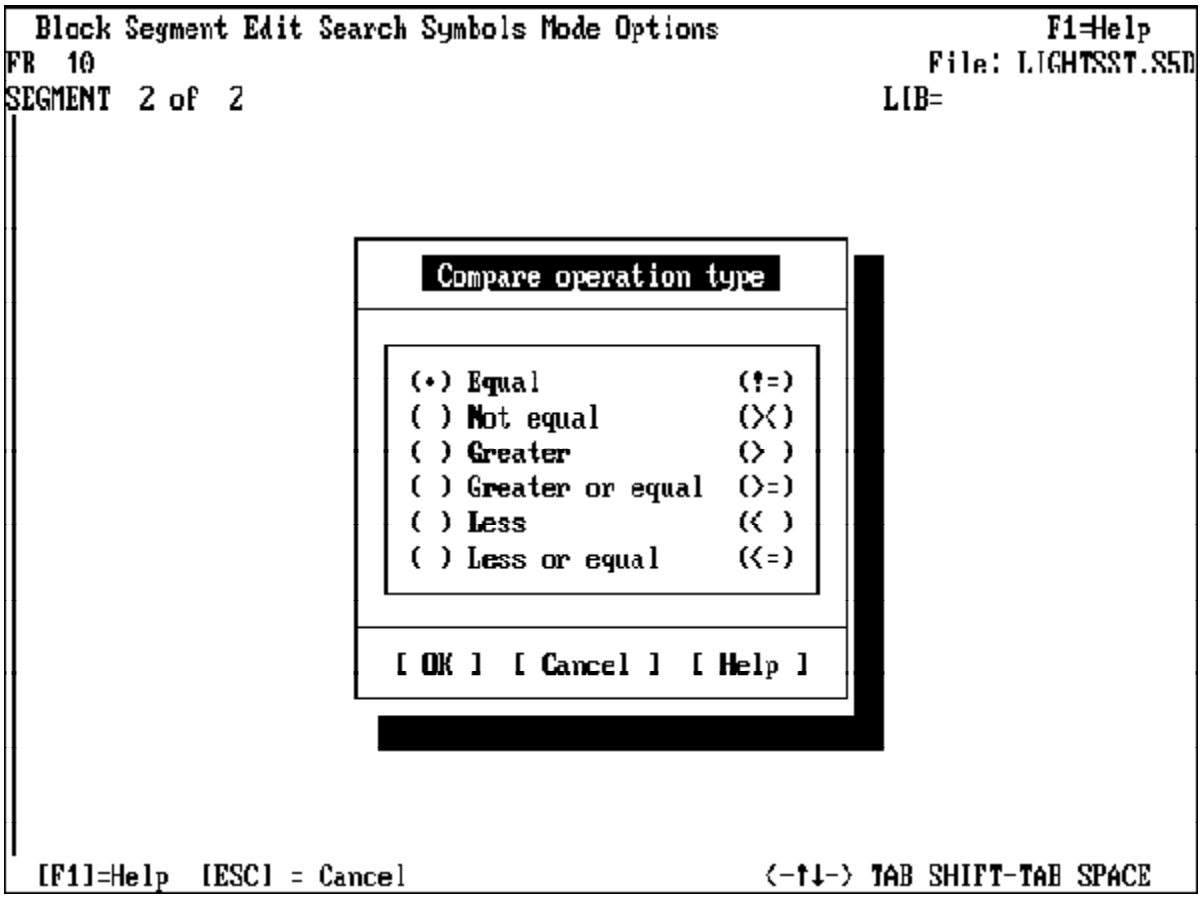

Fig. 10-13: The dialog box for selecting the type of a compare operation.

You can choose between 6 different types of compare operations:

Equal

If both operands (= inputs) have the same bit pattern, the output of the compare operation symbol will be set to "1".

Not equal

If the operands have different bit patterns, the output of the compare operation symbol will be set to "1".

Greater

If the first operand (= the operand at the above input) is greater than the second operand, the output of the compare operation symbol is set to "1".

Greater or equal

If the first operand is greater than the second operand or equals the second operand, the output of the compare operation symbol is set to "1".

Less

If the first operand (= the operand at the above input) is less than the second operand, the output of the compare operation symbol is set to "1".

Less or equal

If the first operand (= the operand at the above input) is less than the second operand or equals the second operand, the output of the compare operation symbol is set to "1".

You can change the type of a compare operation symbol by positioning the cursor on the compare operation symbol and selecting this menu command again.

10.6.9 Conversion operations

Selecting the menu command »Convert« resp. typing the hot key Ctrl + V, causes a dialog box to appear from which you can select one of the following types of conversion operations:

- CFW Ones complement (bits 0-15 of the input value)
- CSW Two's complement (bits 0-15 of the input value)
- CSD Two's complement (bits 0-31 of the input value)

- DEF Convert a 3-digit decimal number to a 16 bit fixed-point number (bits 0-15 of the input value)
- DUF Convert a 16 bit fixed-point number to a 3-digit decimal number to (bits 0-15 of the input value)
- DED Convert a 7-digit decimal number to a 32 bit fixed-point number (bits 0-31 of the input value)
- DUD Convert a 32 bit fixed-point number to a 7-digit decimal number to (bits 0-31 of the input value)
- FDG Convert a 32 bit fixed-point to a 32 bit floating-point number (bits 0-31 of the input value)
- GFD Convert a 32 bit floating-point to a 32 bit fixed-point number (bits 0-31 of the input value)

If the cursor is located on a invalid position, you will get an error message. This symbol is allowed only in FBs.

10.6.10 Shift operations

Selecting the menu command »Shift« resp. typing the hot key Ctrl + S, causes a dialog box to appear from which you can select one of the following types of conversion operations:

- SLW: shift word left (bits 0-15 of the input value)
- SLD: shift double word left (bits 0-31 of the input value)
- SRW: shift word right (bits 0-15 of the input value)
- SSW: shift word left with sign (bits 0-15 of the input value)
- SSD shift double word left with sign (bits 0-31 of the input value)
- RLD rotate double word left (bits 0-31 of the input value)
- RRD rotate double word right (bits 0-31 of the input value)

If the cursor is located on a invalid position, you will get an error message. This symbol is allowed only in FBs.

10.6.11 Digital logic operations

Selecting the menu command »Digital logic operations« resp. typing the hot key Ctrl + D, causes a dialog box to appear from which you can select one of the following digital logic operations:

- AND operation (word)
- OR operation (word)
- Exclusive OR operation (word)

If the cursor is located on a invalid position, you will get an error message. This symbol is allowed only in FBs.

10.6.12 Arithmetic operations

Selecting the menu command »Arithmetic« causes a dialog box to appear from which you can select one of the following arithmetic operations:

- Addition
- Subtraction
- Multiplication
- Division.

If the cursor is located on a invalid position, you will get an error message.

10.6.13 Load Push operations

You can insert a Load operation symbol at the current cursor position using the menu command »Load Push«. If the cursor is located on a invalid position, you will get an error message. This symbol must be the only symbol in the segment.

10.6.14 FB call

Selecting the menu command »FB calls...« resp. typing the hot key Ctrl + F, causes a dialog box to appear from which you can select one of the types of FB call operations and enter the desired block number:

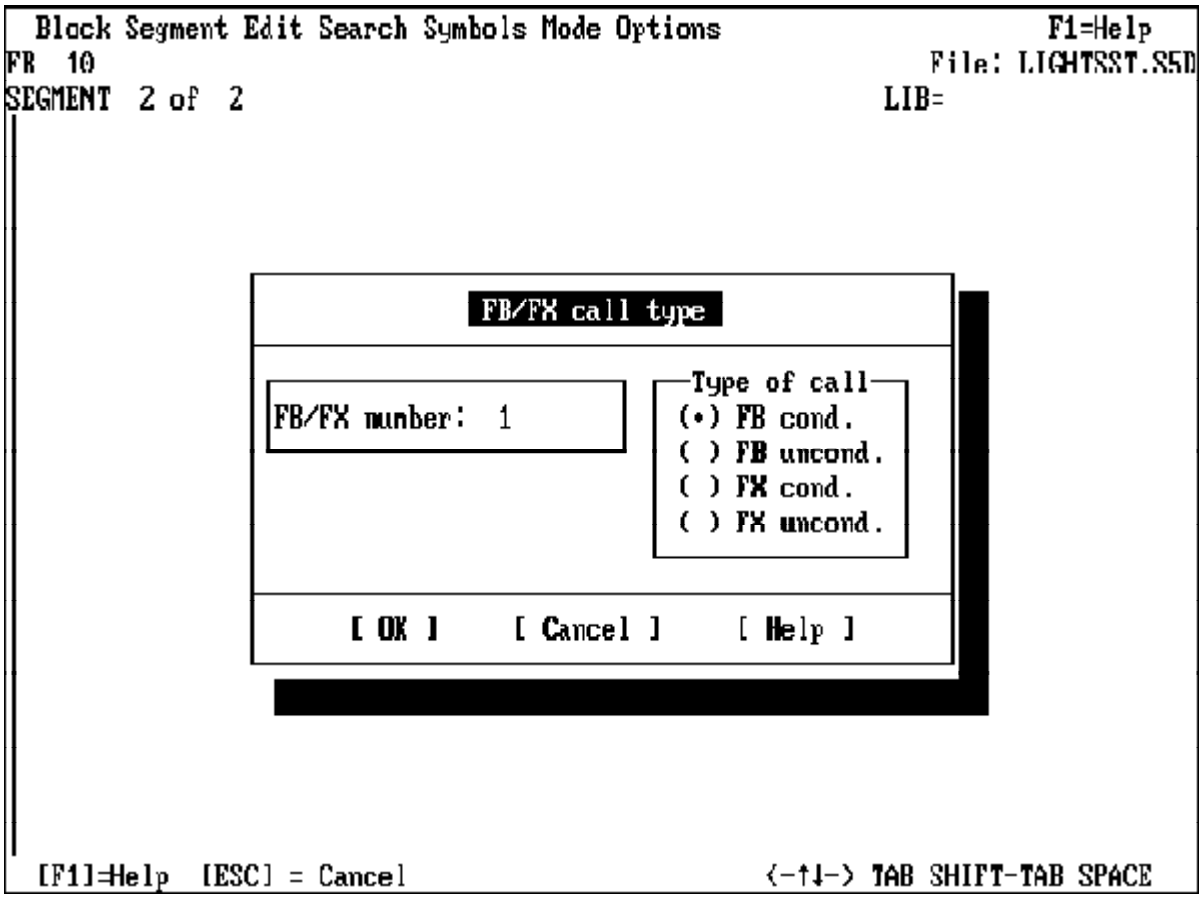

Fig. 10-14: The dialog box for calling an FB/FX.

You can insert a FB/FX call in an empty segment only.

In the dialog box, you can first enter the number of the function block, and then specify the type of the call operation (conditional or unconditional). Use the ↵ key for confirming your selection. The FB/FX call is inserted at the current cursor position if the called FB/FX exists in the file.

You can also insert an FB call symbol by clicking on the tool bar symbol »FB/FX«.

10.7 Examining the control program in the status mode

If you are working on the PLC rather a program file, the menu »Status« is available from which you can start resp. stop a status scan.

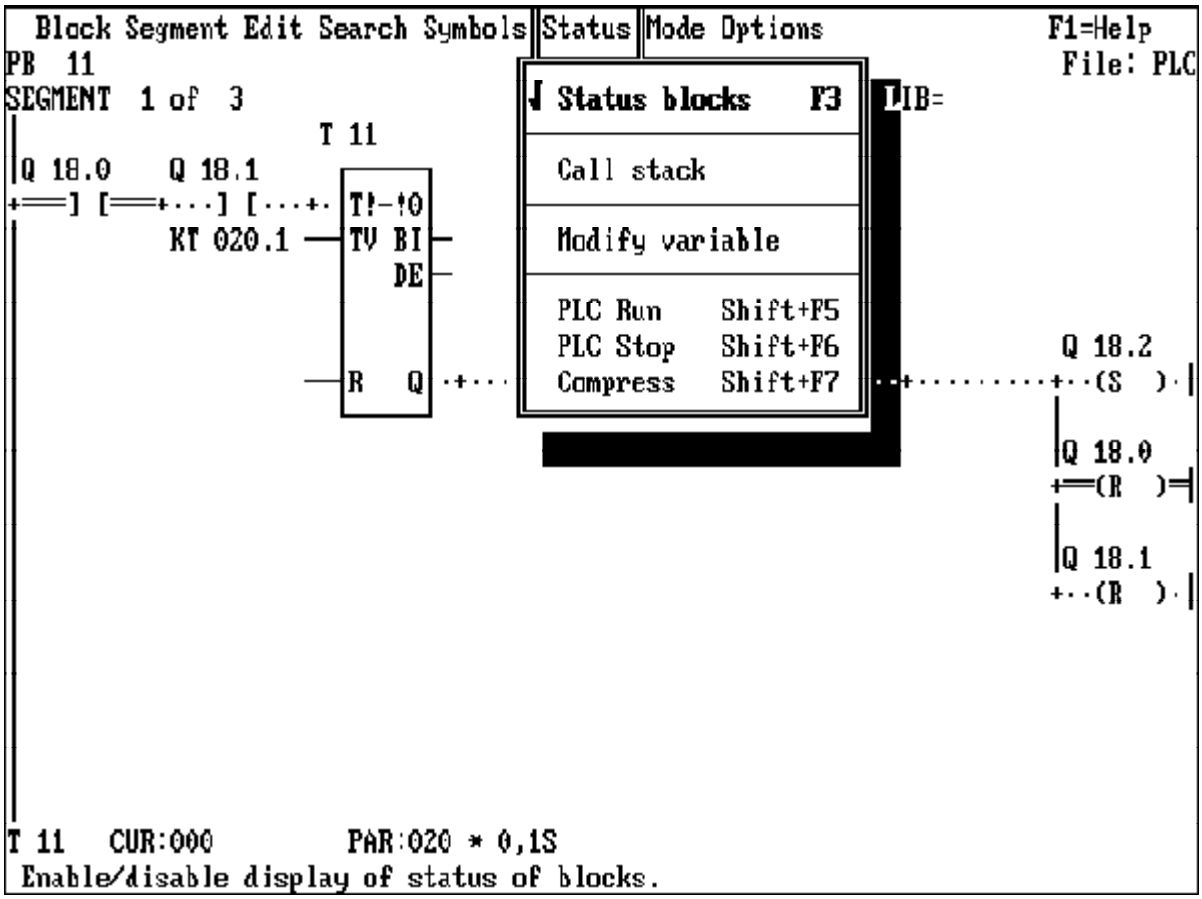

Fig. 10-15: The menu »Status«.

10.7.1 Start/Stop a status scan

Selecting the menu command »Status blocks« resp. typing the hot key [F3] starts resp. stops the status scan. The status scan always refers to the current block of which the current segment is displayed on the screen. It ends before a special delimiting statement, e.g. a jump operation, or when the maximum number of status scans has been reached.

If the message "Block not executed" or "Statement not executed" appears during a status scan, the possible reasons can be:

- the PLC is in »Stop« mode
- the connection between PC and PLC is interrupted
- the PLC has been switched off
- the block is not executed due to a conditional call
- the block is not executed due to a jump operation.

The signal state of an input resp. an output of a symbol is represented as follows: signal state "1" is marked by a double line, and signal state "0" is marked by a dotted line. If syntax highlighting is selected, different colors are used for the two types of lines.

Generally, the signal state of all symbols displayed on the screen is displayed (in contrast to the Siemens software). If a large segment cannot be displayed completely on one page of a high-resolution video mode, you have to scroll in the segment (you can select another video mode with a lower resolution for that).

If only a part of a symbol is visible on the screen, the current signal state of the output of the symbol is not displayed (in general), because the status scan includes only the signal states of those inputs which are visible. Therefore, the signal state of the symbol's output is generally unknown. In some cases, however, the signal state of the output can be determined from the signal states of the visible inputs alone. ACCON-PG will then display the signals state of the output as well.

Negated inputs in LAD are treated as follows: in all cases, the state of the symbol is displayed, and not the state of the operand. That means, a NC contact symbol is displayed in signal state "1" (with a double line) if the operand has signal state "0", and vice versa. The following figure shows this situation (both inputs have signal state "0").

```
 Block Segment Edit Search Symbols Status Mode Options                F1=Help
OB   1                                   DB address 0                 File: PLC
SEGMENT  4 of  4                                          LIB=
|F 100.0   F 100.0                                                    F 102.0
+···] [···+═══]/[═══+·........+·........+·........+·........+·........+··(   ).|
|
|
```

```
  Block Segment Edit Search Symbols Status Mode Options                F1=Help
DB   1                                  DB address 0                  File: PLC
SEGMENT  4 of  4                                          LIB=
|F 100.0   F 100.0                                                    F 102.0
+===] [===+===] [===+.........+.........+.........+.........+.........+..(R  ).|
|
|
```

```
  Block Segment Edit Search Symbols Status Mode Options                F1=Help
PB  11                                   DB address 0                 File: PLC
SEGMENT  1 of  3                                          LIB=
                        T 11
 Q 18.0    Q 18.1
+==] [==+==] [==+=T!-!Q
           KT 020.1 -TV BI-
                     DE-

                                                                  Q 18.2
                    -R   Q ·+·····+·····+·····+·····+··(S  )·|
                                                                  |
                                                                  |Q 18.0
                                                                  +==(R  )=|
                                                                  |
                                                                  |Q 18.1
                                                                  +==(R  )=|
T 11   CUR:016 * 0,1S  PAR:020 * 0,1S
  [Alt]  or  [F10] = Menu    Status active  LAD        9      191360  0002:01
```

Fig. 10-18: Status blocks LAD: timers

With counters, the current counter value and the value to which the counter is to be set, are displayed in the bottom line of the screen (see next figure) if at least a part of the counter is visible on the screen.

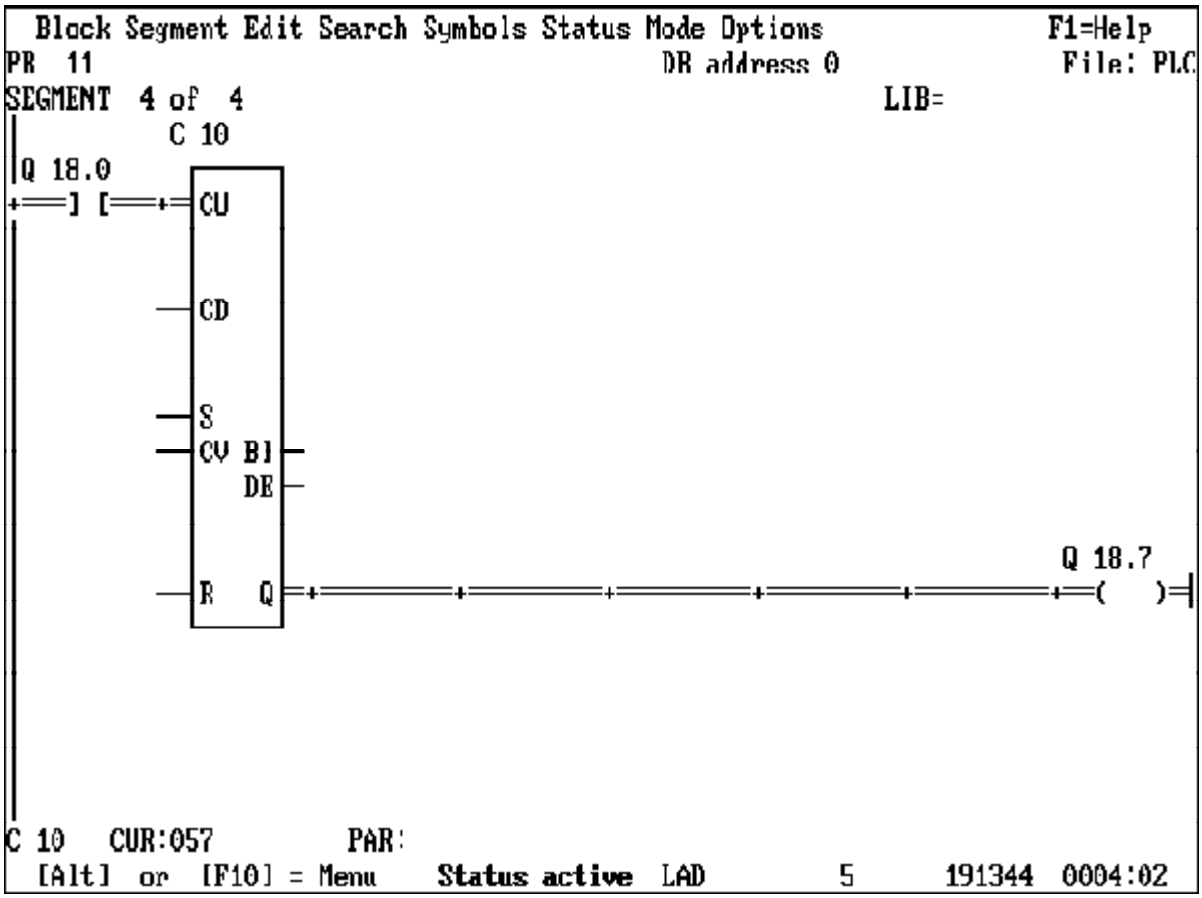

Fig. 10-19: Status block LAD: counters

If several counters and timers exist in the segment and if they are visible, the corresponding number of lines at the bottom of the screen is used for this.

With FB calls, the values of the parameters left from the inputs resp. right from the outputs are displayed.

Symbols with digital inputs are displayed as follows: if the inputs of the symbols are activated by "real" operands (not by outputs of outputs), the values of the operands are displayed under the operands. With arithmetic and compare operations, the format specified within the symbol is used for displaying the operands (F/G/D meaning fixed-point, floating-point,

hexadecimal double word; in all other cases, the operand is displayed in hexadecimal form as a byte/ word/ double word, depending on the size of the operand).

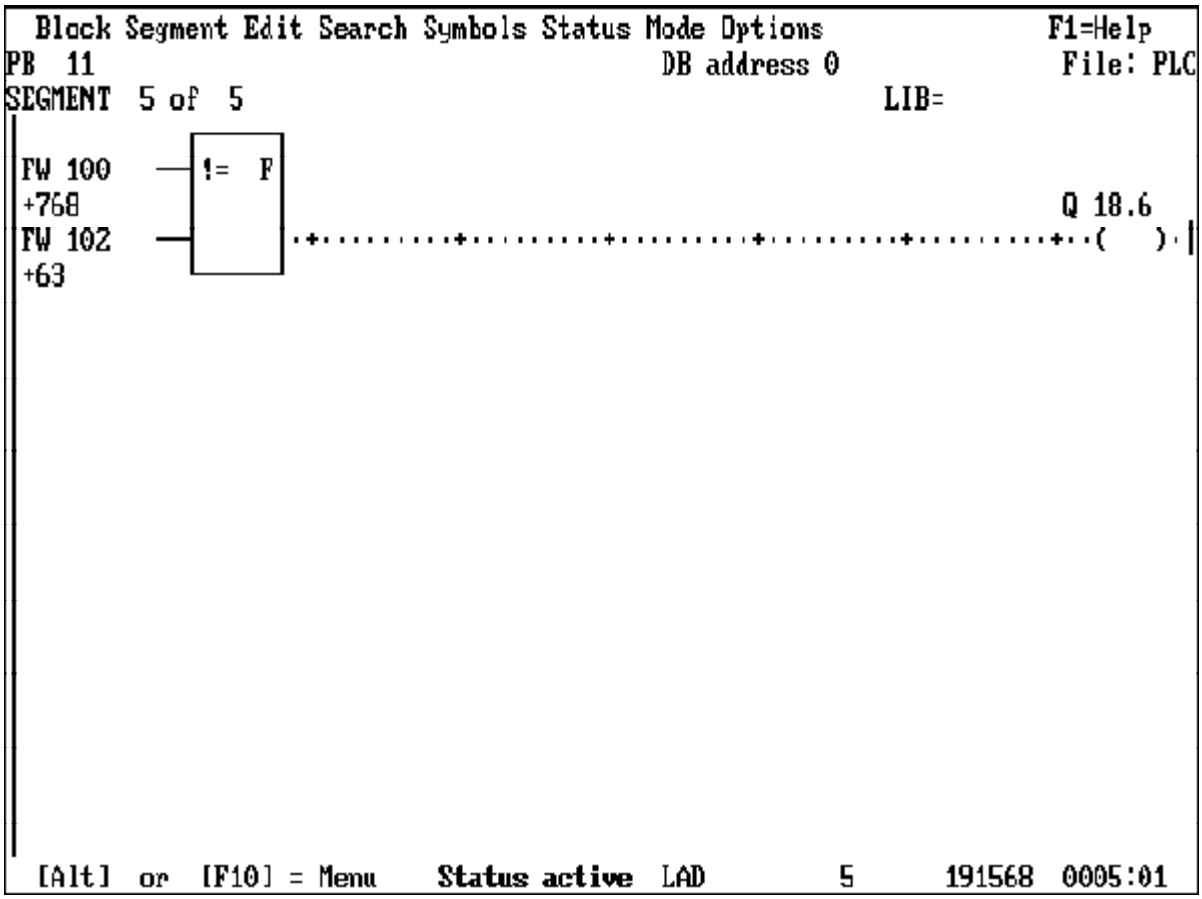

Fig. 10-20: Status blocks LAD: digital inputs

10.7.2 Call stack

After selecting this menu command, the dialog box »Call stack« is displayed. You can specify a sequence of block calls. The status blocks display will be activated ONLY if the block being in the editor is called via exact this sequence of calls.

An example:

The block in the editor be the FB 10. The FB 10 be called from the OB 1 and from the PB 10. Let's specify the call sequence "PB 10". The status block display will show only those executions of the FB 10 which have been initiated from the PB 10.

This simplifies the debugging of complex applications.

10.7.3 Modify variable

The menu item »Modify variable« lets you inspect and edit the current value of an operand via a dialog box. Only word operands of type IW, QW, FW, RS, T and C are allowed.

10.7.4 Run PLC

The menu item »Run PLC« resp. the hot key Shift + F5 will execute a cold resp. a warm restart on the PLC. This operation is described in chapter 5.

10.7.5 Stop PLC

The menu item »Stop PLC« resp. the hot key Shift + F6 will set the PLC into the »Stop« mode. This operation is described in chapter 5.

10.7.6 Compress PLC

The menu item »Compress PLC« resp. the hot key Shift + F7 will compress the PLC memory. This operation is described in chapter 5.

10.8 Representation mode and symbolic editor

The menu »Mode« allows you to select another representation (programming) mode, if the current line and the current segment are syntactically correct, and if the current segment can be represented in the desired mode.

The menu »Mode« is shown in the next figure.

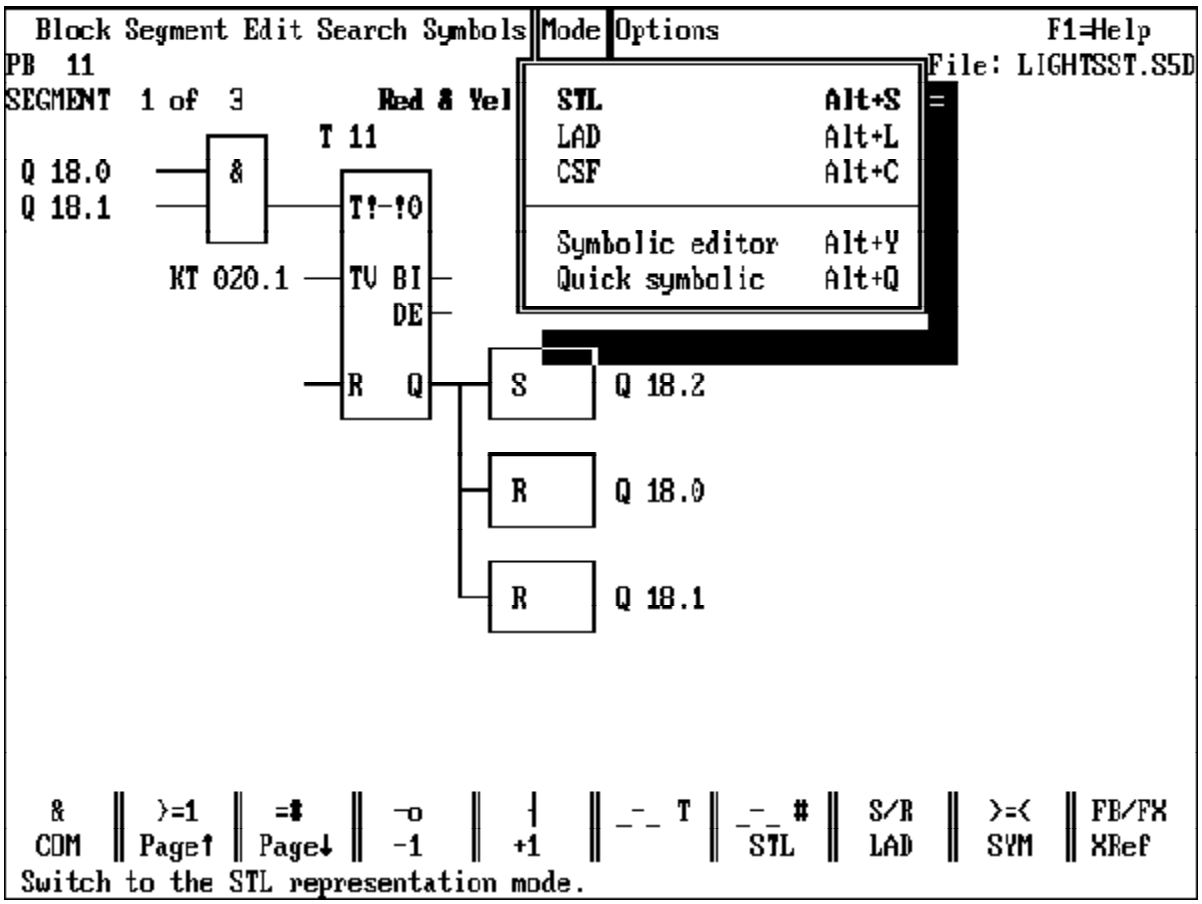

Fig. 10-21: The menu »Mode«.

You can switch into another mode only if all operands of the current segment have been specified.

10.8.1 Select the STL editor

After selecting the menu command »STL« resp. typing the hot key Alt + S resp. clicking on the toolbar symbol "STL", you will activate the STL (statement list) editor. This can always be done because each correct block is representable in STL mode.

Chapter 8 tells you everything about the STL editor.

10.8.2 Select the LAD editor

The menu command »LAD« has no effect as you are already in the LAD editor.

10.8.3 Select the CSF editor

After selecting the menu command »CSF« resp. typing the hot key Alt + C resp. clicking on the toolbar symbol "CSF", you will activate the CSF (control system flowchart) editor. This cannot be done if the current segment is not representable in CSF mode.

Chapter 11 tells you everything about the CSF editor.

10.8.4 Select the symbolic editor

After selecting the menu command »Symbolic editor« resp. typing the hot key Alt + Y resp. clicking on the toolbar symbol "SYM", you will activate the symbolic editor. If the current block has been changed since it was last saved, a dialog box with a corresponding message will appear. You can then decide whether to save the current block, or to cancel the operation.

Chapter 12 tells you everything about the symbolic editor.

10.8.5 Select the quick edit mode of the symbolic editor

After selecting the menu command »Quick symbolic« resp. typing the hot key Alt + Q, you will activate the quick edit mode of the symbolic editor. The quick mode differs from the standard mode in the following point: in the quick edit mode, ACCON-PG lists all operands referenced in the current segment. This allows you to assign operands to symbols very conveniently. The symbols file need not be loaded completely.

An operand for which a corresponding symbol has not yet been defined will be displayed without symbol resp. comment. To assign a symbol to such an operand, locate the cursor to the corresponding symbol field and enter the symbol name.

Chapter 12 tells you everything about the quick edit mode of the symbolic editor.

10.9 Options

The menu »Options« serves for modifying the settings which determine the appearance and the behaviour of ACCON-PG.

The menu »Options« is shown in the following figure.

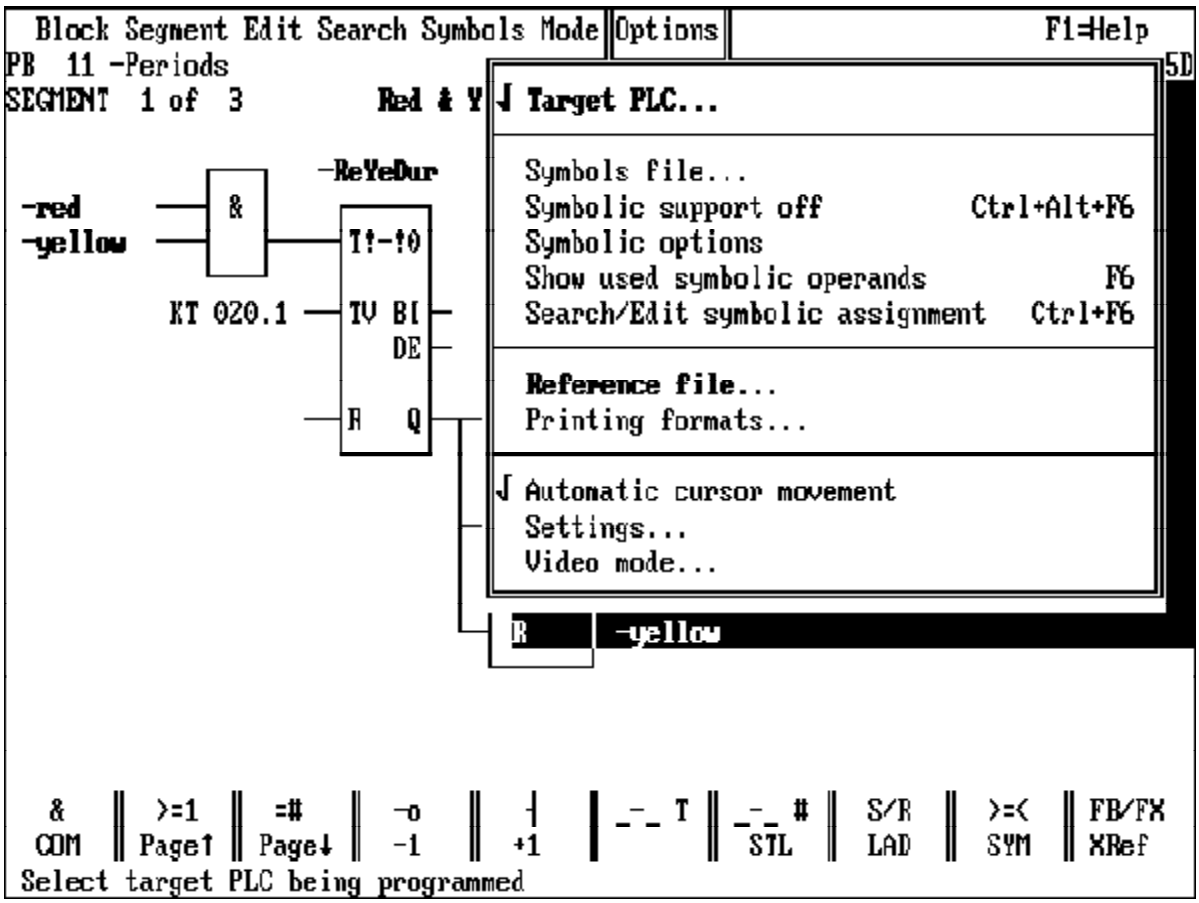

Fig. 10-22 The menu »Options« of the LAD editor.

Most of the options are the same in the STL, LAD and CSF editors.

10.9.1 Select the target PLC

The menu command »Target PLC...« lets you specify the PLC you want to program. This command is the same as described in chapter 6.

In CSF or LAD mode, ACCON-PG will only check all entered operands for availability on the selected target PLC. In STL mode, the entered commands will also be checked.

10.9.2 Load a symbols file

After selecting the menu command »Symbols file«, a file-selection dialog box appears in which you can select a symbols file to be loaded. Symbolic operands will be displayed in the following. You can select the names for the DT file and the SEQ file independently, e.g. an SEQ filename according to Siemens filename conventions, and an arbitrary name for the DT file.

10.9.3 Enable/Disable symbolic support

Selecting the menu command »Symbolic support on/off« resp. typing the hotkey Ctrl + Alt + F6 enables resp. disables the display of symbolic operands. The title of this menu command depends on whether the function is currently enabled, or not. If the symbolic support is enabled, an absolute operand will be replaced by the symbolic name (only if) specified in the symbols file.

The menu commands described below are accessible only if the symbolic support is active.

10.9.4 Symbolic options

This menu command invokes a dialog box for manipulation of the way in which (symbolic) operands are displayed. This menu commands is accessible only if the symbolic support is active.

Always show symbolic operands (CSF/LAD)

In CSF/LAD mode, symbolic operands are displayed only if the current symbols file does not contain symbols longer than 8 characters, and if the file has been saved with the option "Symbol length <= 8" activated.

If this option is ticked, symbolic operands are displayed even if they are longer than 8 characters (they are cut). If this option is not ticked, the symbolic assignment of the operand under the cursor is displayed in the first line of the editor.

In STL mode, this option is irrelevant.

Only operands from symbols file

Use this checkbox to specify whether ACCON-PG accepts only operands for which there is a symbolic assignment in the current symbols file. When entering an operand without an assignment, you will be prompted automatically for entering a symbolic assignment for the new operand.

Show symbolic and / or absolute operands

This radio button lets you configure the display of symbolic operands in the block editors.

- absolute operands: the absolute operand will be displayed in any case (e.g. I 1.2, FY 12).
- symbolic operands: the symbolic operand will be displayed if existing. Otherwise, the absolute operand will be displayed.
- both: in a 132-column video mode, both operands are displayed in STL mode. In an 80-column mode, the symbolic operand is favoured. In LAD/CSF, this option is irrelevant.

Note: of course, you can always enter an operand as an absolute or as a symbolic operand, just as you want.

Show the symbolic comment

This radio button lets you specify whether to display the STL comments or the symbolic comments in the right part of the screen. In a 132-column video mode, both comments can be displayed on one screen, but the symbolic comment cannot be edited. This option has no influence in LAD/CSF.

10.9.5 Show the used symbolic operands

Selecting the menu command »Show used symbolic operands« resp. typing the hot key F6 gives you a list of the symbolic names used in the current segment. A window appears displaying the absolute and the symbolic operands plus the symbolic comments line per line.

10.9.6 Show/Edit the symbolic assignment

Selecting the menu command »Search/Edit symbolic assignment« resp. typing the hot key Ctrl + F6 gives you the current absolute and the symbolic operand plus the symbolic comment in a window. You can edit the symbolic name and comment.

10.9.7 Select a reference file

The menu command »Reference file...« lets you specify a file from which to take the comments and data formats when working on the PLC. When working with comments on the PLC and saving your project, you will be asked whether to store the changed comments in the reference file.

10.9.8 Printing formats

Selecting the menu command »Printing formats« causes a dialog box to be opened where you can perform the following settings:

- page width
- when to perform a form feed
- whether and how to print line numbers
- the representation mode used for printing
- whether and how to print comments
- how to print operands
- how to print the segment comment
- whether to print a list of the symbolic names
- whether to print symbolic operands in bold type
- whether to print a footer.

10.9.9 Automatic cursor movement

Selecting this menu command causes the automatic cursor movement to be switched on resp. off. When it is switched on, the cursor will automatically go from one operand field to the next while editing operands.

10.9.10 Settings

Selecting the menu command »Settings...« causes a dialog box to be opened which is described in chapter 6.6.

10.9.11 Select a video mode

Selecting the menu command »Video mode...« lets you switch to another video mode supported by the video adapter installed in your computer. ACCON-PG supports the extended video modes available on SVGA adapters. In these modes, more symbols can be displayed on one screen. The availability of extended video modes with e.g. 132 columns is especially useful when you get the error message "Not enough space" when inserting a symbol into a segment using a normal video mode.

Chapter 11:

Programming in CSF

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CSF is the abbreviation of Control System Flowchart. This representation mode requires a special editor provided by ACCON-PG. You can activate the CSF editor from the main menu by selecting the menu command »CSF editor« in the menu »Programming« or by typing the hot key Alt + C. The directory will be opened where you can select a block to be loaded into the editor (by double-clicking on the block name, or by pressing ↵ when the cursor bar is on the name of the desired block, or via »Block/Edit« or »Block/New«).

When entering »PB 11« as in our example, you will get to the CSF editor which appears as shown in fig. 11-1.

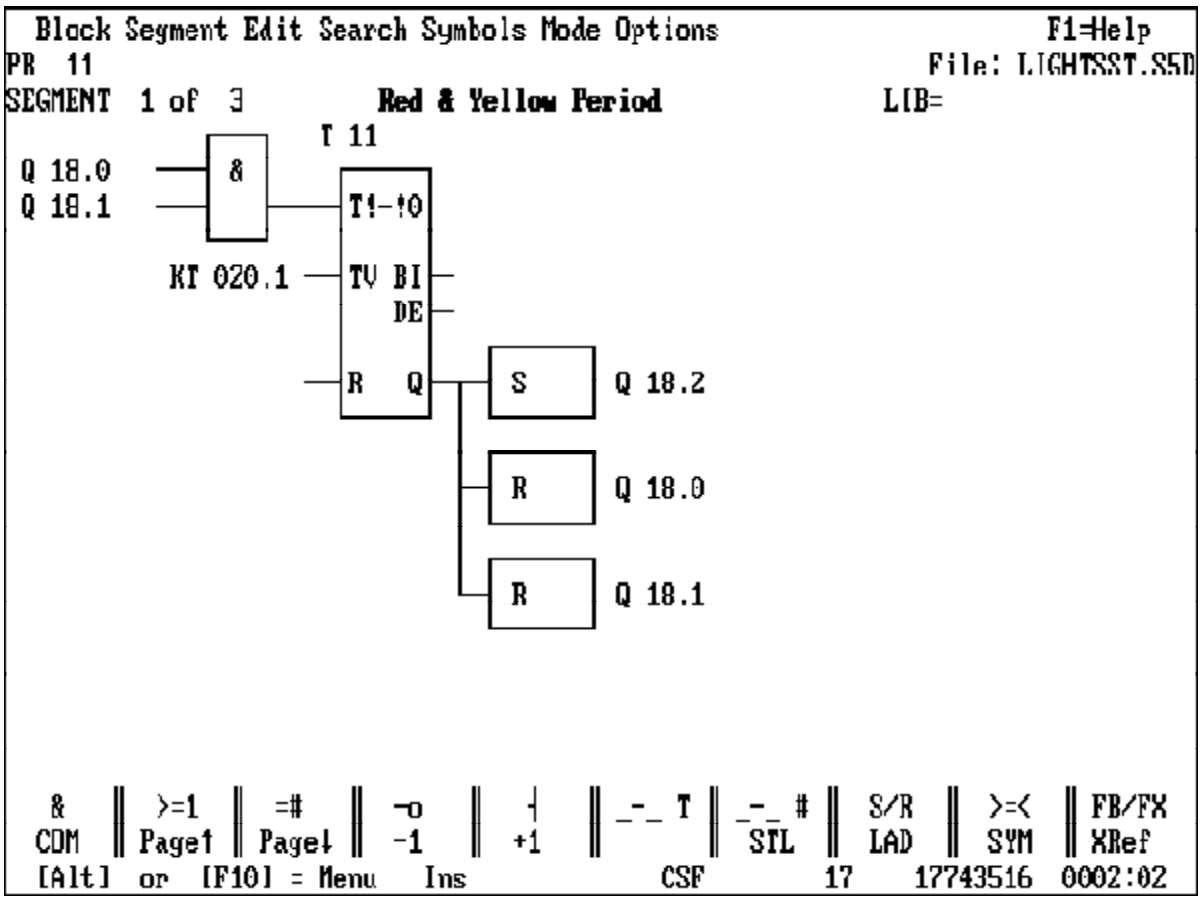

Fig. 11-1: The CSF editor.

11.1 Create a Control System Flowchart

The first line of the CSF editor contains the names of the current block and the current file, the second line contains the name of the current segment and the LIB number.

If a file has already been selected, the block »PB 1« will be loaded. If this block does not exist, or if you are creating a new file, this block will be created.

In fig. 11-1, the tool bar is displayed. As already mentioned, you can switch the tool bar on resp. off using the menu command »Settings« in the menu »Options«.

DB or DX blocks are not representable in CSF mode on principle. In regard of FB and FX blocks, all segments are representable except for the first one.

Segments are not representable in CSF mode if they contain at least one element which is not representable in CSF mode. When you open a segment which cannot be represented in CSF mode, you will get a corresponding message, and the STL editor will be activated automatically.

Segments containing unconditional block calls are representable in CSF mode if they contain nothing else.

If a segment has been created and programmed in CSF mode, it will always be representable in CSF mode.

11.1.1 Enter CSF symbols

The elements of a CSF segment differ from the LAD symbols.

You can insert a symbol when the cursor is on a valid position. Enter the hot key of the desired symbol, or select it from the menu »Symbols« or via the tool bar, if you are using a mouse and if the tool bar is currently available. To insert a symbol via the tool bar, proceed as follows: locate the cursor on the insert position and click on the desired symbol in the tool bar.

If there is enough room for the selected symbol, it will be inserted; otherwise you will get a corresponding message. ACCON-PG expands the segment if necessary so you need not do this manually.

When the selected symbol appears, the ???????? above the symbol designate an operand which can be entered now. Press [Ctrl] + [↵] to go to the first ???????? operand field.

11.1.2 Enter an operand

When the cursor is located on one of the question marks, you can edit the operand name by typing the corresponding letters, e.g. ‘I4.5’. You can simply overwrite the first question mark, the other ones will be deleted automatically. The input field is displayed inverse or emphasized by another color, depending on the selected palette.

When editing an operand, the following editing keys are available:

[Del]	Delete character under cursor.
[←]	Delete character to the left.
[Ins]	Insert character before the cursor.
[Ctrl] + [Y]	Delete whole operand.
[Esc]	Exit from editing the operand, restore status quo.
[Home]	Goto beginning of operand field.
[End]	Goto end of operand field.

Use the cursor keys to move the cursor within the input field, and the [↵] key to confirm your entry. If the entered operand is valid, the cursor will be positioned on the next operand of another symbol that has not yet been specified. This will not be the case if the option »Automatic cursor movement« is ticked off. Keys which are useless for editing operands are locked.

11.2 Block operations

The menu »Block« (shown in the figure below) of the CSF editor enables you to save the current block or to another file, to edit the LIB number and to exit from the CSF editor.

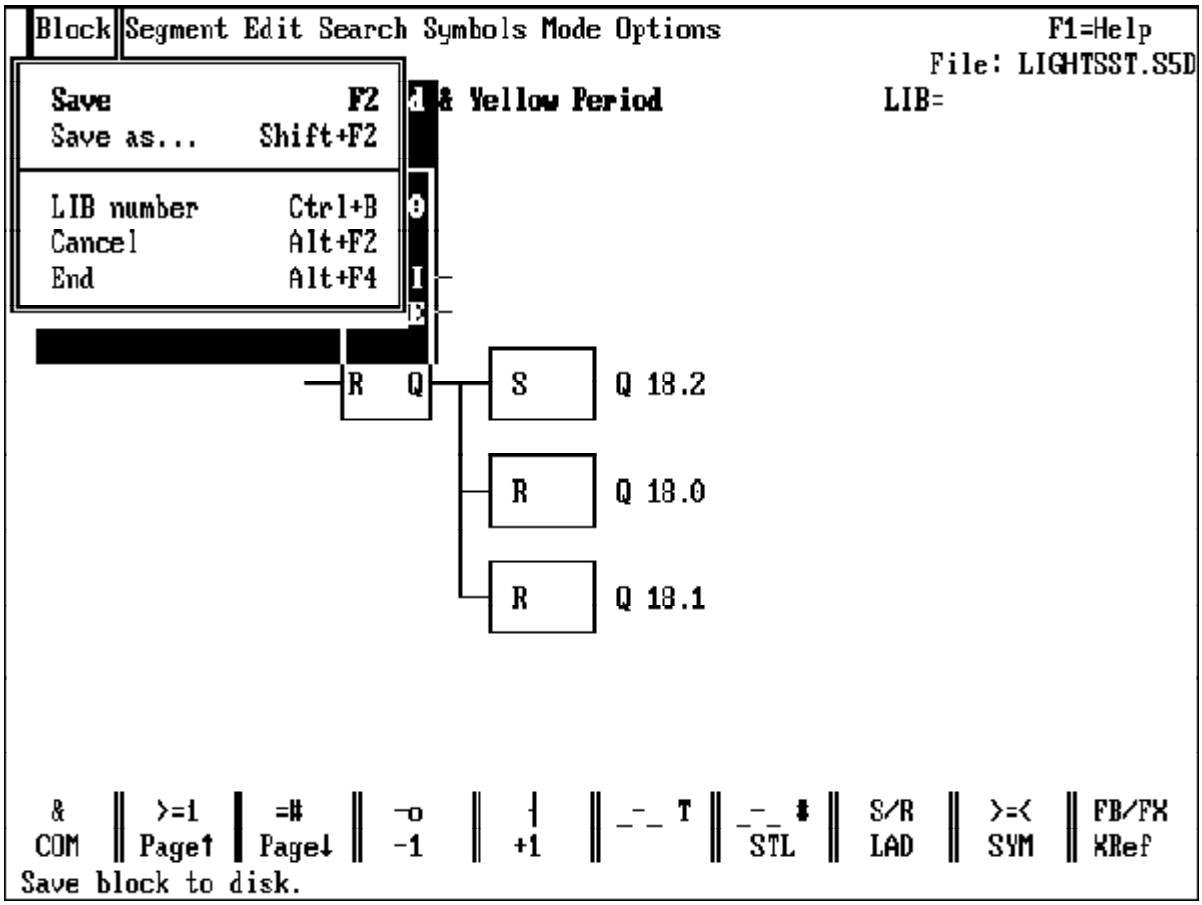

Fig. 11-2: The menu »Block«.

11.2.1 Save a block

You can save the block in the editor to the current file resp. the PLC using the menu command »Save« resp. the hot key F2. If the current file does not yet have a name, the dialog box »Save file« appears in which you must specify the name of the file.

11.2.2 Save a block to another file

You can save the block in the editor to a new file or to another file than the current file using the menu command »Save as« resp. the hot key Shift + F2. The dialog box »Save file« appears in which you must specify the name of the file.

You can select another directory or another drive from the drive / directory list box. If the specified file exists already, a dialog box with a corresponding warning message will appear. You can now decide whether to overwrite the existing file, or to cancel the operation. If the current block exists in the current file already, you will also get a corresponding warning message; so you can cancel the operation if necessary.

The directory provides for more efficient methods for transferring blocks.

11.2.3 Edit the LIB number

After selecting the menu command »LIB number« resp. typing the hot key Ctrl + B resp. clicking on the LIB number field, the cursor is located behind the field »LIB=« in the top right corner of the screen where you can enter resp. edit the number of the library to be used. You can modify the LIB number according to your wishes. The number consists of digits only.

11.2.4 Cancel editing

Selecting the menu command »Cancel« resp. typing the hot key Alt + F2 lets you exit from editing the current block. If the block resp. the file has been changed since it was last saved, a message box with a corresponding notice will appear. You can now cancel the operation, i.e. continue editing, or actually exit editing with a loss of the changes. The block need not be syntactically correct if you want to cancel editing.

11.2.5 End editing

You can leave the CSF editor using the menu command »End« resp. the hot key Alt + F4. If the current block has been modified since it was last saved, a dialog box with a corresponding warning message will appear. You can now save the changes to the block, or cancel the operation.

11.3 Segment operations

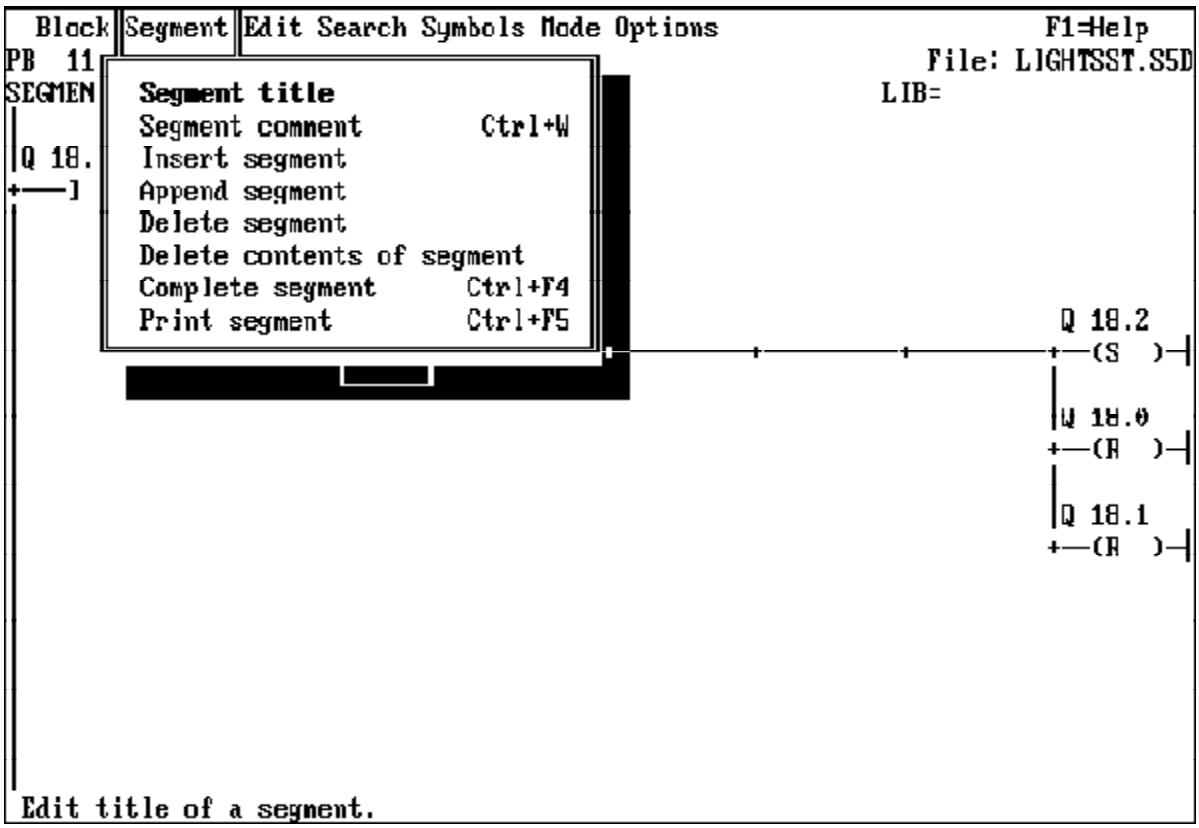

Fig. 11-3: The "Segment" menu

11.3.1 Enter the segment title

After selecting the menu command »Segment title«, the cursor will be located on the second line of the screen where you can enter the title of the current segment. The segment title can also be selected using the mouse by clicking with the left mouse button on the corresponding position. Press the ↵ key to complete your entry and to leave the input field.

11.3.2 Edit the segment comment

After selecting the menu command »Segment comment«, you will be in the comment editor where you can edit the comment of the current segment. You can also activate the segment comment editor by double-clicking with the left mouse button on the segment title, or by using the hot key Ctrl + W, or by clicking on the "COM" symbol in the toolbar (only if the toolbar is activated).

This menu command is described in detail in chapter 13.

11.3.3 Insert a segment

Selecting the menu command »Insert segment« has the following effects: the current segment will be completed, and a new segment will be inserted before it.

A new segment can be inserted only if the syntax check of the current segment can be performed successfully, and if the total number of segments does not exceed 256.

11.3.4 Append a segment

Selecting the menu command »Append segment« has the following effects: the current segment will be completed, and a new segment will be inserted behind it.

A new segment can be inserted only if the syntax check of the current segment can be performed successfully, and if the total number of segments does not exceed 256.

11.3.5 Delete a segment

Selecting the menu command »Delete segment« will cause the current segment to be deleted without checking for correct syntax. You have to confirm the deletion before it is actually executed. You can also cancel the operation.

11.3.6 Delete the contents of a segment

Selecting the menu command »Delete contents of segment« will cause the contents of the current segment to be deleted without checking for correct syntax. You have to confirm the deletion before it is actually executed. You can also cancel the operation.

11.3.7 Complete the current segment

Selecting the menu command »Complete segment« has the following effects: the current segment is checked for undefined operands etc. The next segment will be opened (a new segment will be appended if necessary).

You can also access this function using the hot key Ctrl + F4.

11.3.8 Print a segment

Selecting the menu command »Print segment« resp. typing the hot key Ctrl + F5 will cause the current segment to be printed using the specified standard printer and the current printer settings. You can modify the formats used for printing using the menu command »Printer options...« in the menu »Options«.

11.4 Edit blocks

The menu »Edit« contains the block editing commands which differ from the corresponding commands in the STL editor resp. in the LAD editor.

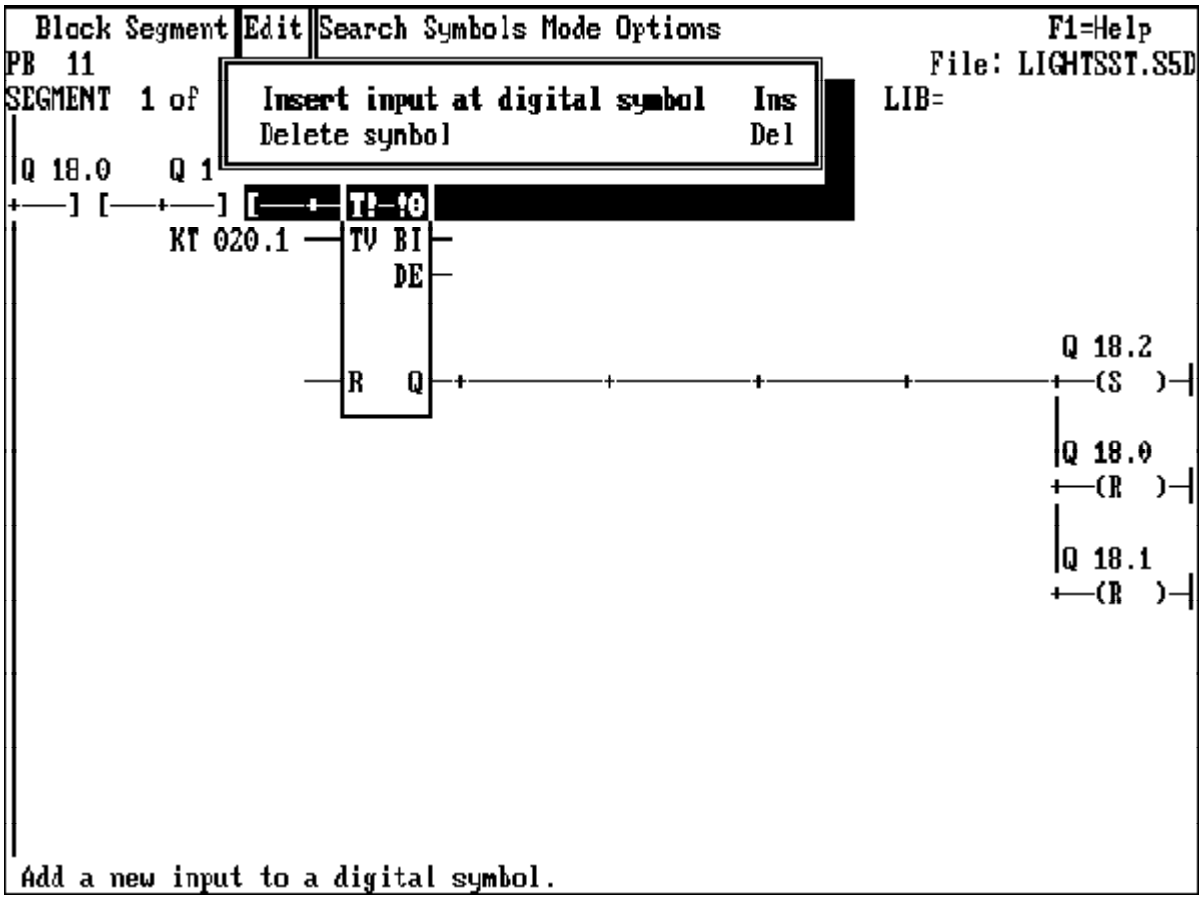

Fig. 11-4: The menu »Edit«.

11.4.1 Insert an input

You can add a further input to an AND or an OR symbol using this menu command resp. the hot key [Ins] when the cursor is located on the desired position. You cannot insert further inputs for a complex symbol (timer, counter, flag) which have a fixed number of inputs. The toolbar symbol »┤« can also be used for inserting a further input.

11.4.2 Delete an input or a symbol

Selecting the menu command »Delete input / symbol« resp. typing the hot key [Del] deletes the input of a symbol if the cursor is located on that input. You can delete the whole symbol by first deleting all of its inputs. With arithmetic or digital word operation symbols, you cannot delete the last but two inputs.

11.4.3 Negate an input

Selecting the menu command »Negate input« resp. typing the hot key [Ctrl] + [J] negates the input on which the cursor is located. Using this menu command again will restore the former non-negating input. You can negate only inputs representing a single operand. The toolbar symbol »-o« can also be used for negating an input.

11.5 Search/Replace text and goto

The menu »Search« contains functions for searching and replacing operands, and for positioning the cursor on a specific location within the program.

The following figure shows the menu »Search«.

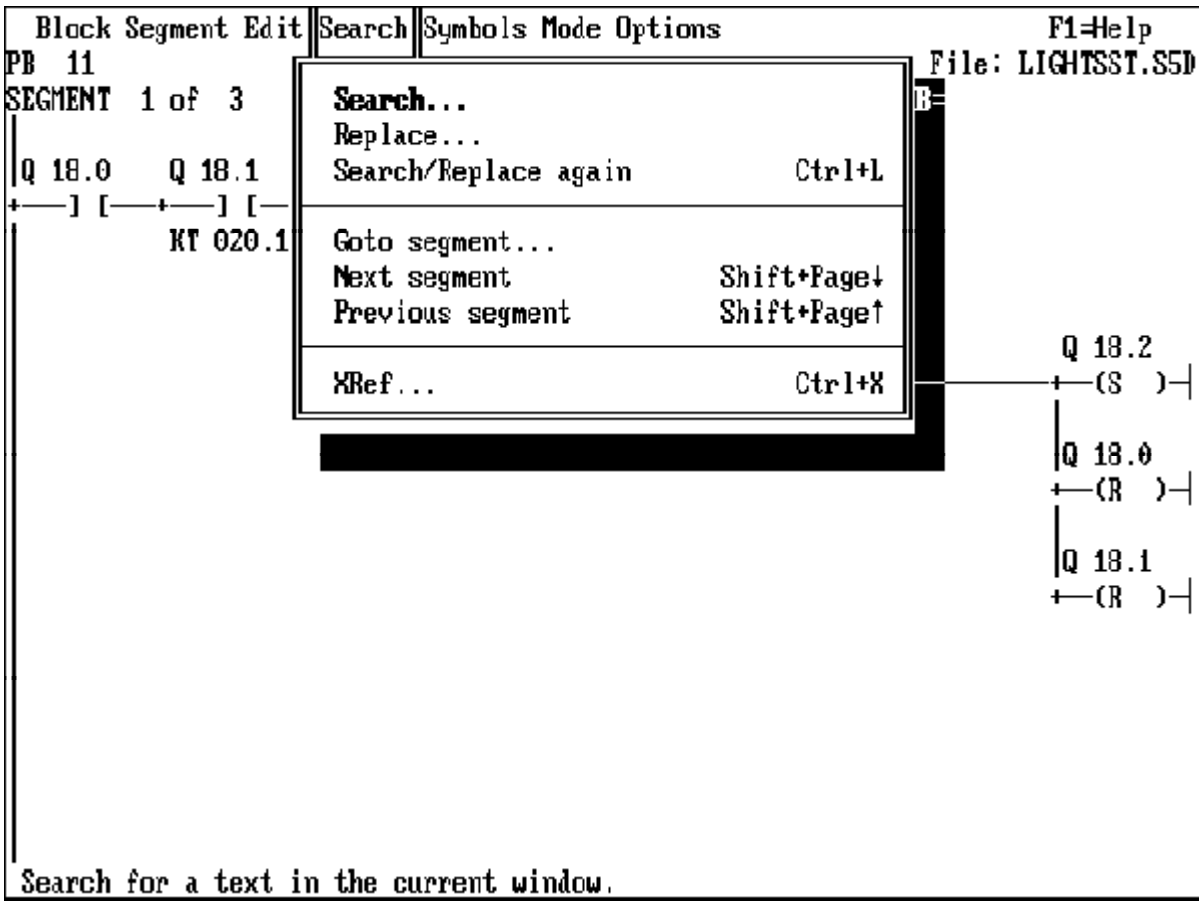

Fig. 11-5: The menu »Search«.

11.5.1 Search for a string

After selecting the menu command »Search...«, the dialog box »Search text« shown in figure 11-6 will be opened. In CSF mode, only operands can be searched for. Therefore, the entered search string has to be a valid operand; otherwise you will get a corresponding error message. The components of the dialog box »Search text« are described in the following.

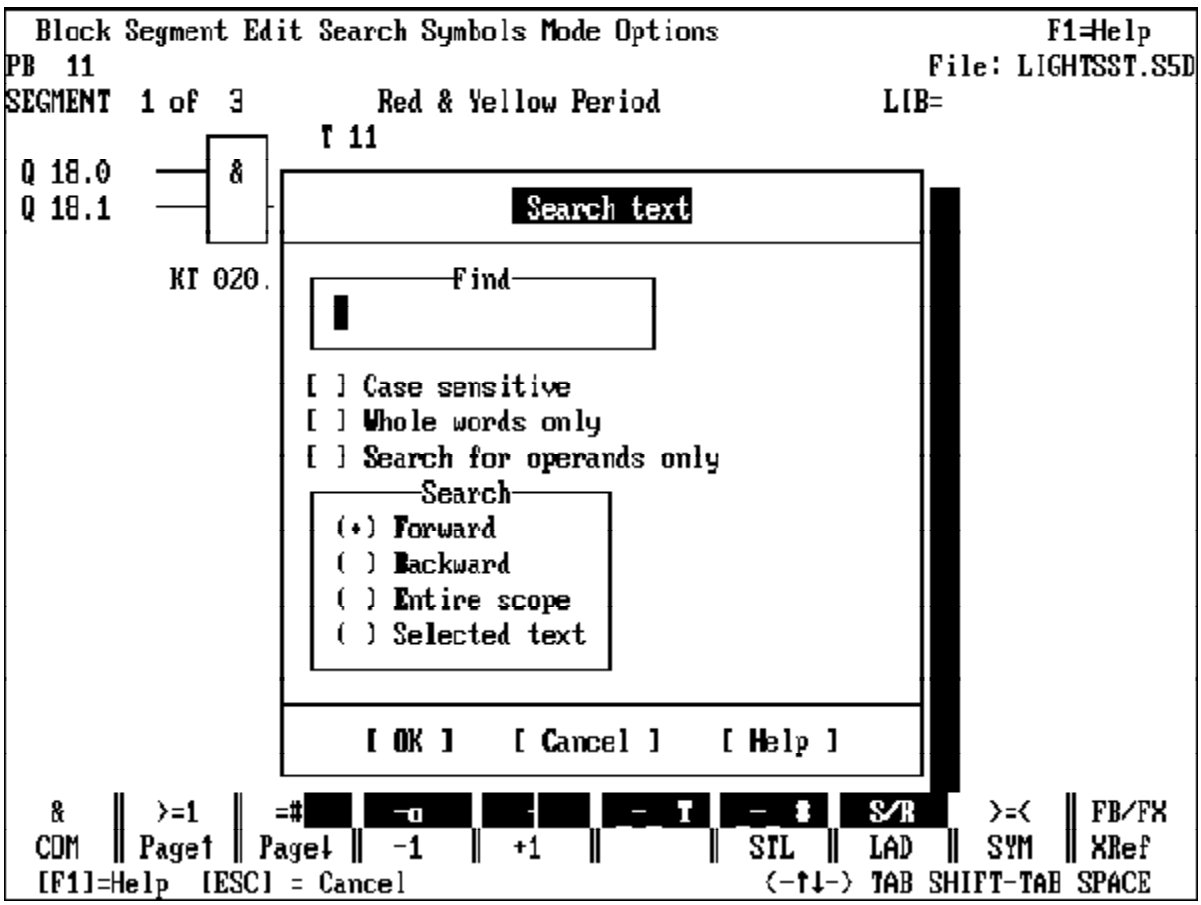

Fig. 11-6: The dialog box »Search text«.

Search string

The operand to search for has to be specified in the text input field »Find«.

Case-sensitive search

The check box »Case sensitive« has no effect in CSF mode.

Whole words only

The check box »Whole words only« has no effect in CSF mode.

Search for operands only

The check box »Search for operands only« is always ticked in CSF mode.

Search direction

The radio button »Search« can be used to specify those parts of the texts to be searched. There are four available options: you can search forward, backward, in the whole text (from the beginning of the text) or in the marked block only (from the beginning of the block).

11.5.2 Search for and replace a text string

After selecting the menu command »Replace...«, the dialog box »Replace text« shown in figure 11-7 will be opened. The components of this dialog box resemble the components of the dialog box »Search text« and are therefore described here without too many details.

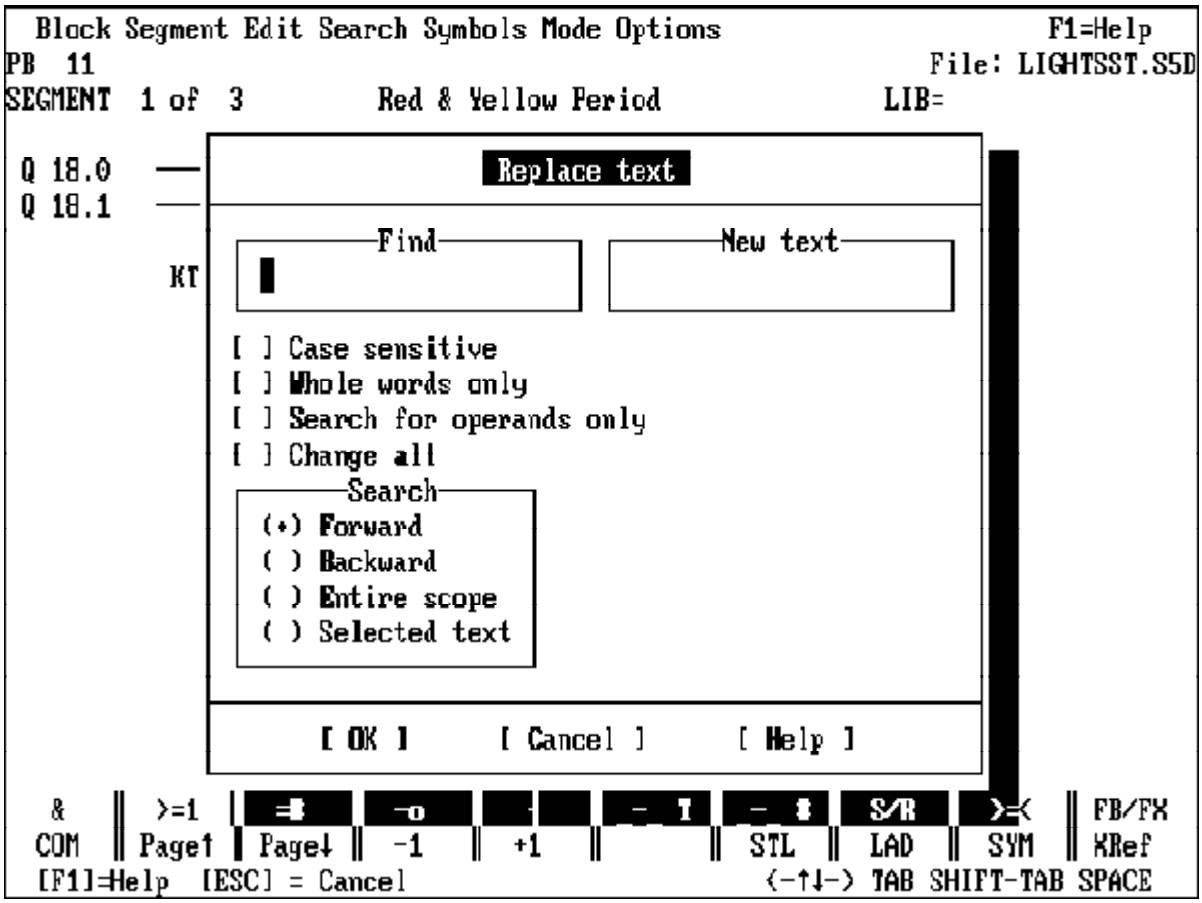

Fig. 11-7: The dialog box »Replace text«.

Search string

The operand to search for has to be specified in the text input field »Find«.

Replace string

The new operand has to be specified in the text input field »New text«.

Case-sensitive search

The check box »Case sensitive« has no effect in CSF mode.

Whole words only

The check box »Whole words only« has no effect in CSF mode.

Search for operands only

The check box »Search for operands only« is always ticked in CSF mode.

Search direction

The radio button »Search« can be used to specify those parts of the texts to be searched. There are four available options: you can search forward, backward, in the whole text (from the beginning of the text) or in the marked block only (from the beginning of the block).

Replace all occurences

If the check box »Change all« is ticked, all occurences of the search string will be replaced by the replace string; otherwise only the first occurence will be replaced. Each changed operand will be checked for correct syntax before leaving it. If the operand is found to be erroneous, the search and replace operation is cancelled, and the cursor is positioned on the erroneous operand.

11.5.3 Search / Replace again

The menu command »Search / Replace again« resp. the hot key Ctrl + L lets you search for resp. replace the next occurence of the specified search string. Which action will be carried out, depends on the last action. The same options are used for the search process.

If a search string has not yet been specified, the dialog box »Search text« (see fig. 11-6) appears.

11.5.4 Goto segment

When selecting the menu command »Goto segment«, a dialog box will appear in which you can enter the number of the segment to go to. If the current segment contains undefined operands, you will not be able to leave it.

11.5.5 Goto next segment

When selecting the menu command »Next segment« resp. typing the hot key Shift + Page↓ resp. clicking on the tool bar symbol "+1", the cursor is located at the beginning of the next segment.

11.5.6 Goto previous segment

When selecting the menu command »Previous segment« resp. typing the hot key Shift + Page↑ resp. clicking on the tool bar symbol "-1", the cursor is located at the beginning of the previous segment.

11.5.7 XREF

You can call this command via the menu, or by selecting the toolbar symbol "XREF", or by typing the hotkey Ctrl + X. A dialog box appears where you can select the desired operation. You can view the list of the occurences of a certain operand and go to any of these occurences if there is a reference list which is up-to-date. You can generate a reference list with the menu command »Block/Generate XREF« in the directory. Use the option »Automatically update XREF« to keep the reference list up-to-date; it will be updated each time you save your changes in a block editor.

Select "Destination block" to go directly to a specific block, or "Origin block" to return to the block from which you first called the XREF function.

11.6 CSF symbols

The menu »Symbols« shown below contains all CSF symbols.

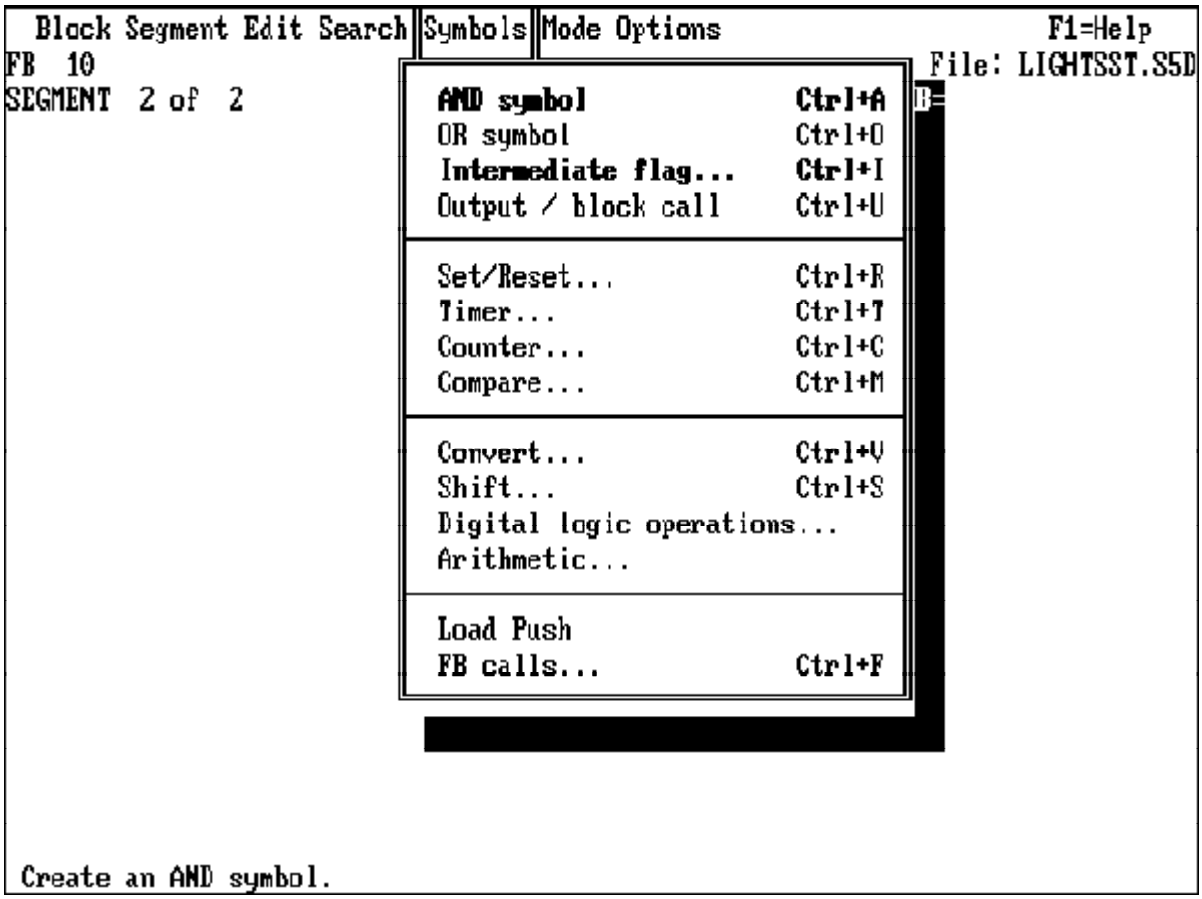

Fig. 11-8: The menu »Symbols«.

11.6.1 AND symbol

You can use this menu command resp. the hot key Ctrl + A to insert an AND symbol with two inputs at the current cursor position. You can also click on the tool bar symbol "&". The segment will be expanded automatically. If there is not enough room at the current position, you will get a corresponding error message.

11.6.2 OR symbol

You can use this menu command resp. the hot key Ctrl + O to insert an OR symbol with two inputs at the current cursor position. You can also click on the tool bar symbol ">=1". The segment will be expanded automatically. If there is not enough room at the current position, you will get a corresponding error message.

11.6.3 Intermediate flag

You can use this menu command resp. the hot key Ctrl + I to insert an intermediate flag symbol at the current cursor position. You can also click on the tool bar symbol "=#". If the position is not valid, you will get a corresponding error message. A dialog box appears in which you can select a "normal" intermediate flag or a negating intermediate flag.

When the cursor is located on the character "#" or "/" of the intermediate flag, you can change the type (normal or negating) of the intermediate flag using the menu command »Edit/Negate input«. By selecting the symbol intermediate flag again (on the same position), you can parallel a further intermediate flag.

11.6.4 Output / Block call

If the current segment is empty, you can use this menu command resp. the hot key Ctrl + U to insert a symbol for an unconditional block call. In this case, a dialog box appears in which you can choose between activating a data block and calling a (program) block.

If the current segment contains symbols, you can add another output to a symbol. New outputs can be added below existing outputs at the right side of a symbol. You can also use this method for assigning an output to a complex symbol which does not possess an output yet.

11.6.5 Set/Reset symbols

You can use this menu command resp. the hot key Ctrl + R to insert a Set or a Reset symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. After selecting this menu command, the dialog box shown in fig. 11-9 appears:

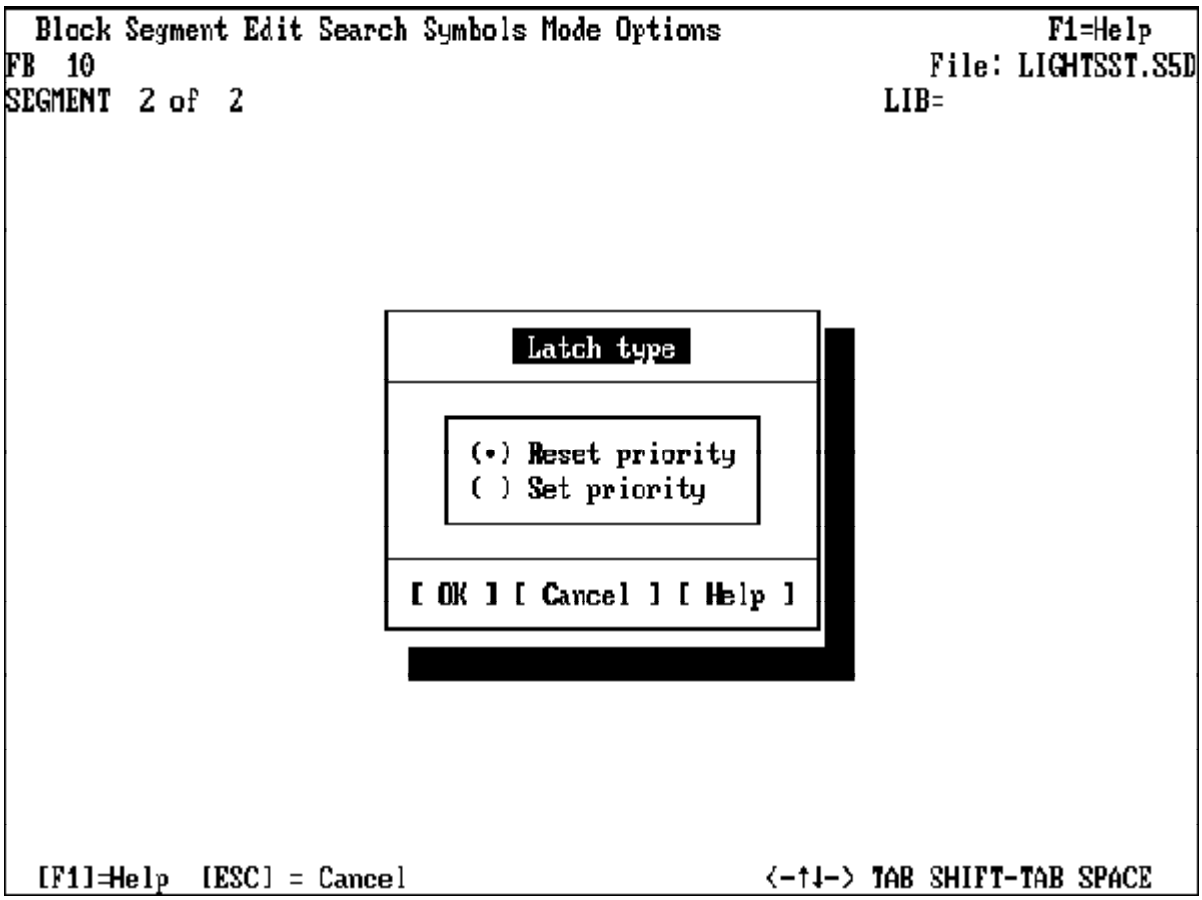

Fig. 11-9: The dialog box for selecting the type of a Set/Reset operation.

Here you can select the type of the Set/Reset operation. You can either select Set priority or Reset priority for the RS flip-flop. You can change the priority of an existing Set/Reset symbol by positioning the cursor on the symbol and selecting this menu command resp. typing the hot key.

Reset priority

When both inputs of the flip-flop are "1", the flip-flop will be reset, i.e. its output will be "0".

Set priority

When both inputs of the flip-flop are "1", the flip-flop will be set, i.e. its output will be "1".

You can also use the toolbar symbol "S/R" for inserting a Set/Reset symbol.

11.6.6 Timer

You can use this menu command resp. the hot key Ctrl + T to insert a timer symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. After selecting this menu command, the dialog box shown in fig. 11-10 appears:

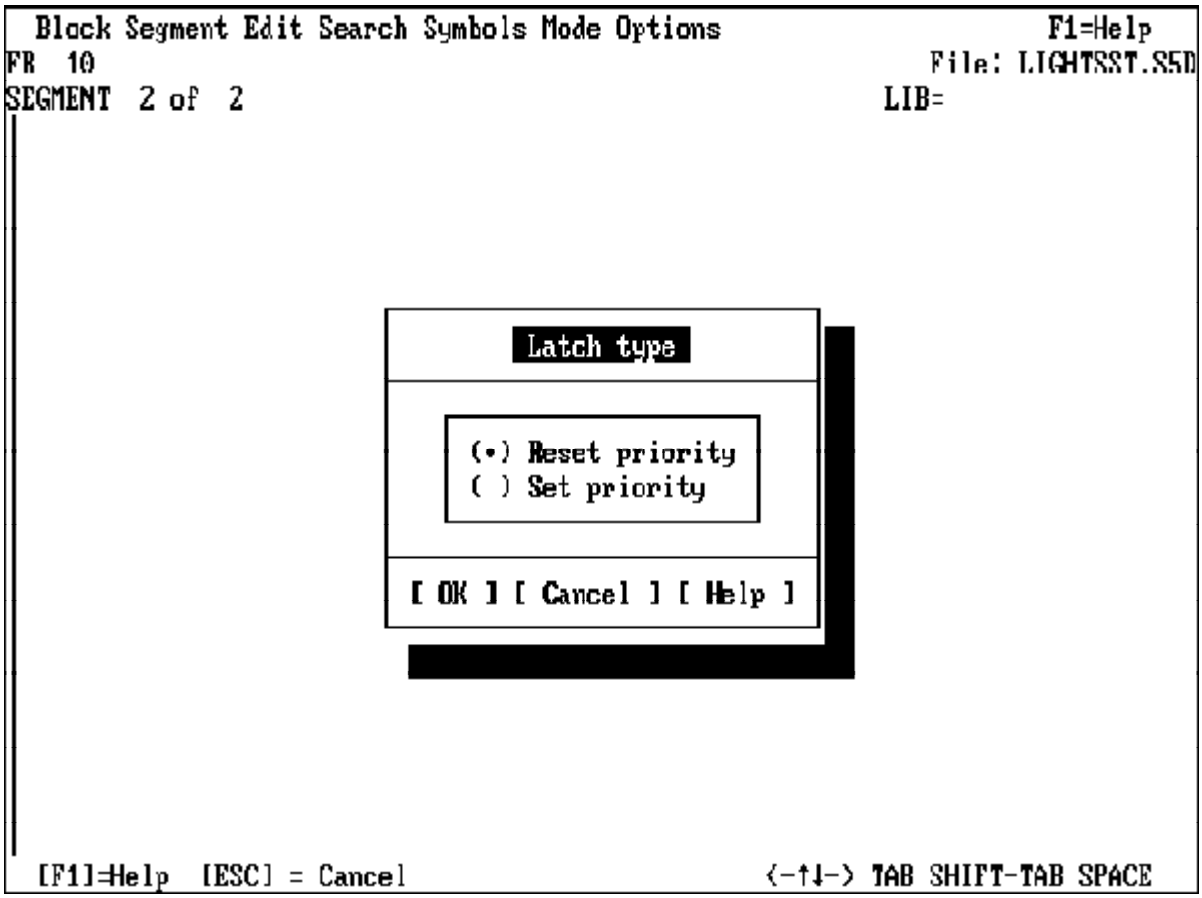

Fig. 11-10: The dialog box for selecting the type of a timer.

You can choose between 5 timer types:

Pulse (SP)

When the Start input changes its state from »0« to »1«, the timer is started. The binary output is set to »1« while the timer is running. It runs as long as the Start input state remains "1"; if it changes to "0" while the timer runs, the timer will be reset.

Extended pulse (SE)

When the Start input changes its state from »0« to »1«, the timer is started. Independently of the duration of the input signal, the binary output will be "1" during the programmed time. A short and a long start pulse will result in "1" signals of the same duration at the output.

ON delay (SD)

When the Start input changes its state from »0« to »1«, the timer is started. After the programmed time has elapsed, the binary output will be set to "1", but only if the input signal is still "1".

Latching ON delay (SS)

When the Start input changes its state from »0« to »1«, the timer is started. After the programmed time has elapsed, the binary output will be set to "1", no matter if the input signal is still "1". Before starting the timer again, it has to be reset first.

OFF delay (SF)

When the Start input changes its state from »0« to »1«, the binary output of the timer is set to "1". When the Start input changes its state from »1« to »0«, the timer is started. The binary output remains "1" until the programmed time has elapsed. Then it will be set to "0".

You can change the type of a timer by positioning the cursor on the timer symbol and selecting this menu command again.

You can also use the toolbar symbol "_-_ T" for inserting a timer symbol.

11.6.7 Counter

You can use this menu command resp. the hot key Ctrl + C to insert a counter symbol at the current cursor position. If the position is not valid, a corresponding error message will appear. After selecting this menu command, the dialog box shown in fig. 11-11 appears:

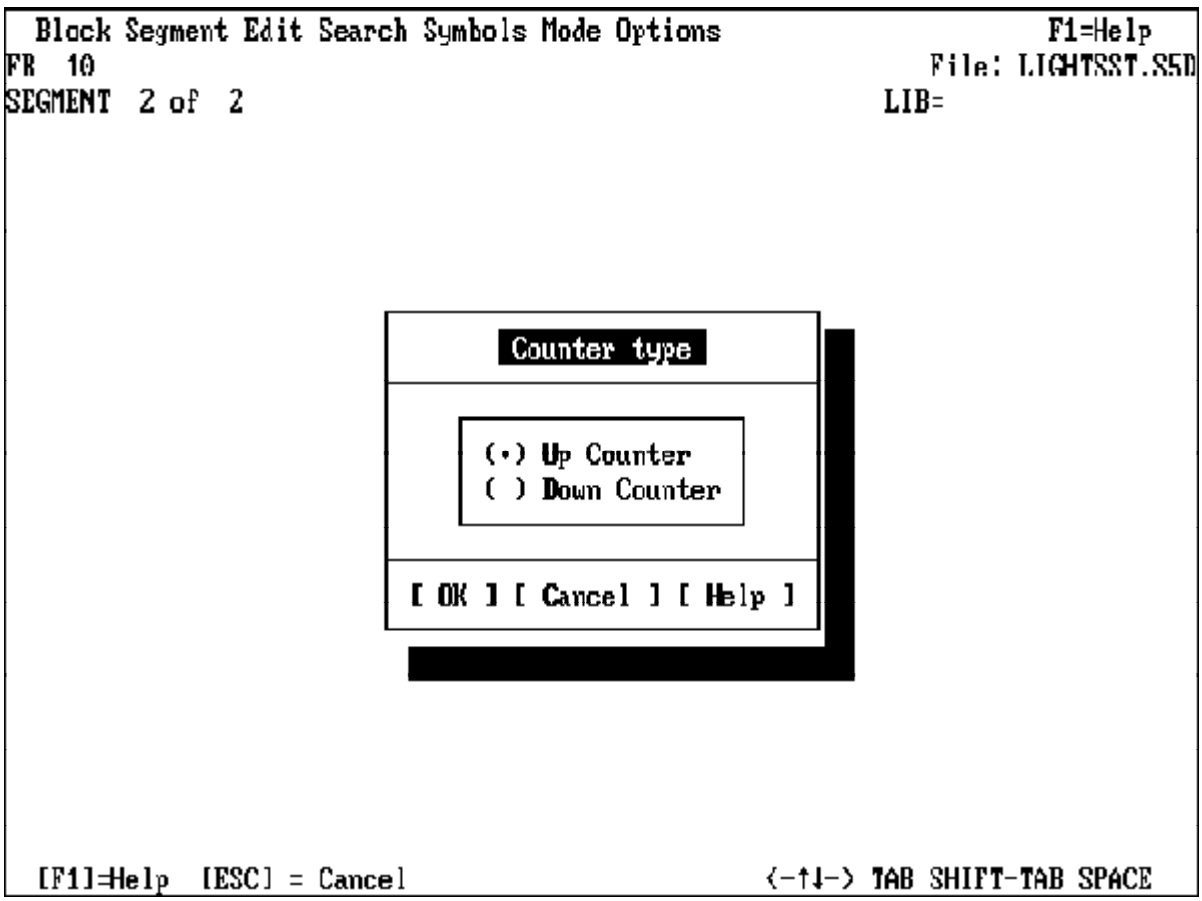

Fig. 11-11: The dialog box for selecting the type of a counter.

You can now select the desired counter type using the mouse, or the cursor keys plus the ↵ key.

Up counter

An up counter is incremented each time when its Count-up input CU changes from "0" to "1". If the counter value reaches 999, it will no longer be incremented. There is no simple means for determining a counter value of 999, like a flag (carry).

Down counter

A down counter is decremented each time when its Count-down input CD changes from "0" to "1". If the counter value reaches 0, it will no longer be decremented. There is no simple means for determining a counter value of 0, like a flag (carry).

You can change the type of a counter by positioning the cursor on the counter symbol and selecting this menu command again.

You can also use the toolbar symbol "_-_ #" for inserting a counter symbol.

11.6.8 Compare

You can use this menu command resp. the hot key Ctrl + M to insert a compare operation symbol at the current cursor position. You can also use the toolbar symbol ">=<" for inserting a compare symbol. If the position is not valid, a corresponding error message will appear. A compare operation symbol can be inserted only in the first column of the CSF editor, due to its inputs expecting word operands. After selecting this menu command, the dialog box shown in fig. 11-12 appears:

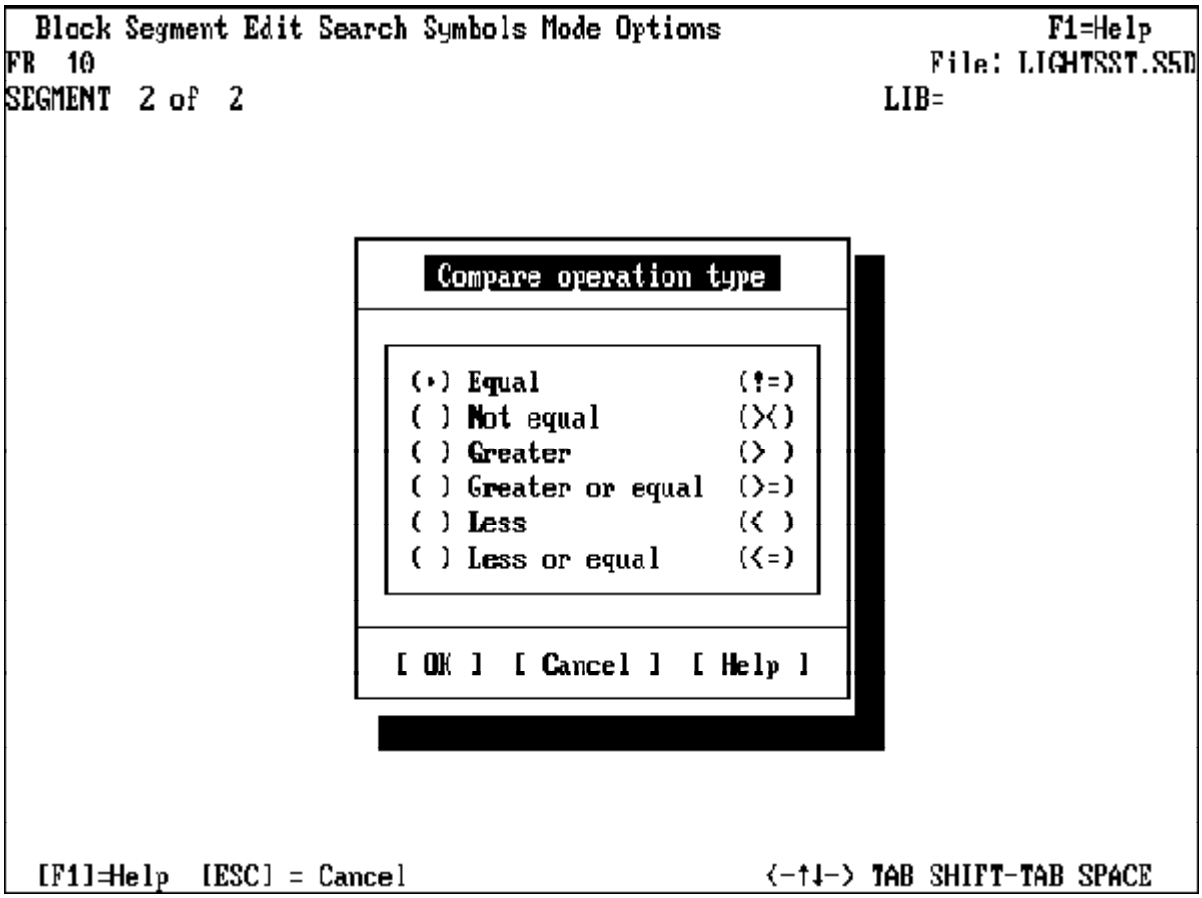

Fig. 11-12: The dialog box for selecting the type of a compare operation.

You can choose between 6 different types of compare operations:

Equal

If both operands (= inputs) have the same bit pattern, the output of the compare operation symbol will be set to "1".

Not equal

If the operands have different bit patterns, the output of the compare operation symbol will be set to "1".

Greater

If the first operand (= the operand at the above input) is greater than the second operand, the output of the compare operation symbol is set to "1".

Greater or equal

If the first operand is greater than the second operand or equals the second operand, the output of the compare operation symbol is set to "1".

Less

If the first operand (= the operand at the above input) is less than the second operand, the output of the compare operation symbol is set to "1".

Less or equal

If the first operand (= the operand at the above input) is less than the second operand or equals the second operand, the output of the compare operation symbol is set to "1".

You can change the type of a compare operation symbol by positioning the cursor on the compare operation symbol and selecting this menu command again.

11.6.9 Conversion operations

Selecting the menu command »Convert« resp. typing the hot key Ctrl + V, causes a dialog box to appear from which you can select one of the following types of conversion operations:

- CFW Ones complement (bits 0-15 of the input value)
- CSW Two’s complement (bits 0-15 of the input value)
- CSD Two’s complement (bits 0-31 of the input value)

- DEF Convert a 3-digit decimal number to a 16 bit fixed-point number (bits 0-15 of the input value)
- DUF Convert a 16 bit fixed-point number to a 3-digit decimal number to (bits 0-15 of the input value)
- DED Convert a 7-digit decimal number to a 32 bit fixed-point number (bits 0-31 of the input value)
- DUD Convert a 32 bit fixed-point number to a 7-digit decimal number to (bits 0-31 of the input value)
- FDG Convert a 32 bit fixed-point to a 32 bit floating-point number (bits 0-31 of the input value)
- GFD Convert a 32 bit floating-point to a 32 bit fixed-point number (bits 0-31 of the input value)

If the cursor is located on a invalid position, you will get an error message. This symbol is allowed only in function blocks.

11.6.10 Shift operations

Selecting the menu command »Shift« resp. typing the hot key Ctrl + S, causes a dialog box to appear from which you can select one of the following types of conversion operations:

- SLW: shift word left (bits 0-15 of the input value)
- SLD: shift double word left (bits 0-31 of the input value)
- SRW: shift word right (bits 0-15 of the input value)
- SSW: shift word left with sign (bits 0-15 of the input value)
- SSD shift double word left with sign (bits 0-31 of the input value)
- RLD rotate double word left (bits 0-31 of the input value)
- RRD rotate double word right (bits 0-31 of the input value)

If the cursor is located on a invalid position, you will get an error message. This symbol is allowed only in function blocks.

11.6.11 Digital logic operations

Selecting the menu command »Digital logic operations« resp. typing the hot key Ctrl + D, causes a dialog box to appear from which you can select one of the following digital logic operations:

- AND operation (word)
- OR operation (word)
- Exclusive OR operation (word)

If the cursor is located on a invalid position, you will get an error message. This symbol is allowed only in function blocks.

11.6.12 Arithmetic operations

Selecting the menu command »Arithmetic« causes a dialog box to appear from which you can select one of the following arithmetic operations:

- Addition
- Subtraction
- Multiplication
- Division.

If the cursor is located on a invalid position, you will get an error message.

11.6.13 Load Push operations

You can insert a Load operation symbol at the current cursor position using the menu command »Load Push«. If the cursor is located on a invalid position, you will get an error message. This symbol must be the only symbol of the segment.

11.6.14 FB call

Selecting the menu command »FB calls...« resp. typing the hot key Ctrl + F, causes a dialog box to appear from which you can select one of the types of FB call operations and enter the desired block number:

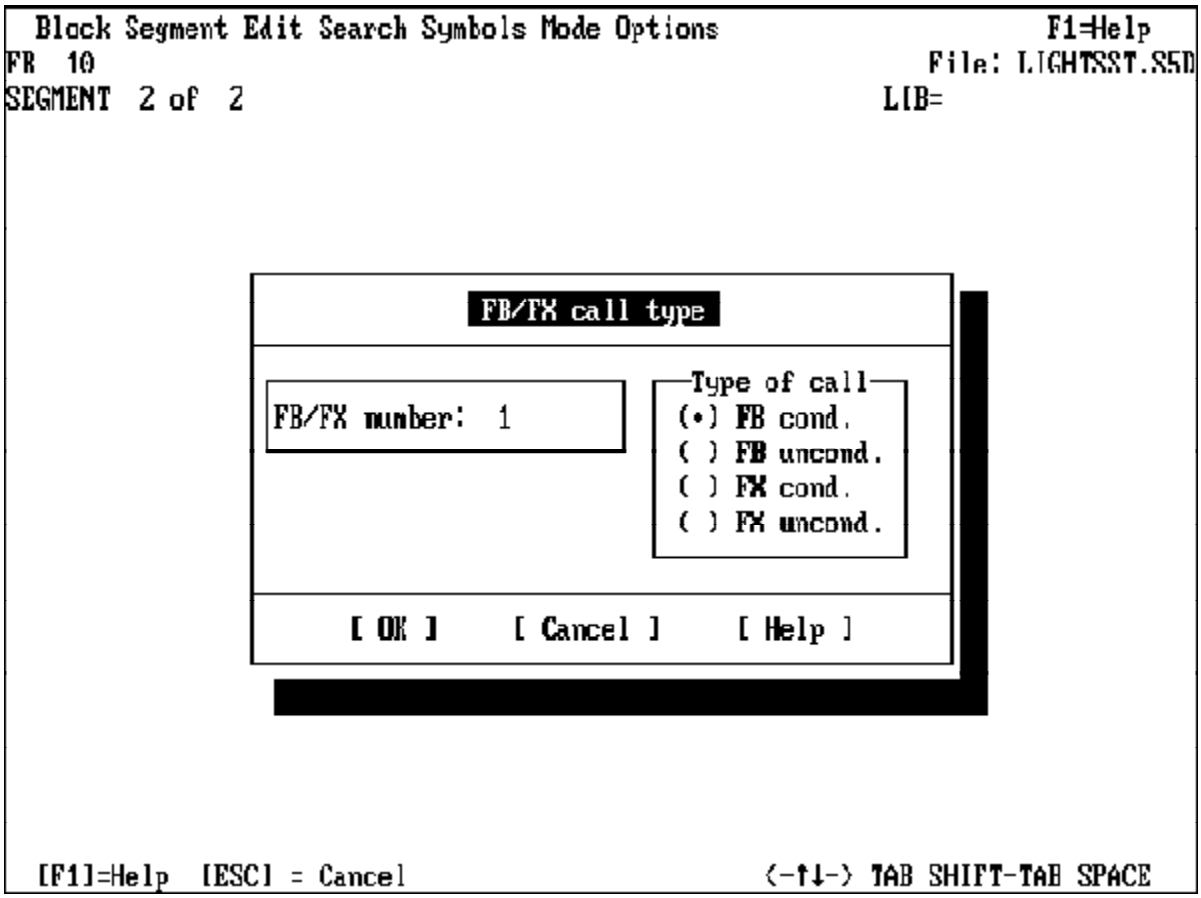

Fig. 11-13: The dialog box for calling a FB/FX.

You can insert a FB/FX call in an empty segment only.

In the dialog box, you can first enter the number of the function block, and then specify the type of the call operation (conditional or unconditional). Use the [↵] key for confirming your selection. The FB/FX call is inserted at the current cursor position if the called FB/FX exists in the file.

You can also use the toolbar symbol "FB/FX" for inserting a compare symbol.

11.7 Examining the control program in the status mode

If you selected the menu command »Status Blocks CSF« from the main menu, the menu »Status« is available from which you can start resp. stop a status scan.

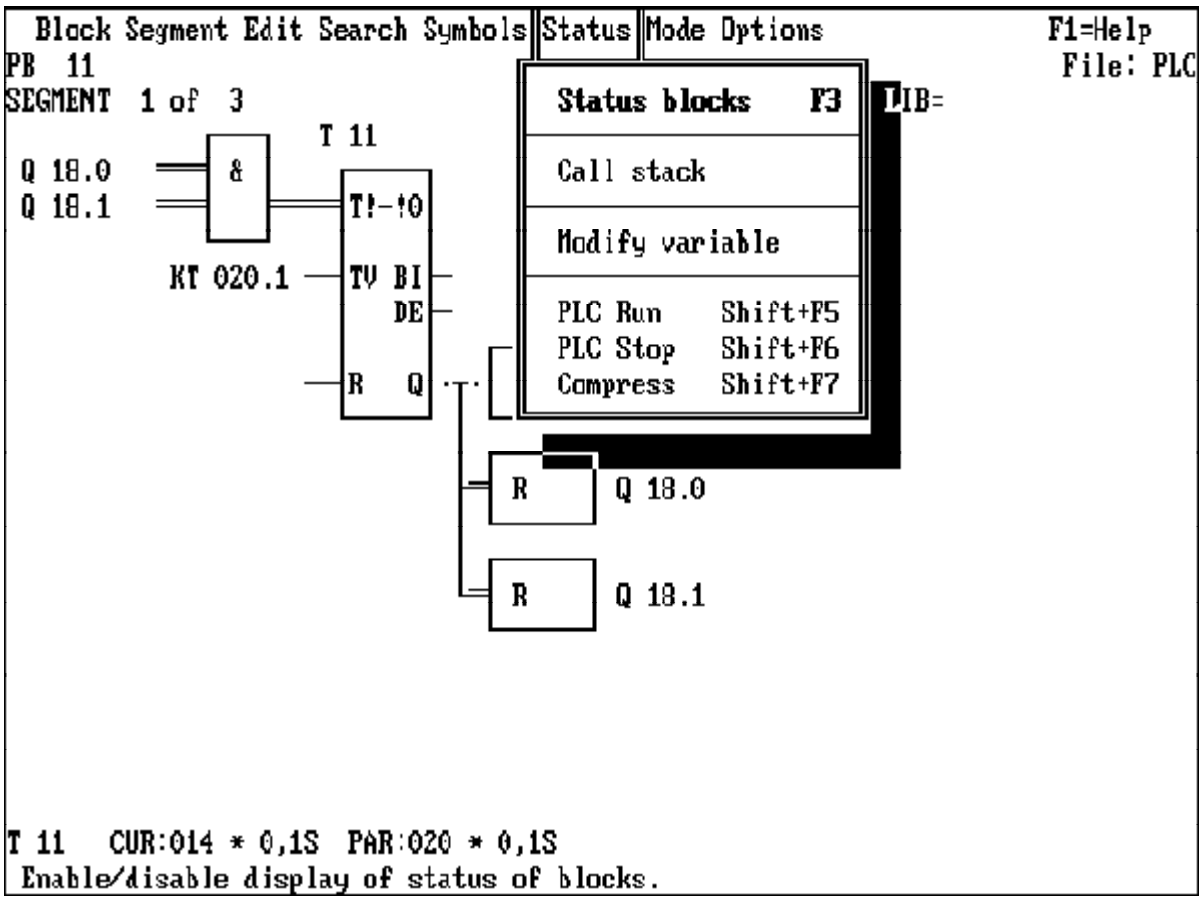

Fig. 11-14: The menu »Status«.

11.7.1 Start/Stop a status scan

Selecting the menu command »Status blocks« resp. typing the hot key F3 starts resp. stops the status scan. The status scan always refers to the current block of which the current segment is displayed on the screen. It ends before a special delimiting statement, e.g. a jump operation, or when the maximum number of status scans has been reached.

If the message "Block not executed" or "Statement not executed" appears during a status scan, the possible reasons can be:

- the PLC is in »Stop« mode
- the connection between PC and PLC is interrupted
- the PLC has been switched off
- the block is not executed due to a conditional call
- the block is not executed due to a jump operation.

The signal state of an input resp. an output of a symbol is represented as follows: signal state "1" is marked by a double line, and signal state "0" is marked by a dotted line. If syntax highlighting is selected, different colors are used for the two types of lines.

Generally, the signal state of all symbols displayed on the screen is displayed (in contrast to the Siemens software). If a large segment cannot be displayed completely on one page of a high-resolution video mode, you have to scroll in the segment (you can select another video mode with a lower resolution for that).

If only a part of a symbol is visible on the screen, the current signal state of the output of the symbol is not displayed (in general), because the status scan includes only the signal states of those inputs which are visible. Therefore, the signal state of the symbol's output is generally unknown. In some cases, however, the signal state of the output can be determined from the signal states of the visible inputs alone. ACCON-PG will then display the signals state of the output as well.

An example:

If a partially visible AND symbol has a visible input with signal state "0", then the signal state of the output is "0" as well, independently from the signal state of the other (perhaps invisible) inputs. Therefore, the signal state of the output of the AND symbol is displayed as "0". If all visible inputs of the AND symbol have signal state "1", however, the signal state of the output cannot be determined (if an invisible input has signal state "0", the signal state of the output is "0", too; if all invisible inputs have signal state "1", the signal state of the output is "1"). The situation is similar with OR symbols.

Negated inputs in CSF are treated as follows: in all cases, the RLO »arriving« at the symbol's input is displayed. The fact that the RLO is negated by the input is not displayed with the input. The signal state of the output is displayed with the negation considered, of course. The following figure shows this situation.

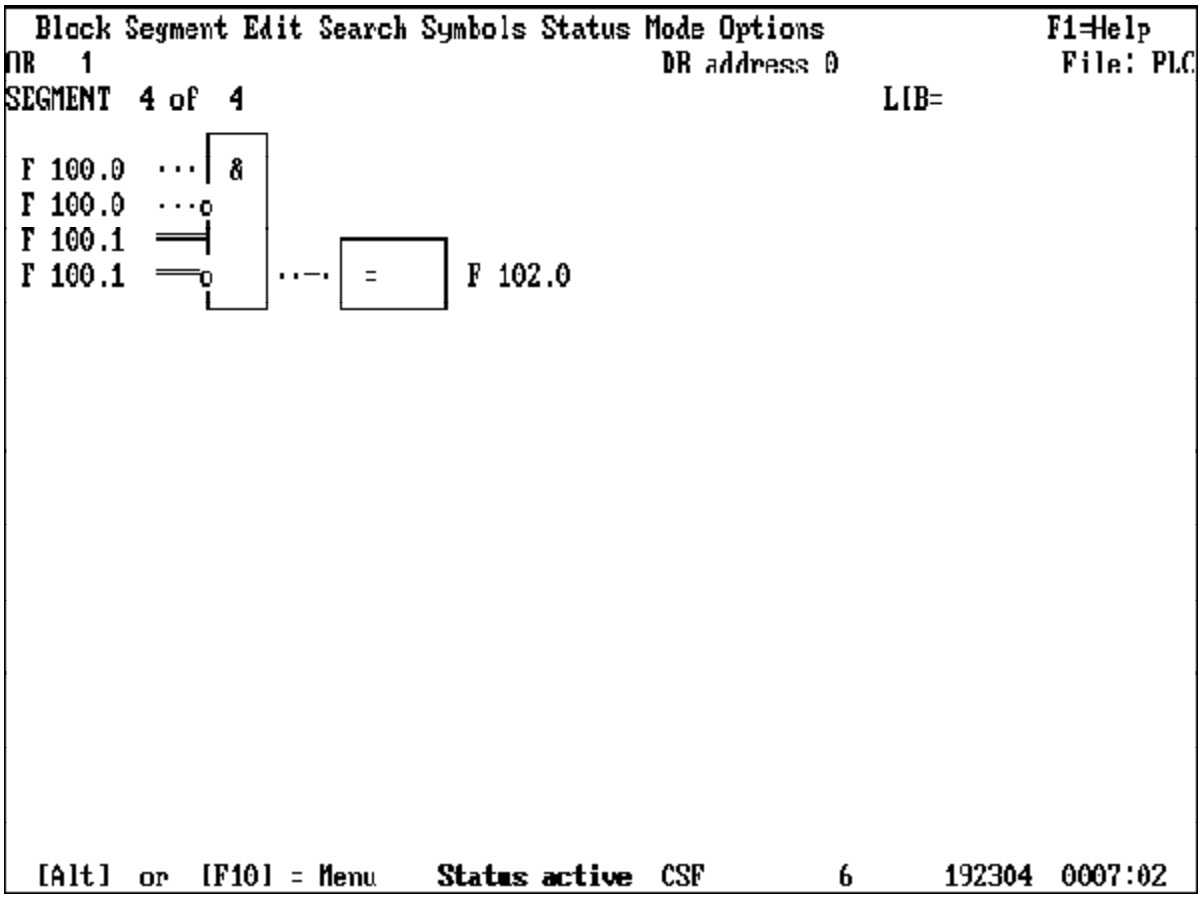

Fig. 11-15: Status blocks CSF: negated inputs

With output symbols in CSF, always the state of the operand is displayed which is not in all cases the same state as the RLO left from the symbol (e.g. with a Reset symbol).

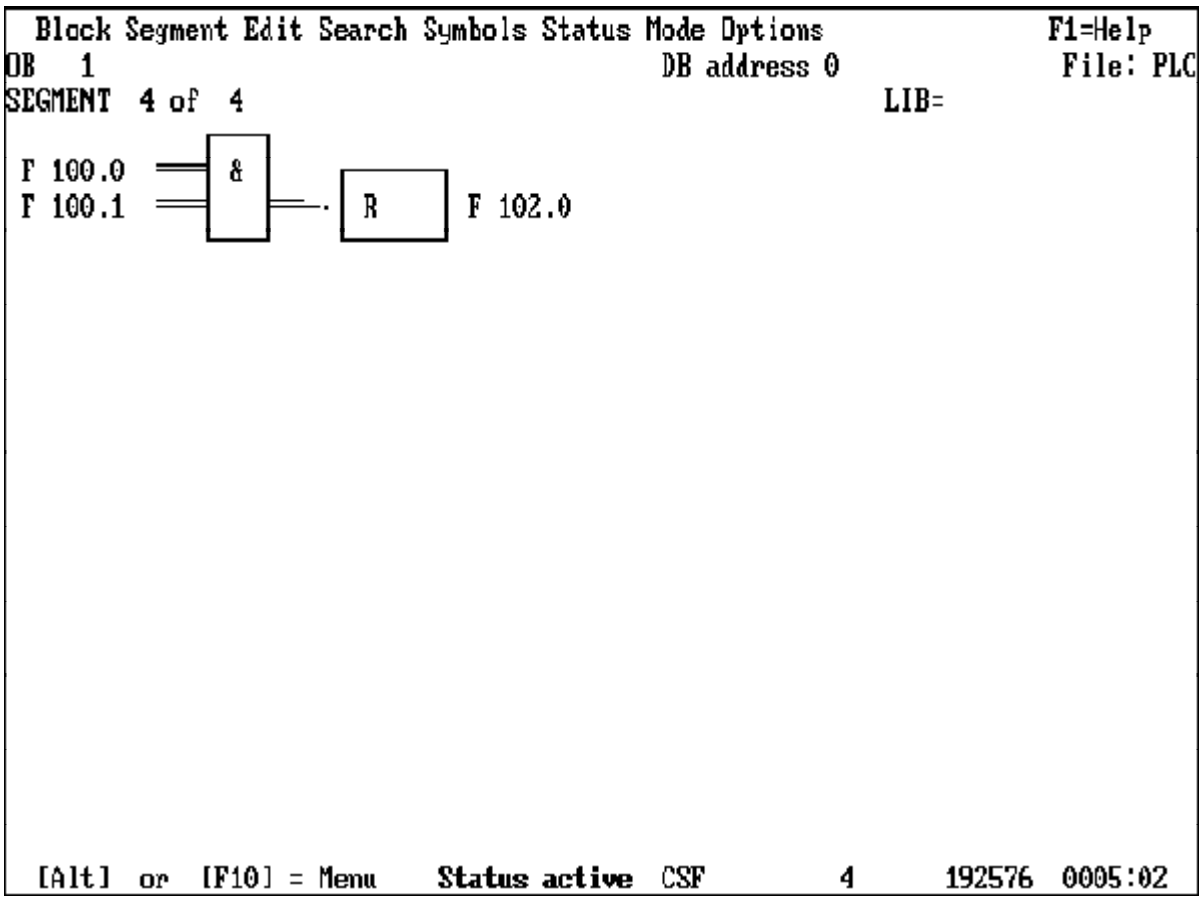

Fig. 11-16: Status blocks CSF: input symbols

With timers, the current timer value and the value to which the timer is to be set, are displayed in the bottom line of the screen (see next figure) if at least a part of the timer is visible on the screen.

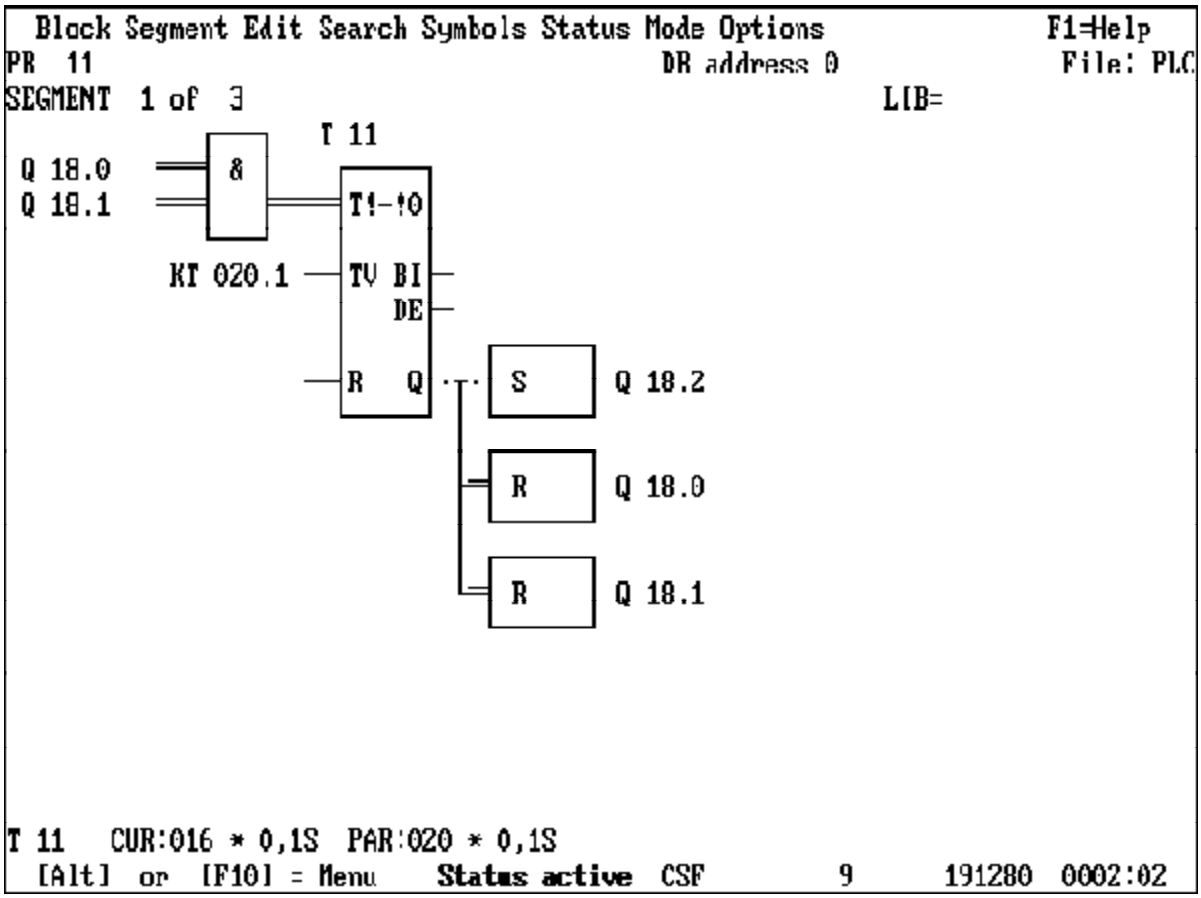

Fig. 11-17: Status blocks CSF: timer symbol

With counters, the current counter value and the value to which the counter is to be set, are displayed in the bottom line of the screen (see next figure) if at least a part of the counter is visible on the screen.

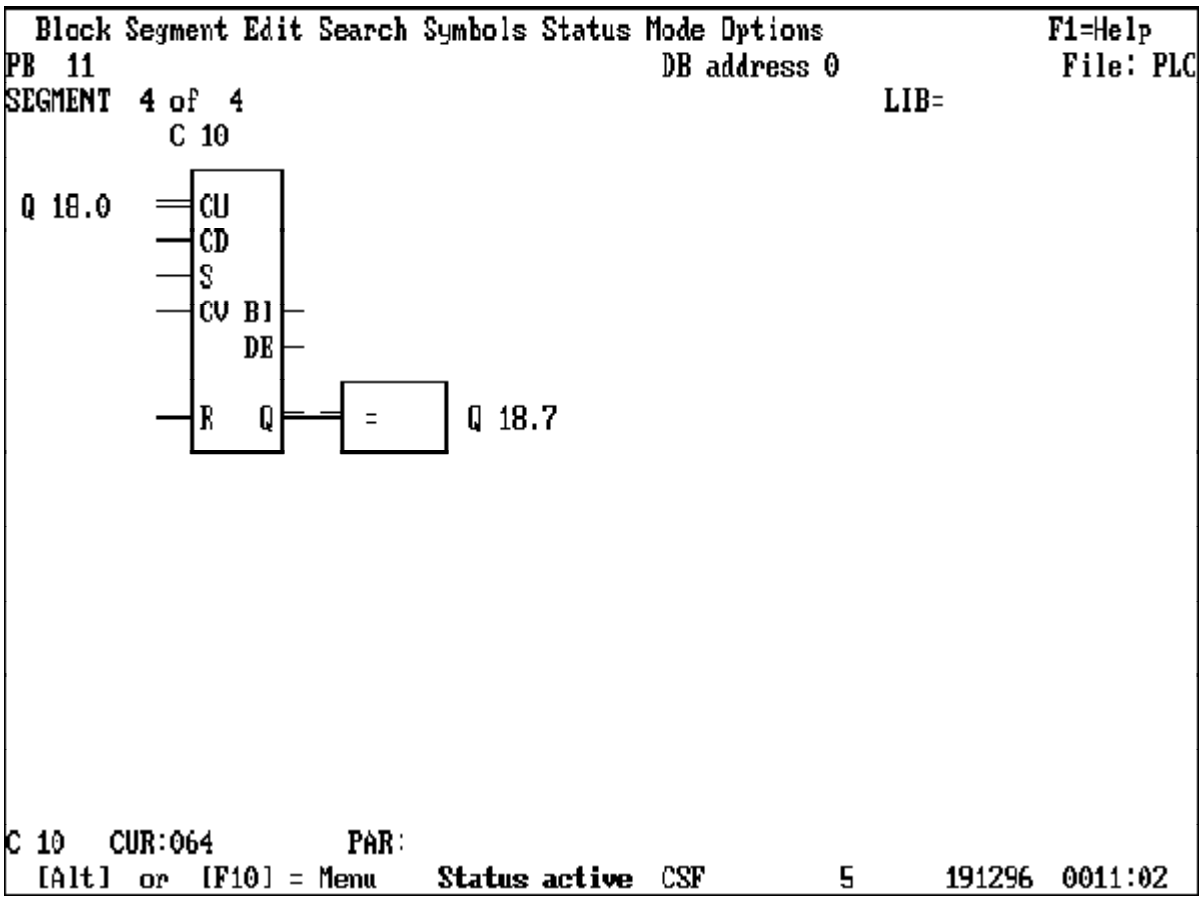

Fig. 11-18: Status blocks CSF: counter symbol

If several counters and timers exist in the segment and if they are visible, the corresponding number of lines at the bottom of the screen is used for this.

With FB calls, the values of the parameters left from the inputs resp. right from the outputs are displayed.

Symbols with digital inputs are displayed as follows: if the inputs of the symbols are activated by "real" operands (not by outputs of outputs), the values of the operands are displayed under the operands. With arithmetic and compare operations, the format specified within the symbol is used for displaying the operands (F/G/D meaning fixed-point, floating-point,

hexadecimal double word; in all other cases, the operand is displayed in hexadecimal form as a byte/ word/ double word, depending on the size of the operand).

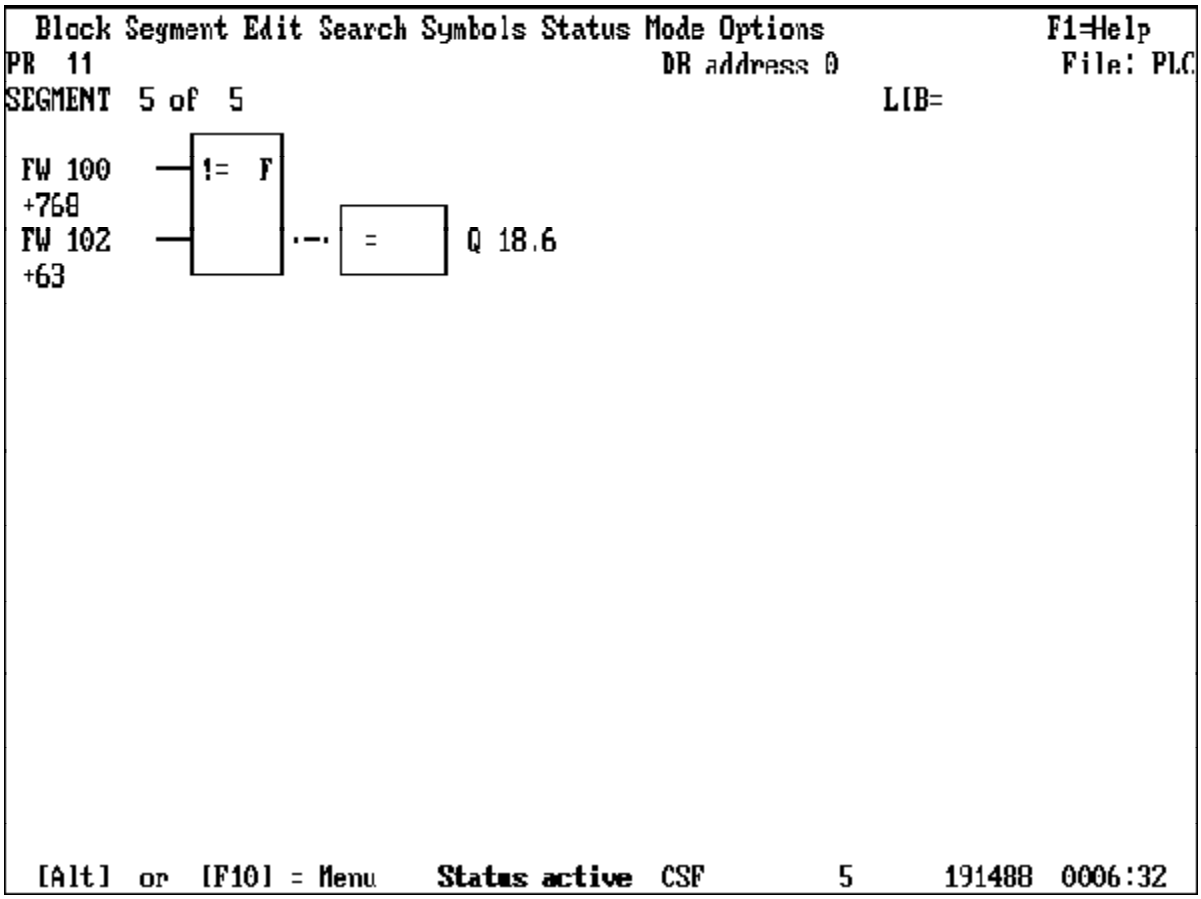

Fig. 11-19: Status blocks CSF: digital inputs

With (negating) paralleled intermediate flags, you have to consider that the RLO runs through the intermediate flags one after another. The RLO is inverted by a negating intermediate flag, of course. This happens invisible, however. You can only see the RLO before the top / first intermediate flag and after the bottom / last intermediate flag (see next figure).

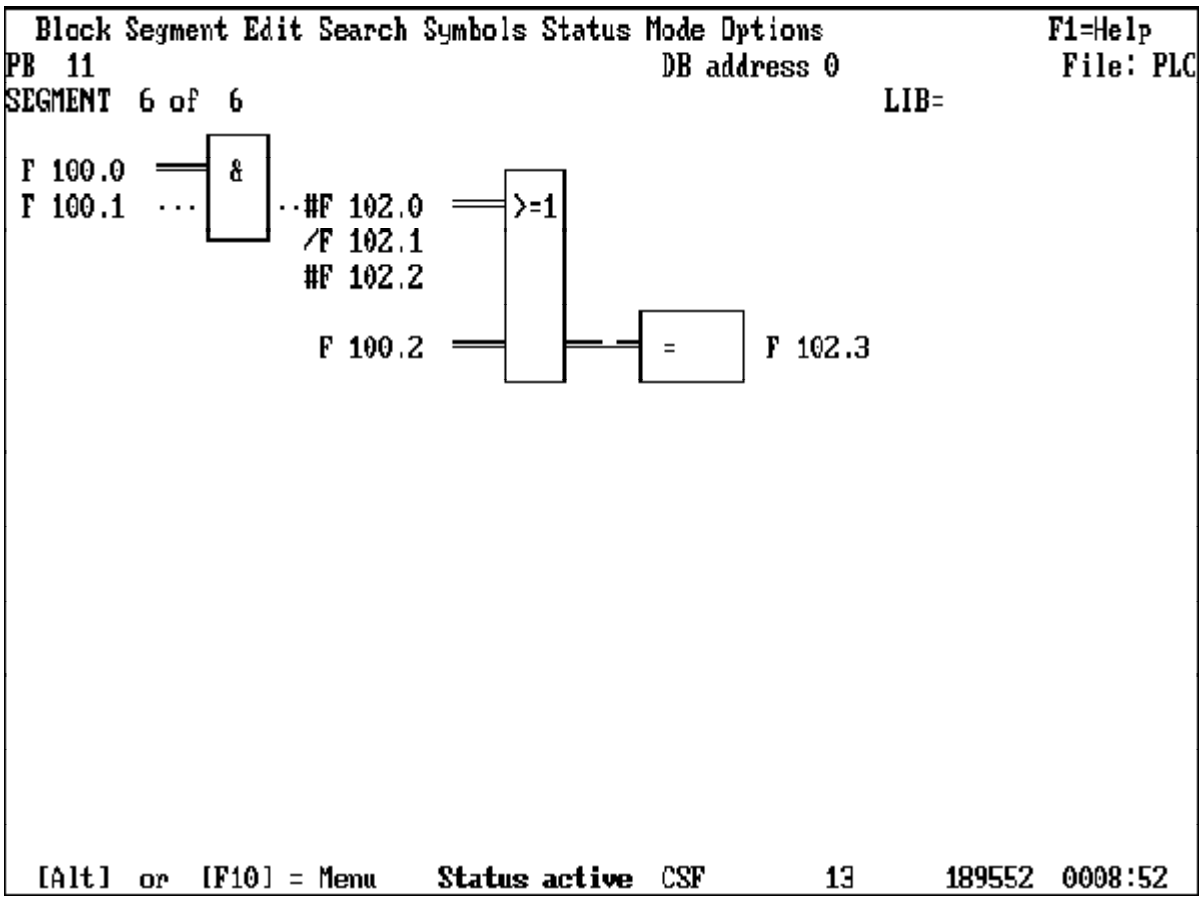

Fig. 11-20: Status blocks CSF: paralleled intermediate flags

11.7.2 Call stack

After selecting this menu command, the dialog box »Call stack« is displayed. You can specify a sequence of block calls. The status blocks display will be activated ONLY if the block being in the editor is called via exact this sequence of calls.

An example:

The block in the editor be the FB 10. The FB 10 be called from the OB 1 and from the PB 10. Let's specify the call sequence "PB 10". The status block display will show only those executions of the FB 10 which have been initiated from the PB 10.

This simplifies the debugging of complex applications.

11.7.3 Modify variable

The menu item »Modify variable« lets you inspect and edit the current value of an operand via a dialog box. Only word operands of type IW, QW, FW, RS, T and C are allowed.

11.7.4 Run PLC

The menu item »Run PLC« resp. the hot key Shift + F5 will execute a cold resp. a warm restart on the PLC. This operation is described in chapter 5.

11.7.5 Stop PLC

The menu item »Stop PLC« resp. the hot key Shift + F6 will set the PLC into the »Stop« mode. This operation is described in chapter 5.

11.7.6 Compress PLC

The menu item »Compress PLC« resp. the hot key Shift + F7 will compress the PLC memory. This operation is described in chapter 5.

11.8 Representation mode and symbolic editor

The menu »Mode« allows you to select another representation (programming) mode, if the current line and the current segment are syntactically correct, and if the current segment can be represented in the desired mode.

The menu »Mode« is shown in the next figure.

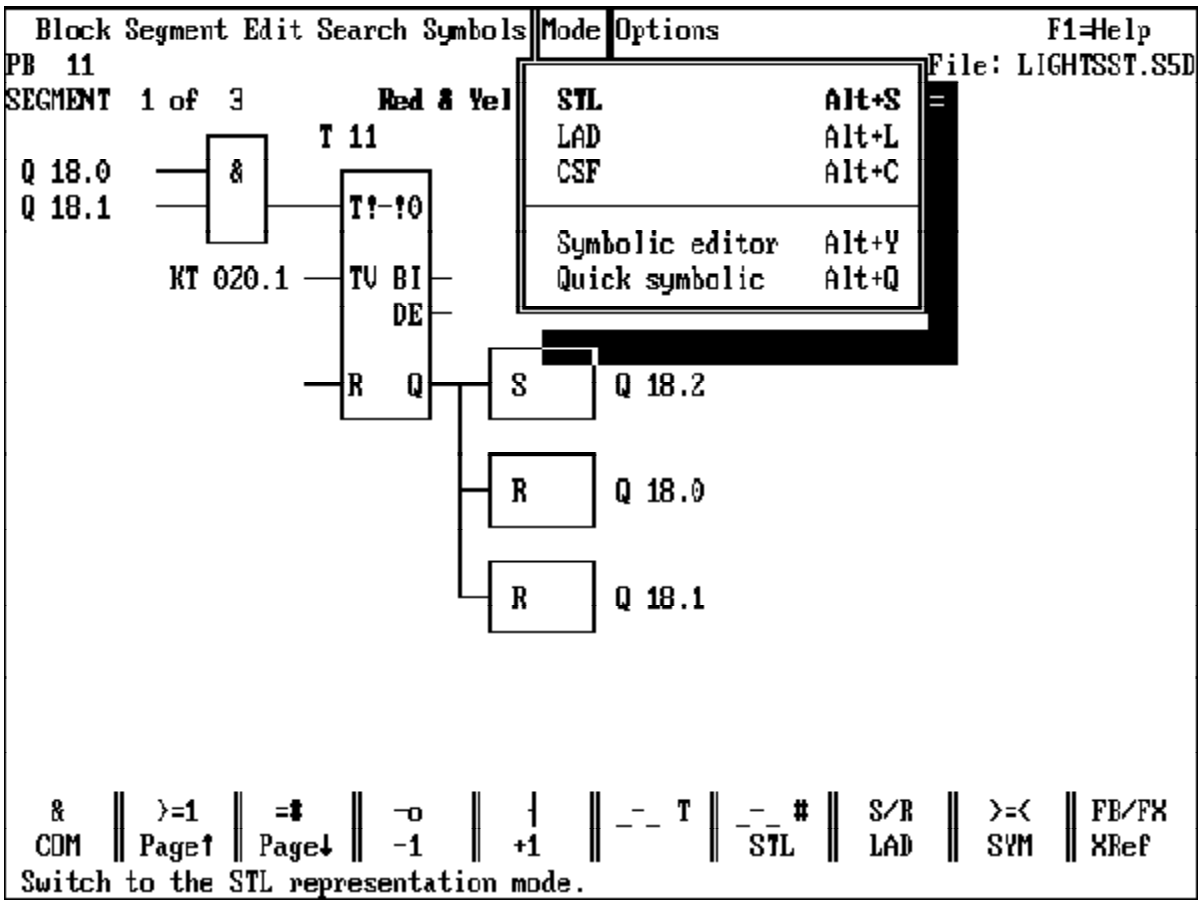

Fig. 11-21: The menu »Mode«.

You can switch into another mode only if all operands of the current segment have been specified.

11.8.1 Select the STL editor

After selecting the menu command »STL« resp. typing the hot key Alt + S resp. clicking on the toolbar symbol "STL", you will activate the STL (statement list) editor. This can always be done because each correct block is representable in STL mode.

Chapter 8 tells you everything about the STL editor.

11.8.2 Select the LAD editor

After selecting the menu command »LAD« resp. typing the hot key Alt + L resp. clicking on the toolbar symbol "LAD", you will activate the LAD (control system flowchart) editor. This cannot be done if the current segment is not representable in LAD mode.

Chapter 10 tells you everything about the LAD editor.

11.8.3 Select the CSF editor

The menu command »CSF« has no effect as you are already in the CSF editor.

11.8.4 Select the symbolic editor

After selecting the menu command »Symbolic editor« resp. typing the hot key Alt + Y resp. clicking on the toolbar symbol "SYM", you will activate the symbolic editor. If the current block has been changed since it was last saved, a dialog box with a corresponding message will appear. You can then decide whether to save the current block, or to cancel the operation.

Chapter 12 tells you everything about the symbolic editor.

11.8.5 Select the quick edit mode of the symbolic editor

After selecting the menu command »Quick symbolic« resp. typing the hot key Alt + Q, you will activate the quick edit mode of the symbolic editor. The quick mode differs from the standard mode in the following point: in the quick edit mode, ACCON-PG lists all operands referenced in the current segment. This allows you to assign operands to symbols very conveniently. The symbols file need not be loaded completely.

An operand for which a corresponding symbol has not yet been defined will be displayed without symbol resp. comment. To assign a symbol to such an operand, locate the cursor to the corresponding symbol field and enter the symbol name.

Chapter 12 tells you everything about the quick edit mode of the symbolic editor.

Chapter 12:

The Symbolic Editor

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12.1 The meaning of symbolic programming

The symbolic editor serves for creating and editing assignments of absolute operands (e.g. “Q 2.3”) to symbolic operands (e.g. “DOOR 1”).

If the symbolic mode is activated during programming and a symbols file has been selected, the symbolic operands contained from the symbols file will be displayed instead of their corresponding absolute operands, e.g.: “A -DOOR 1” instead of “A Q 2.3”. The hyphen designates a symbolic operand.

You can assign a comment of up to 40 characters to each symbolic assignment. This comment can be displayed in the STL editor instead of the STL comment. If ACCON-PG detects your video adapter to support a 132 column text mode, you will be able to display even both comments simultaneously on one screen. When doing so, you will be able to edit only the STL line comment but not the symbolic comment.

In the symbolic editor, you can enter an absolute operand into the left field titled “Operand”. The symbolic name to be assigned this operand can be entered into the corresponding input field “Symbol”.

Depending on the specified symbol length (see menu “Options”), the symbol may be up to either 8 or 24 characters long. If you want to symbolic programming in LAD mode or in CSF mode, you should set the symbol length to be <=8. This has the advantage that symbolic operands can be displayed directly in the operand field in the corresponding editor.

If the specified length is greater than 8, the operands will be displayed in the LAD/CSF editor only when the cursor is located on an operand field. The operand will then not be displayed in the operand field, but in the first line of the editor.

By selecting the menu command »Always show symbolic operands« of the menu "Settings", you can nevertheless display the first 8 characters of the symbolic name in the LAD/CSF mode. This makes sense only if the symbolic operands already differ from each other in the first 8 characters.

The operands will not be checked for validity resp. ambiguities until the symbols file is saved. If an error is found during saving, a window appears with the error descriptions. This error list can be accessed in the following by selecting the menu command »Show error list« in the menu »Edit«.

When entering absolute operands, you can use wildcards. Enter the character "?"; when leaving the current line, the line will be expanded. The wildcards will be replaced by valid characters. An example: enter "F 1.?" and press ↵; the line will be expanded. You will have 8 lines with the operands "F 1.0" up to "F 1.7".

There are two modes of the symbolic editor. The mode is determined by the way in which you call the symbolic editor. The standard mode is activated by calling the symbolic editor via the menu command or the toolbar symbol »SYM«. In this mode, all menu commands are available. The main disadvantage of the standard mode is that always the whole symbols file must be loaded.

The second mode of the symbolic editor is the quick edit mode. This mode can be activated only from the block editors (STL, LAD, CSF). Only the operands appearing in the current segment are listed, so you need not load the whole symbols file (which may be an SEQ text file, or a DT data base). Not all menu commands are available in this mode. The following figure shows the symbolic editor in the quick edit mode.

```
 File Edit TxtBlk Search Options                                    F1=Help
Quick Edit Mode                                                 File: LIGHTSZ0.DT
  Operand  Symbol                  Comment
> Q 18.2   green                   Output: green lights
> Q 18.0   red                     Output: red lights
> Q 18.1   yellow                  Output: yellow lights
  T 11

 [Alt]  or  [F10] = Menu   Over          SYM        5    18741276  0001:04
```

Fig. 12-1: The symbolic editor in quick edit mode

Assignments from the symbols file are displayed with a »>« in the first column. Absolute operands without a corresponding symbolic name are listed as well so that you can enter the symbolic assignment.

12.2 File operations

The menu »File« (shown in the figure below) of the symbolic editor enables you to create new symbols files, to load existing symbols files, to save or rename them, to convert them from and to the SEQ format, and to exit from the symbolic editor. If the quick edit mode of the symbolic editor is active, some of the menu commands for working with files are not accessible.

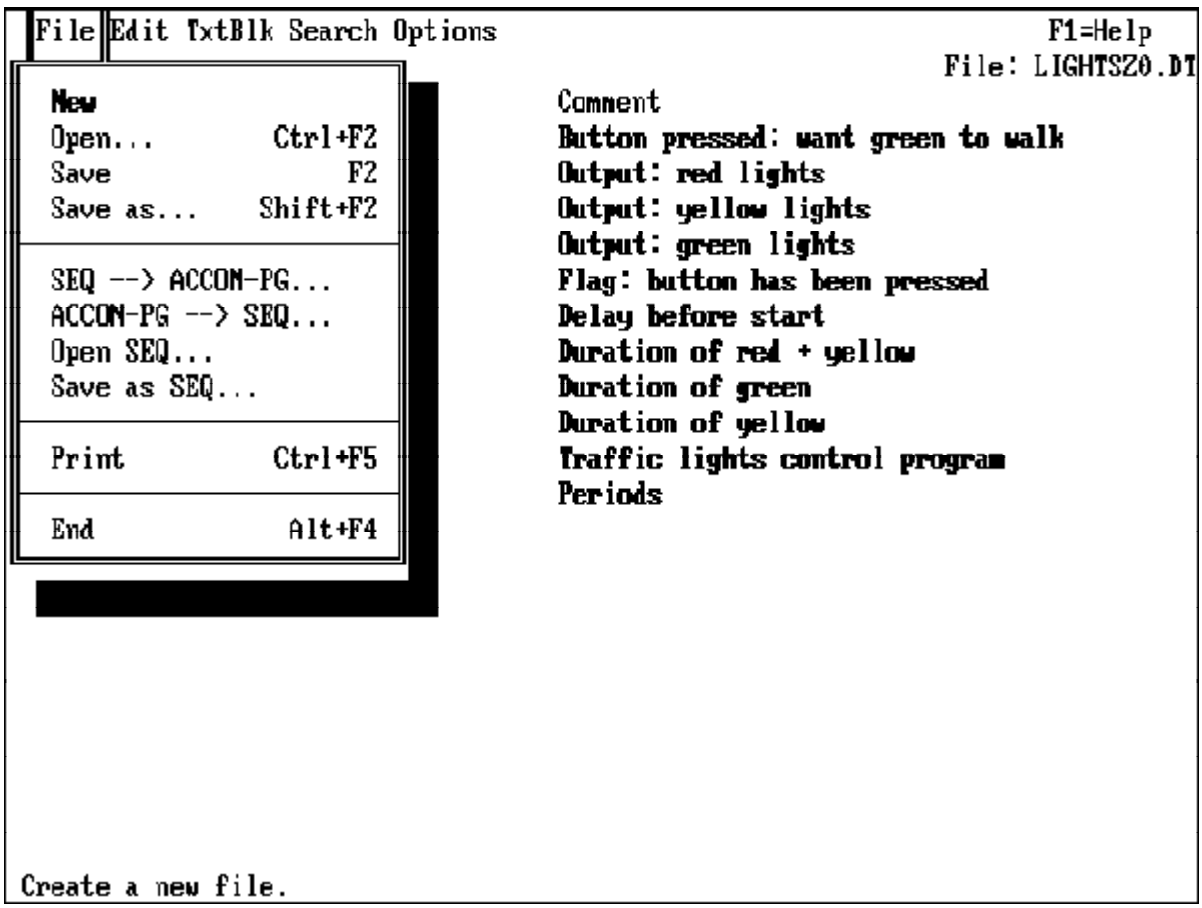

Fig. 12-2: The menu »File«.

12.2.1 Create a new file

When selecting the menu command »New«, the current symbols file (if existing) will be closed. If you have modified the file, you will be asked whether to save the changes or not. If the current file does not yet have a name, you will asked for its name.

If the symbolic editor has been empty, i.e. a file has not yet been loaded, and new entries do not exist, you will get no reaction on this menu command.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.2 Open a file

After selecting the menu command »Open« resp. typing the hot key Ctrl + F2, the file-selection dialog box »Open file« appears on the screen displaying all existing symbols files. If a symbols file has been in the editor before, it will be closed. If you have modified the file, you will be asked whether to save the changes or not.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.3 Save a file

You can save the file in the editor using the menu command »Save« resp. the hot key F2.

If the quick edit mode of the symbolic editor is active, the new resp. modified symbolic assignments will be appended to the file.

12.2.4 Save a file as

You can save the file in the editor under a new name using the menu command »Save as« resp. the hot key Shift + F2. The dialog box »Save file« appears in which you must specify the name of the file. If you specify the name of an already existing file, you will have to confirm your entry.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.5 Convert SEQ files into ACCON-PG symbols files

You can convert a SEQ symbols file (e.g., an original Siemens symbols file) into a symbols file in the ACCON-PG format, using the menu command »SEQ-->ACCON-PG...«. A dialog box appears in which you must specify the name of the SEQ file to be converted. Then, another dialog box appears in which you must specify the name of the ACCON-PG symbols file (the destination file). Finally, the conversion will be performed.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.6 Convert ACCON-PG symbols files into SEQ files

You can convert a symbols file in the ACCON-PG format into a SEQ symbols file, using the menu command »ACCON-PG-->SEQ...«. A dialog box appears in which you must specify the name of the ACCON-PG symbols file to be converted. Then, another dialog box appears in which you must specify the name of the SEQ file (the destination file). Finally, the conversion will be performed.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.7 Open a SEQ file

Using the menu command »Open SEQ«, you can read in a SEQ symbols file without converting it into the ACCON-PG symbols file format.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.8 Save a symbols file as a SEQ file

Using the menu command »Save as SEQ«, you can write a symbols file in the SEQ format without having to convert it first from the ACCON-PG symbols file format.

If the quick edit mode of the symbolic editor is active, this menu command is not accessible.

12.2.9 Print a file

You can print the symbols file in the editor using the menu command »Print« resp. the hot key Ctrl + F5. You can modify the printer settings and the formats used for printing by selecting the corresponding menu command in the menu »Options«.

If the quick edit mode of the symbolic editor is active, only that part of the symbols file which is in the editor is going to be printed.

12.2.10 End editing

You can leave the symbolics editor using the menu command »End« resp. the hot key Alt + F4. If the current file has been modified since it was last saved, a dialog box with a corresponding warning message will appear. You can now save the changes, or cancel the operation.

12.3 Edit symbolic assignments

The menu »Edit« of the symbolic editor (shown in fig. 12-2) contains numerous functions for editing symbols files. The menu commands are a subset of the equivalent commands of the STL editor.

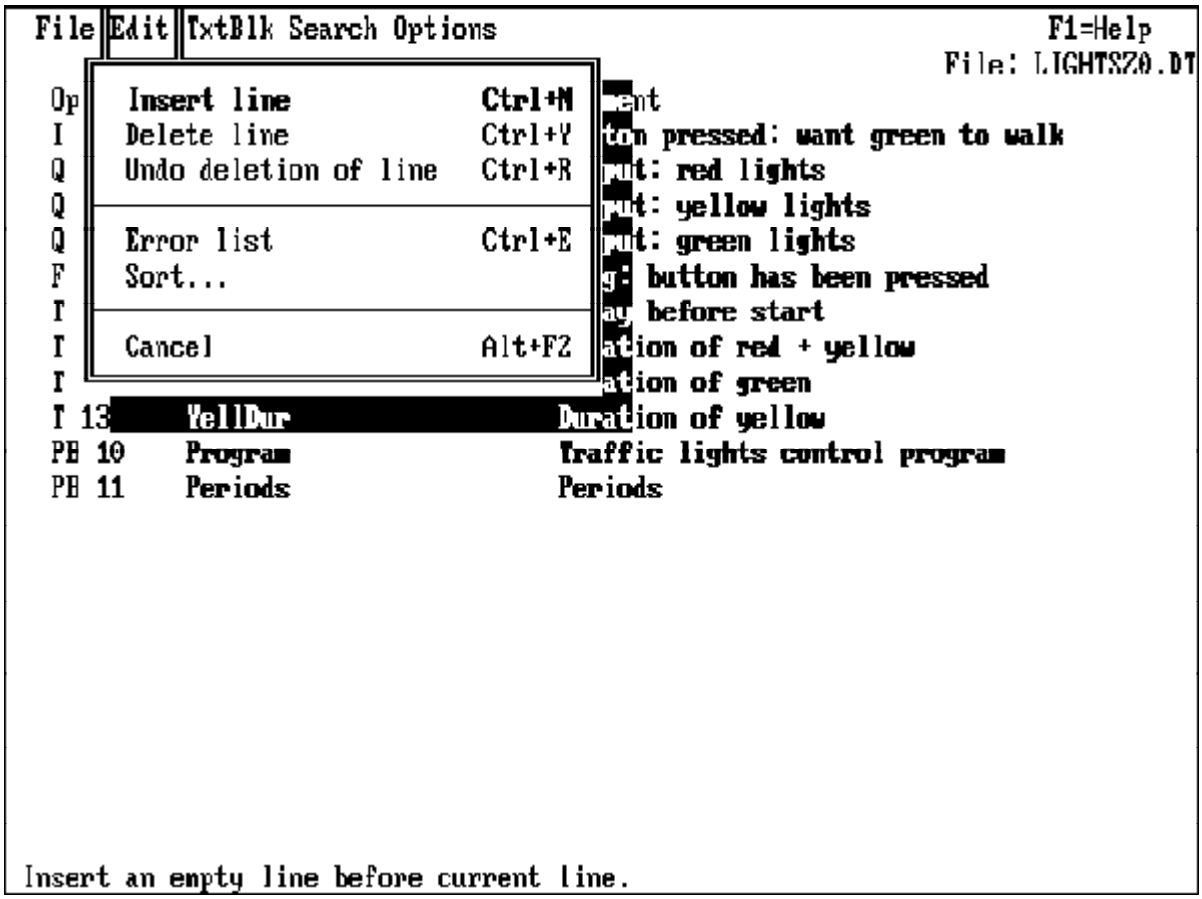

Fig. 12-3: The menu »Edit«.

12.3.1 Insert a line

The menu command »Insert line« can be used for inserting an empty line before the current line. The following lines are moved down one position.

You can also use the hot key Ctrl + N to insert lines.

12.3.2 Delete a line

Selecting the menu command »Delete line« causes the current line to be deleted. The following lines are moved up one position.

You can also use the hot key Ctrl + Y to delete lines.

12.3.3 Undo the deletion of a line

Selecting the menu command »Undo deletion of line« causes the last deleted line to be inserted before the current line. This command enables you to duplicate or move lines conveniently.

The hot key Ctrl + R has the same effect.

12.3.4 Show the error list

Selecting the menu command »Show error list« shows you a window with a list of the errors found during the last file save operation.

If no errors have been found, or you have not yet saved the file, nothing will be displayed.

The hot key Ctrl + E and the toolbar symbol »Error« have the same effect.

12.3.5 Sort symbolic assignments

Selecting the menu command »Sort...« lets you sort the symbols file either by the absolute operand, by the absolute operand plus address, or by the symbolic operand. The difference between sorting by the absolute operand and sorting by the absolute operand plus address is: if a symbols file contains the absolute operands IB 1, IB 2, IW1, I 1.1, I 1.2, I 2.0 and I 3.0, the result of the first kind of sort will be: I 1.1, I 1.2, I 2.0, I 3.0, IB 1, IB 2, IW 1; and the result of the second kind of sort will be: I 1.1, I 1.2, IB 1, IW 1, I 2.0, IB 2, I 3.0.

12.3.6 Cancel editing

Selecting the menu command »Cancel« resp. typing the hot key Alt + F2 lets you leave the editor without saving. You have to confirm your selection.

If you have called the (quick edit mode of the) symbolic editor from another editor, you will return to that editor. If you have called the symbolic editor from the main menu, all changes made since the last file saving operation will be lost, but you will still be in the symbolic editor.

12.4 Working with text blocks

The menu »TxtBlk« contains various functions for working with text blocks. The commands are identical with the corresponding commands of the STL editor. The functions can be called using WordStar block commands (Ctrl + K resp. Ctrl + Q plus another key identifying the command).

Note:

The commands contained in this menu refer to text blocks rather than STEP 5 blocks. It should be clear which type of blocks is referred to, even if we do not explicitly write "STEP 5 blocks / program blocks" or "text blocks".

The menu »TxtBlk« is shown is fig. 12-4.

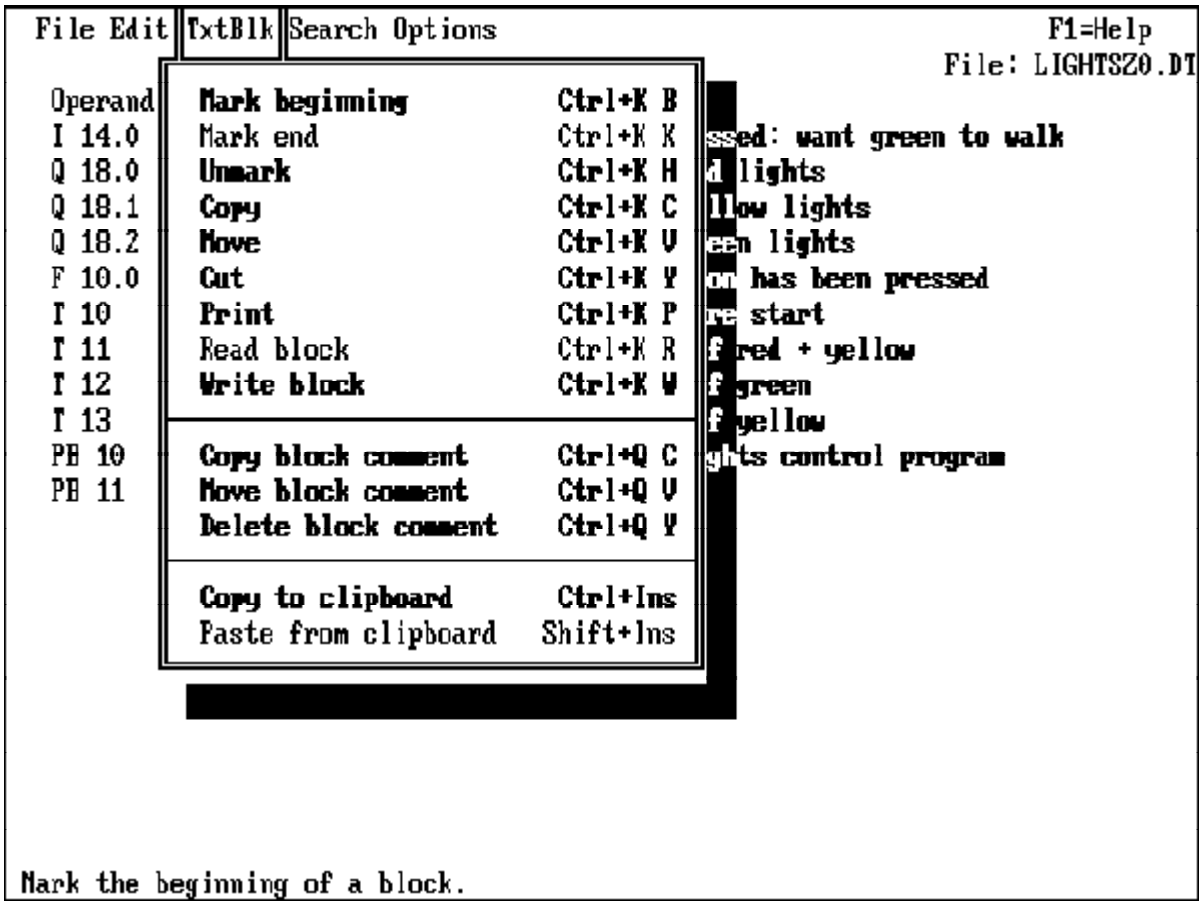

Fig. 12-4: The menu »TxtBlk«.

12.4.1 Mark the beginning of a block

Selecting the menu command »Mark beginning« resp. typing the hot key Ctrl + K, B lets you define the current line to be the beginning of a text block. A marked block is displayed using a special color, depending on the currently selected palette.

If the end of the block has not yet been specified or the specified end of the block is located before the beginning of the block, the end of the current segment resp. block resp. file is taken as the end of the block.

12.4.2 Mark the end of a block

Selecting the menu command »Mark end« resp. typing the hot key Ctrl + K, K lets you define the current line to be the end of a text block.

If the beginning of the block has not yet been specified or the specified beginning of the block is located behind the end of the block, the beginning of the current segment resp. block is taken as the beginning of the block.

12.4.3 Unmark blocks

Selecting the menu command »Unmark« resp. typing the hot key Ctrl + K, H causes the current block marks to be deleted.

12.4.4 Copy blocks

Selecting the menu command »Copy« resp. typing the hot key Ctrl + K, C causes a copy of the current block to be inserted before the current line. This can be done only if the current line is not a part of the marked block.

The marked block itself is not affected by the operation.

12.4.5 Move blocks

Selecting the menu command »Move« resp. typing the hot key Ctrl + K, V causes the marked block to be removed from its original position and to be inserted before the current line. This can be done only if the current line is not contained in the marked block.

12.4.6 Cut blocks

Selecting the menu command »Cut« resp. typing the hot key Ctrl + K, Y causes the marked block to be deleted without asking for confirmation.

The last cut block is contained in the clipboard. By selecting the menu command »Paste from clipboard«, this block can be re-inserted.

12.4.7 Print blocks

Selecting the menu command »Print« resp. typing the hot key Ctrl + K, P causes the marked block to be printed.

You can modify the formats used for printing using the menu command »Printing formats...« in the menu »Options«.

12.4.8 Read blocks from file

Selecting the menu command »Read« resp. typing the hot key Ctrl + K, R causes a block to be inserted at the current cursor position. This block is another symbols file in the SEQ format, which has been created using the menu command »Write block«. The inserted block is marked after the operation.

This is a comfortable method for merging two symbols files.

12.4.9 Write block to file

Selecting the menu command »Write block« resp. typing the hot key Ctrl + K, W causes the marked block to be written to a file in the SEQ format. The block can then be inserted into another symbols file.

12.4.10 Copy block comment

Selecting the menu command »Copy block comment« resp. typing the hot key Ctrl + Q, C causes the comment part of the current block to be inserted at the current position. The old comment at this position will be overwritten without warning.

12.4.11 Move block comment

Selecting the menu command »Move block comment« resp. typing the hot key Ctrl + Q, V causes the comment part of the marked block to be removed from its original position and to be inserted at the position. The old comment at this position will be overwritten without warning.

12.4.12 Delete block comment

Selecting the menu command »Delete block comment« resp. typing the hot key Ctrl + Q, Y causes the comment part of the marked block to be deleted without asking for confirmation.

The last cut block is contained in the clipboard. By selecting the menu command »Paste from clipboard«, this block can be re-inserted.

12.4.13 Copy a block to the clipboard

Selecting the menu command »Copy to clipboard« resp. typing the hot key Ctrl + Ins lets you copy the marked block to the clipboard. The block contained in the clipboard can be inserted anywhere into the text (or into another symbols file) at any time. The contents of the clipboard remain unchanged until you copy another block to the clipboard (using either the command »Copy to clipboard« or the command »Cut«), or until you return to the main menu.

12.4.14 Paste a block from the clipboard

Selecting the menu command »Paste from clipboard« resp. typing the hot key Shift + Ins lets you insert the block contained in the clipboard at the current cursor position. The contents of the clipboard remain unchanged and can therefore be inserted many times at different positions in the text. This menu command is available only if a block has been copied into the clipboard before.

12.5 Search/Replace text and goto

The menu »Search« contains functions for searching and replacing parts of the program text, and for positioning the cursor on a specific location within the text. The menu commands are a subset of the equivalent commands of the STL editor. Note that you can mark up to 10 locations in the text using the hotkeys Ctrl + K, 0 … 9, and jump to any of these locations using the hotkeys Ctrl + Q, 0 … 9.

The following figure shows the menu »Search«.

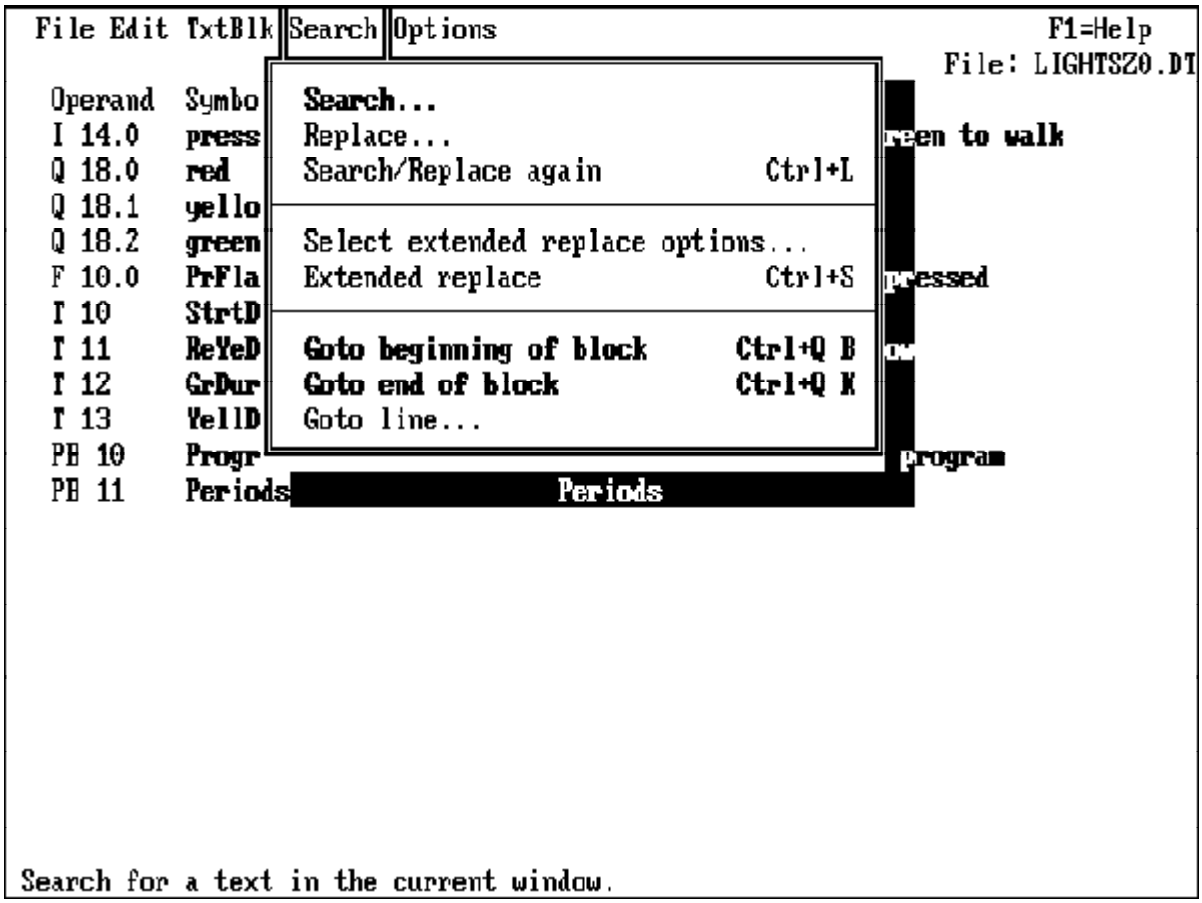

Fig. 12-5: The menu »Search«.

12.5.1 Search for a string

After selecting the menu command »Search...«, the dialog box »Search text« will be opened. The search string has to be specified in the text input field »Find«.

The search options you can specify are the same as in the STL editor.

12.5.2 Search for and replace a text string

After selecting the menu command »Replace...«, the dialog box »Replace text« will be opened. The search string has to be specified in the text input field »Find«. The replace string has to be specified in the text input field »New text«.

The search options you can specify are the same as in the STL editor.

12.5.3 Search / Replace again

The menu command »Search / Replace again« resp. the hot key Ctrl + L lets you search for resp. replace the next occurence of the specified search string. Which action will be carried out, depends on the last action. The same options are used for the search process.

If a search string has not yet been specified, the dialog box »Search text« appears.

12.5.4 Search for symbolic assignment

The menu command »Search for assignment« is available only in the quick edit mode of the symbolic editor and serves for loading a symbolic assignment from the symbols file. The absolute of the symbolic operand of the current line will be taken as the search string, depending on the current settings.

You should make use of this menu command, when you want to define a new operand in the quick edit mode of the symbolic editor and you are not sure about whether this operand has already a symbolic name or not. If the absolute operand does already have a symbolic name, you will be asked whether to include it into the quick edit mode (so you would be able to edit it).

12.5.5 Set options for Extended Replace operation

Use this menu command to specify the options for the "extended replace" operation. This includes the text file with the search and replace texts, the area of the text to be searched and the interpretation of the search text.

Extended replace means that several texts are replaced by some other texts simultaneously. The search and replace texts are contained in a control file in ASCII text format. The structure of such a file must be as follows:

- Each line contains a search text and the corresponding replace text separated by a tabulator (TAB character)..
- The search text starts with the beginning of the line and ends with the tabulator.
- The replace text starts directly after the tabulator and ends with the end of the line.
- Both texts must not be longer than 20 characters, extra characters will be ignored.

12.5.6 Extended Replace operation

Use this menu command resp. type the hotkey Ctrl + S to execute the "extended replace" operation. See the menu command above for details.

12.5.7 Goto the beginning of a block

When selecting the menu command »Goto beginning of block« resp. typing the hot key Ctrl + Q, B, the cursor will be located on the first line of the marked block. If there is no marked block, the menu command is not accessible.

12.5.8 Goto the end of a block

When selecting the menu command »Goto end of block« resp. typing the hot key Ctrl + Q, K, the cursor will be located on the last line of the marked block. If there is no marked block, the menu command is not accessible.

12.5.9 Goto line

When selecting the menu command »Goto line«, a dialog box will appear in which you can enter the number of the line to go to. If the specified line number is greater than the number of existing lines, the cursor is going to be locate on the last line of the text.

12.6 Options

The menu »Options« serves for modifying the settings which determine the appearance and the behaviour of ACCON-PG, including:

- symbol length
- printing formats
- various other settings
- cursor type
- video mode.

The menu »Options« is shown in the following figure.

```
File Edit TxtBlk Search Options                                  F1=Help
                                                          File: LIGHTSZ0.DT
 Operand  Symbol        ✓ Symbol length ≤ 8
 I 14.0   press                                   sed: want green to walk
 Q 18.0   red             Printing formats...      lights
 Q 18.1   yellow          Settings...              low lights
 Q 18.2   green           Video mode...            en lights
 F 10.0   PrFlag                                   n has been pressed
 T 10     StrtDely                  Delay before start
 T 11     ReYeDur                   Duration of red + yellow
 T 12     GrDur                     Duration of green
 T 13     YellDur                   Duration of yellow
 PB 10    Program                   Traffic lights control program
 PB 11    Periods                   Periods

Toggles between symbol length ≤ 8 and > 8.
```

Fig. 12-6: The menu »Options« of the symbolics editor.

12.6.1 Short symbols

The menu command »Symbol length <=8« lets you specify the maximum length of symbolic operands. You can choose between a maximum length of 8 or of 24 characters. If the currently set length is 8, the menu command is ticked; otherwise it is ticked off.

A symbolic name which is not longer than 8 characters can be displayed directly instead of the absolute operand in the CSF resp. LAD editor. If the symbol length is currently set to 24, these names will be displayed in the first line of the editor when the cursor is located on an operand field.

You can change the symbol length of a symbols file from 8 to 24 characters without problems. The way back is not that easy, of course. You will get a warning message if there are symbol names longer than 8 characters. You can shorten such names when confirming the warning message.

This menu command is not available in the quick edit mode of the symbolic editor.

12.6.2 Printing formats

Selecting the menu command »Printing formats« causes the dialog box »Printing format« to appear where you can specify all the options concerning the printing of symbols files (and some further options without any influence). You can load a printer configuration file by clicking on the push button »Printer...« if necessary. In the following dialog box »Printer configuration« you can specify the page width, the printer port, the character set, escape sequences etc.

See 6.11 for more details.

12.6.3 Settings

Selecting the menu command »Settings...« causes a dialog box to be opened which is described in chapter 6.7.

12.6.4 Select a video mode

Selecting the menu command »Video mode...« lets you switch to another video mode supported by the video adapter installed in your computer. ACCON-PG supports the extended video modes available on SVGA adapters.

In a higher-resolution mode, you will probably get problems with the mouse cursor being displayed incorrectly. You can solve this problem by replacing your out-dated mouse driver, or by switching the mouse cursor off (using the menu command »Settings«).

12.7 The menu »Help«

The menu »F1=Help« shown in the figure below gives you some general information on the symbolic editor.

```
File Edit TxtBlk Search Options                                  F1=Help
                                                                          DI
                                                   Keyboard
 Operand  Symbol                  Comment
 I 14.0   press                   Button pres      General information
 Q 18.0   red                     Output: red      Program information
 Q 18.1   yellow                  Output: yel
 Q 18.2   green                   Output: gre
 F 10.0   PrFlag                  Flag: button has been pressed
 T 10     StrtDely                Delay before start
 T 11     ReYeDur                 Duration of red + yellow
 T 12     GrDur                   Duration of green
 T 13     YellDur                 Duration of yellow
 PB 10    Program                 Traffic lights control program
 PB 11    Periods                 Periods

Display keyboard of the editor.
```

Fig. 12-7: The menu »Help«.

12.7.1 The keyboard layout of the symbolic editor

Use the menu command »Symbolic editor keyboard layout« to display a list of all the (hot) keys used with the symbolic editor.

Chapter 13:

Program Documentation

Overview

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You have the following possibilities of creating program documentation in ACCON-PG: STL line comments, symbolic operands, segment comments and plant comments.

The segment comments are loaded together with the program file and can be edited by selecting the menu command »Segment comment« in the menu »Edit« resp. (if the tool bar is selected) clicking with the mouse on the symbol »COM«. The segment comments are stored in a separate block with a name of its own. This name has the format »xxDO.yyy«, where "xx" designates the type of the block to which the segment comment belongs. The block number is given with "yyy" (zero-padded if necessary). An example: the Siemens standard name of the block corresponding with the PB1 is PBDO.001.

Plant comments are stored in a file with an arbitrary name of up to 8 characters. To edit the plant comment, select the desired block using the menu command »Edit« in the menu »Block« of the directory. A new block can be created in the directory by selecting the menu command »New« in the menu »Block«. You have to enter a name starting with the character "#".

13.1 Segment comments

The segment comment editor is described in this section.

```
  Edit TxtBlk Search                                                F1=Help
OB   1 -Cycle                                              File: LIGHTSST.S5D
$1    0↑
Traffic light control↑
==================↑
↑
This program implements a simple traffic light control.↑
In the initial state, the RED lights are on. When a button is pressed, the↑
program cycle starts. After a short delay, the RED and YELLOW↑
lights are turned on; in the following state, the GREEN lights are turned on,↑
then the YELLOW and finally the RED lights again.↑
The state transitions are controlled by timers.↑
↑
Used operands:↑
Inputs  :  I 14.0↑
Outputs :  Q 18.0↑
           Q 18.1↑
           Q 18.2↑
Flags :    F 10.0↑
Timers:    T 10↑
           T 11↑
           T 12↑
           T 13↑
|
  [Alt]  or  [F10] = Menu   Ins            DOC       593   17677980  0002:01
```

Fig. 13-1: The segment comment editor.

13.1.1 Edit

The menu »Edit« shown in the next figure contains the functions for editing a segment comment.

```
Edit TxtBlk Search                                          F1=Help
                                                   File: LIGHTSST.SSD
  Delete line        Ctrl+Y
  Delete paragraph   Ctrl+A

  Cancel             Alt+F2
  Exit               Alt+F4   le traffic light control.↑
                              lights are on. When a button is pressed, the↑
program cycle starts. After a short delay, the RED and YELLOW↑
lights are turned on: in the following state, the GREEN lights are turned on,↑
then the YELLOW and finally the RED lights again.↑
The state transitions are controlled by timers.↑
↑
Used operands:↑
Inputs  :  I 14.0↑
Outputs :  Q 18.0↑
           Q 18.1↑
           Q 18.2↑
Flags :    F 10.0↑
Timers:    T 10↑
           T 11↑
           T 12↑
           T 13↑
Delete current line.
```

Fig. 13-2: The menu »Edit«.

13.1.1.1 Delete a line

You can delete the current line by selecting the menu command »Delete line« resp. typing the hot key [Ctrl] + [Y].

13.1.1.2 Delete a paragraph

You can delete the current paragraph by selecting the menu command »Delete paragraph« resp. typing the hot key [Ctrl] + [A].

13.1.1.3 Cancel editing

You can quit the segment comment editor by selecting the menu command »Cancel« resp. typing the hot key Alt + F2. All changes made since calling the editor will be lost after confirming the cancel operation.

13.1.1.4 End the segment comment editor

Selecting the menu command »End« resp. typing the hot key Alt + F4 lets you save the changes and leave the segment comment editor.

13.1.2 Block operations

The menu »TxtBlk« shown in the next figure contains the functions for working with text blocks. The only difference between the block operations in the segment comment editor and the (text) block operations of the STL editor is that blocks need not start resp. end with the beginning resp. end of a line.

See chapter 8 for more details.

13.1.3 Search operations

The menu »Search« shown in the next figure contains the search operations known from the STL editor.

See chapter 8 for more details.

13.2 Plant comments

The DOC block editor is described in this section.

```
 File Edit TxtBlk Search                                          F1=Help
Block:    AMPEL                                          File: LIGHTSST.S5D
Projectno.: 1234-5678-901↑
Date:       09-30-1994↑
Author:     Kurt Bachmann↑
↑
Version:↑
↑
07-18-1994↑
created↑
↑
09-30-1994↑
modified, KB↑
|

 [Alt]  or  [F10] = Menu   Ins            DOC       130   17743516  0001:01
```

Fig. 13-3: The DOC block editor.

13.2.1 File operations

The menu »File« shown in the below figure provides for the following file operations:

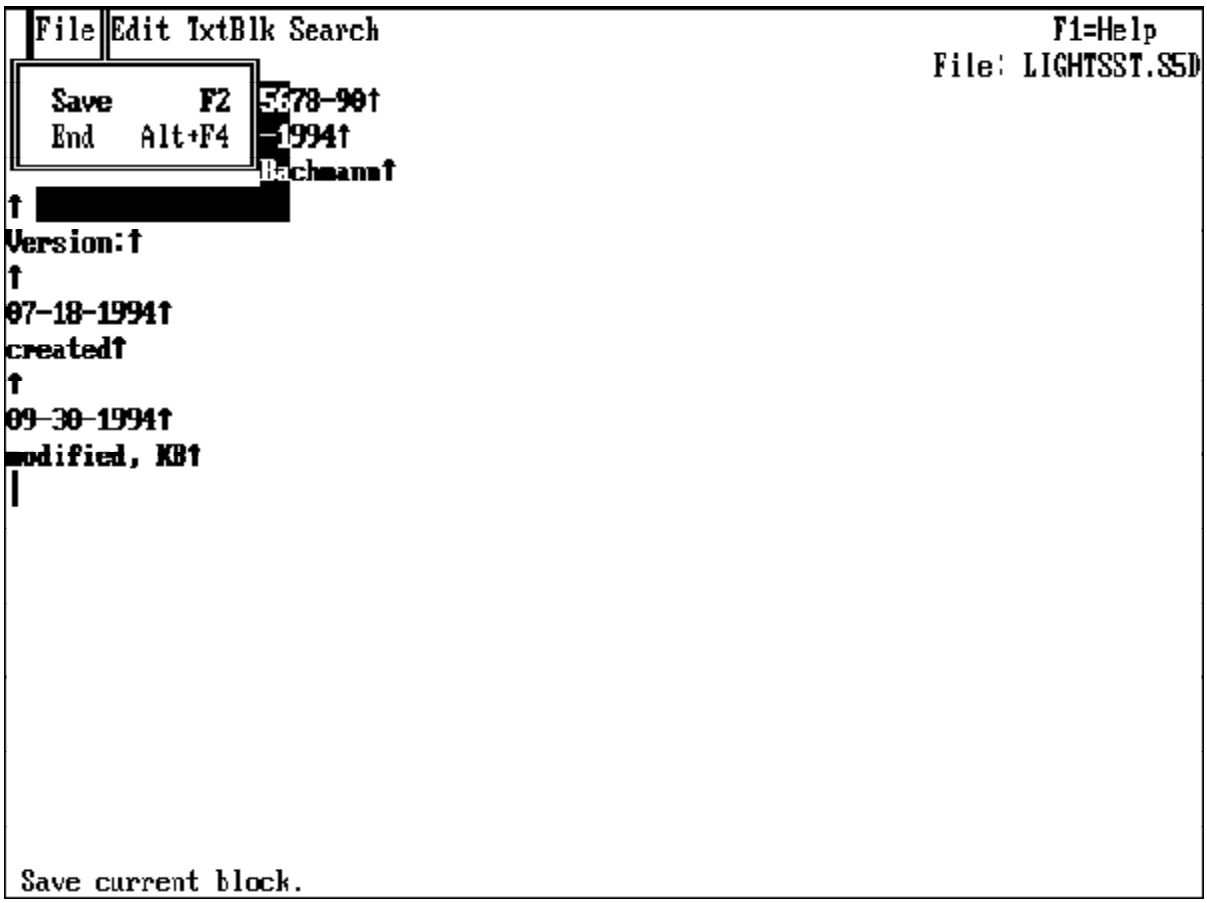

Fig. 13-4: The menu »File«.

13.2.1.1 Save a DOC block

The current DOC block can be saved by selecting the menu command »Save« resp. typing the hot key F2.

13.2.1.2 End editing DOC blocks

Selecting the menu command »End« resp. typing the hot key Alt + F4 lets you exit from editing the current block. If this block has been changed since it was last saved you will get a warning message, so you can save the changes or cancel the operation.

13.2.2 Edit

The menu »Edit« shown in the next figure contains the functions for editing a plant comment.

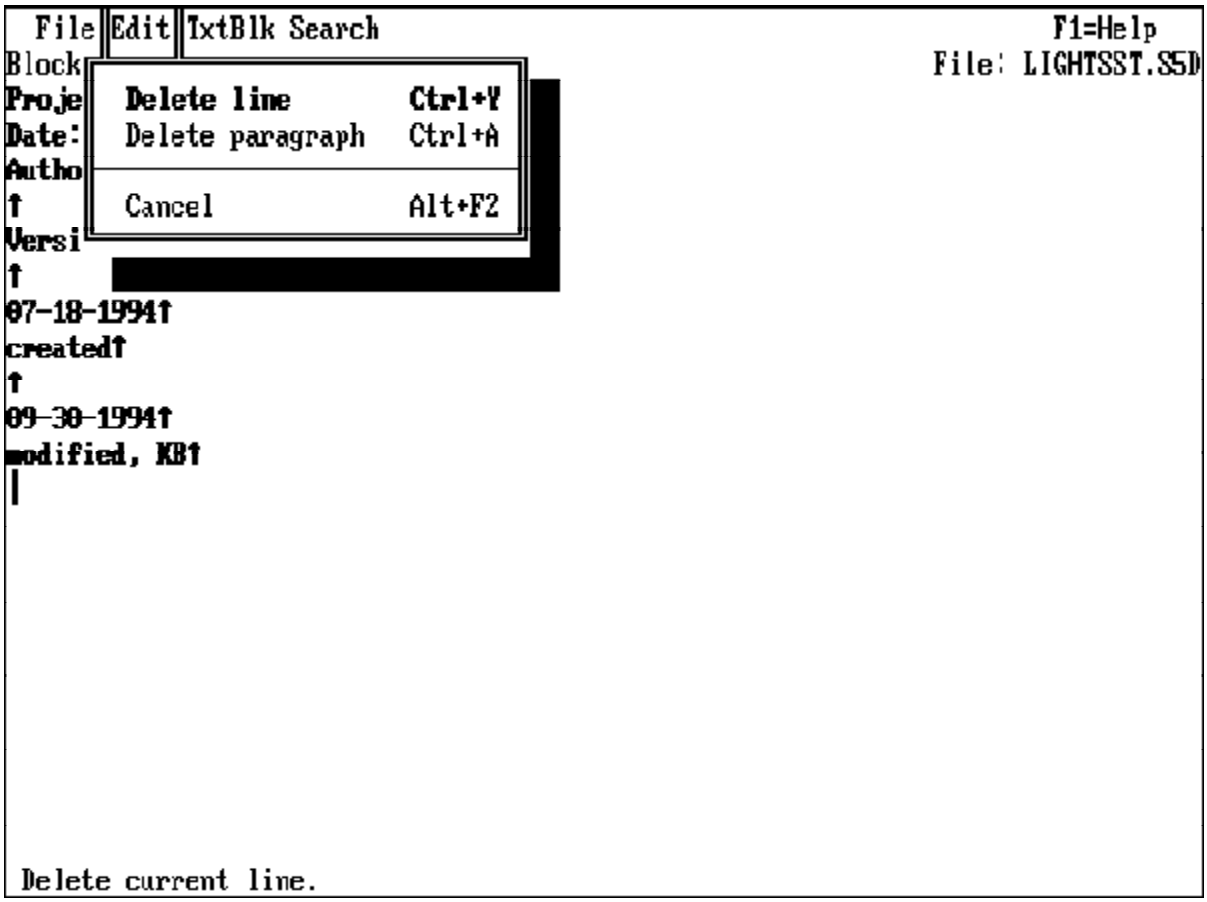

Fig. 13-5: The menu »Edit«.

13.2.2.1 Delete a line

You can delete the current line by selecting the menu command »Delete line« resp. typing the hot key Ctrl + Y.

13.2.2.2 Delete a paragraph

You can delete the current paragraph by selecting the menu command »Delete paragraph« resp. typing the hot key Ctrl + A.

13.2.2 Block operations

The menu »TxtBlk« shown in the next figure contains the functions for working with text blocks. The only difference between the block operations in the segment comment editor and the (text) block operations of the STL editor is that blocks need not start resp. end with the beginning resp. end of a line.

See chapter 8 for more details.

13.2.3 Search operations

The menu »Search« shown in the next figure contains the search operations known from the STL editor.

See chapter 8 for more details.

Chapter 14:

The Footer Editor

Overview

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In the dialog box »Printing formats«, you can specify whether a footer is to be printed at the bottom of each page. You can configure this footer so that it shows teh project title etc. The footer can be edited using the editor described in this chapter (see fig. 14-1).

When creating a new footer, it will be initialized with the contents of one of the two default footers »DEFAULF1.INI« resp. »DEFAULF2.INI« (depending on the width of the footer). By modifying these default footers, you can create your own standard footers which will be used as a starting point (template) when creating a new footer for a new project. If the default footers cannot be found, ACCON-PG uses an internal default footer that cannot be changed.

If you are using an educational license of ACCON-PG, you cannot modify the footer (even if you selected another footer file). There is only one field of the footer which is taken from the selected footer file that can be used for your specific purposes. This field is located at the bottom left corner.

```
 File Edit Options                                                F1=Help
80 character footer file   : LIGHTSF1.IN1

 A C C O N - P G

 Job identifier:    1234-5678-90        Date:          30.09.1994
 Plant:             08/15               Modification:                  PAGE
 Plant pos. number: Crssg. E27/K2531    Name:          Kurt Bachmann

 [Alt]  or  [F10] = Menu   Over
```

Fig. 14-1: The footer editor.

14.1 File operations

The menu »File« (see fig. 14-2) contains the file operations.

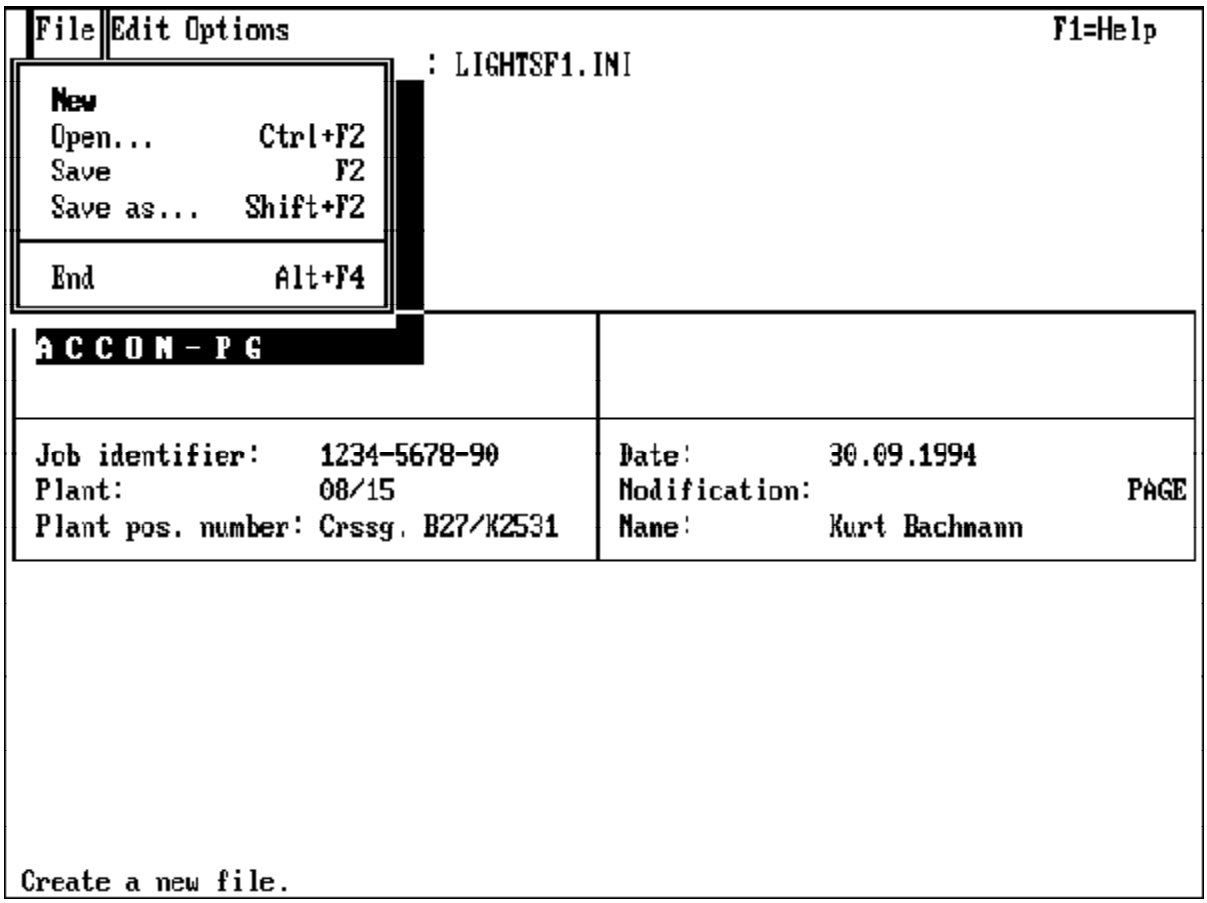

Fig. 14-2: The menu »File«.

14.1.1 New

You can create a new footer file using the menu command »New«. A file-selection dialog box appears where you can enter the name of the file to be created. Then, you will have to specify the footer width (80 or 132 columns). If another footer has already been loaded into the editor and changes have been made, you will first be asked whether to save the changes.

14.1.2 Open

You can load a footer file using the menu command »Open« resp. typing the hot key Ctrl + F2. A file-selection dialog box appears from which you can select a "*.INI" file. If another footer has already been loaded into the editor and changes have been made, you will first be asked whether to save the changes.

14.1.3 Save

The current footer can be saved using the menu command »Save« resp. typing the hot key F2.

14.1.4 Save as

The current footer can be saved to a new file using the menu command »Save as« resp. typing the hot key Shift + F2. A file-selection dialog box appears from which you can select a "*.INI" file.

14.1.5 End the footer editor

Selecting the menu command »End« resp. typing the hot key Alt + F4 lets you exit from editing the current footer. If the footer has been changed since it was last saved you will get a warning message. You can then save the changes or cancel the operation. When confirming your selection, you will be asked whether to use the edited footer for the printing jobs to follow.

14.2 Edit

The menu »Edit« shown in the next figure contains the functions for editing a footer.

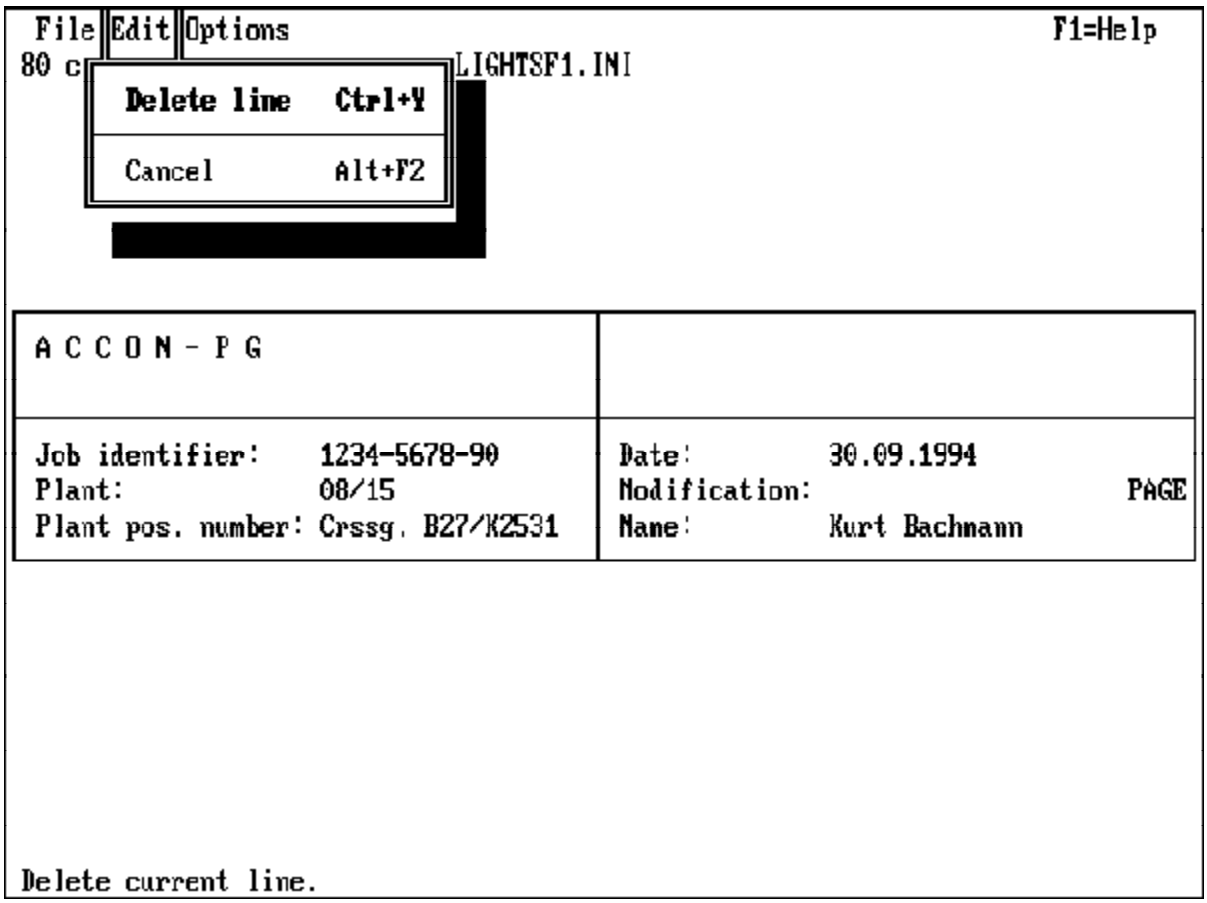

Fig. 14-3: The menu »Edit«.

14.2.1 Delete a line

Selecting the menu command »Delete line« resp. typing the hot key Ctrl + Y lets you delete the current line.

14.2.2 Cancel editing

Selecting the menu command »Cancel« resp. typing the hot key Alt + F2 lets you quit editing the current footer. Changes made to the footer will be lost (but you will have to confirm the cancel operation first).

14.3 Options

The menu »Options« shown below serves for modifying the settings which determine the appearance and the behaviour of ACCON-PG.

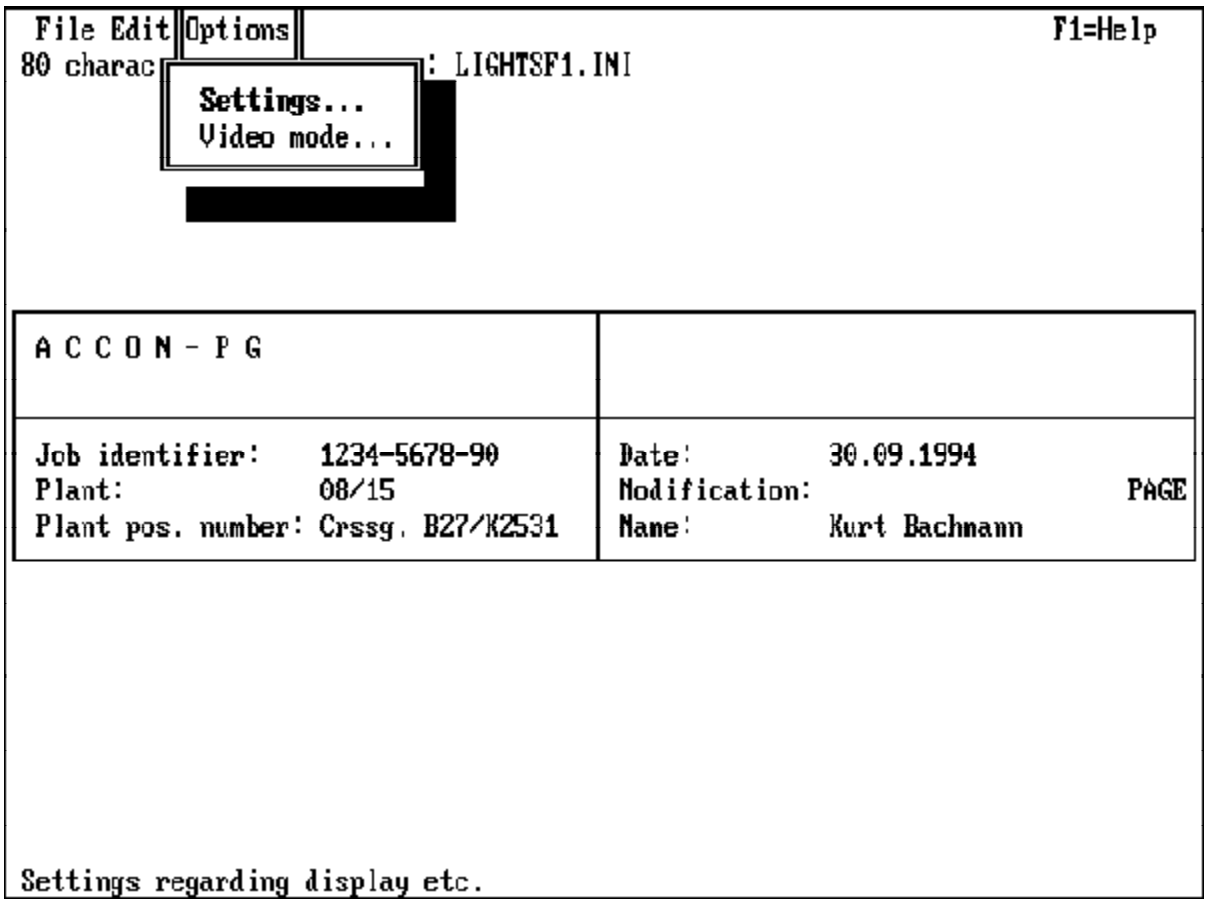

Fig. 14-4: The menu »Options«

Chapter 15:

Status Variables, Force Variables, Force Outputs

Overview

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When selecting one of the menu commands »Status Variables«, »Force Variables« and »Force Outputs« in the main menu or in the directory, you will activate a further menu. The menu is the same for all 3 menu commands, except for the fact that you do not have the same possibilities of entering inputs.

You will see a table with 2 or 3 columns, depending on the selected video mode. Each column consists of 3 input fields. You are expected to enter an operand (bit, byte, word or double word) into the left field, e.g. “IB 12” or “QW 16”. With »Force Outputs«, you can here specify only outputs, i.e. operands of type “QB”, “QW” or “QD”. The desired data format should be entered into the input field in the middle. You cannot enter any data type into any field, e.g. a bit can only have the “KM” format, a byte can have one of the following formats: “KM”, “KH”, “KY”, “KS” or “KF”. The input field at the right serves for displaying the current operand value during a status scan with the functions »Status Variables« and »Force Variables«. With the functions »Force Variables« and »Force Outputs«, you can here enter values which can be assigned to operands resp. outputs. The entered values are displayed inverse until they are transferred to the PLC.

The first time when calling one these functions, you will see an empty status scan table, as shown below:

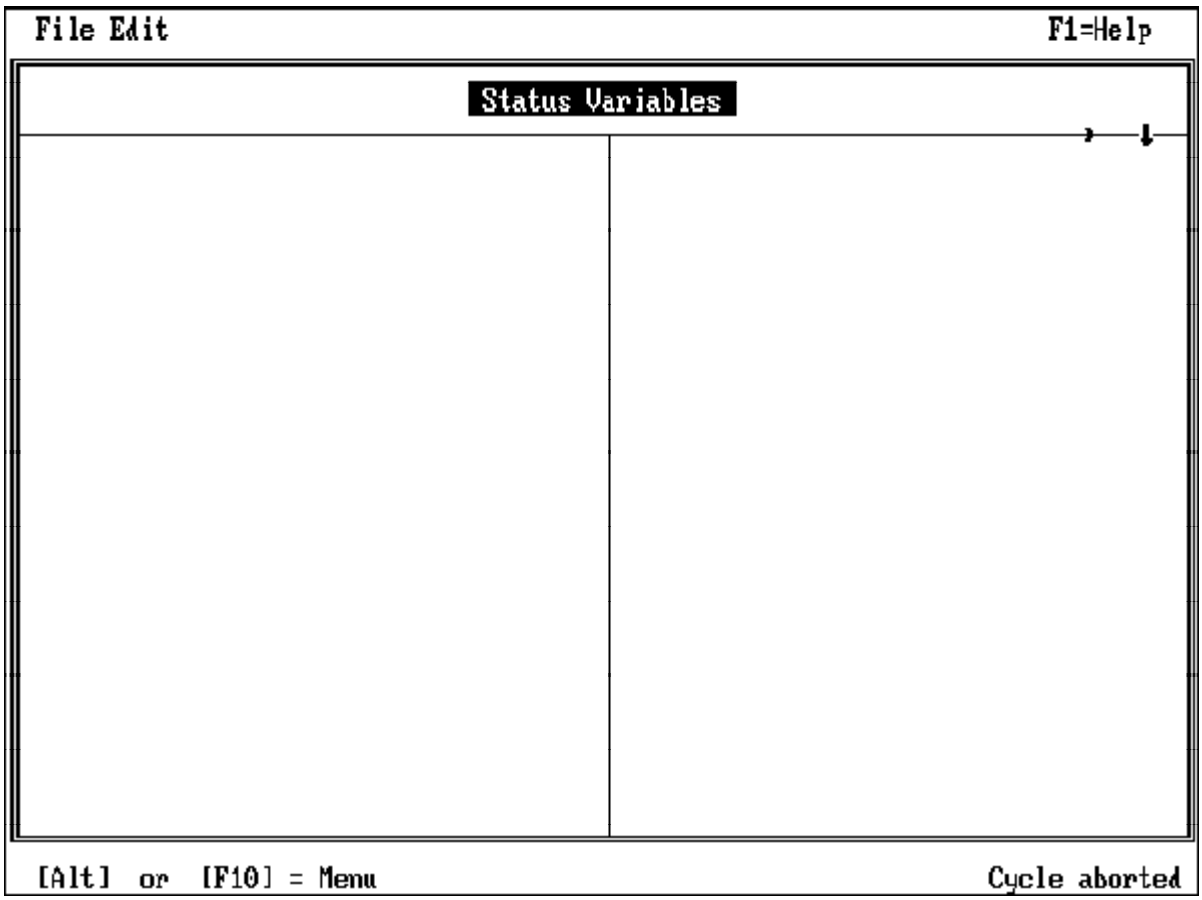

Fig. 15-1: Empty status scan table for function »Status Variables«

You can now enter operands (called "process variables"). When leaving the menu, the entered process variables will be stored in the file »PG.ST« automatically. This file will automatically be loaded when one of these functions is called again, and you will get the same screen as before. The following figure shows a status scan table with entered process variables. All the process variables together make up the so-called status scan.

```
File Edit                                                    F1=Help

                          Status Variables

 FW  44     KF
 FD  46     KG
 I   14.0   KM
 F   10.0   KM
 QB  18     KM
 T   10     KT
 T   11     KT
 T   12     KT
 T   13     KT
 C   10     KC

 [Alt]  or  [F10] = Menu                                Cycle aborted
```

Fig. 15-2: Status scan table for »Status Variables«

When loading the table, the process variables are checked for correctness:

- the specified data blocks must exist in the PLC,
- for the specified data, a data block must first be defined,
- the specified data must be contained in the data block defined before. If a data block contains e.g. 10 words, you can access data indexed from 0 to 9; accessing data above word no. 9 is forbidden.
- for »Force Outputs«, only operands of type “QB”, “QW” or “QD” are allowed.

If the status file contains specifications of data violating one of these rules, these entries will not be included into the status scan.

15.1 File operations

As mentioned above, the process variables of the current status scan are stored automatically. However, you can also save status scans or reload status scans already stored. The necessary menu commands are contained in the menu »File« shown in the figure below.

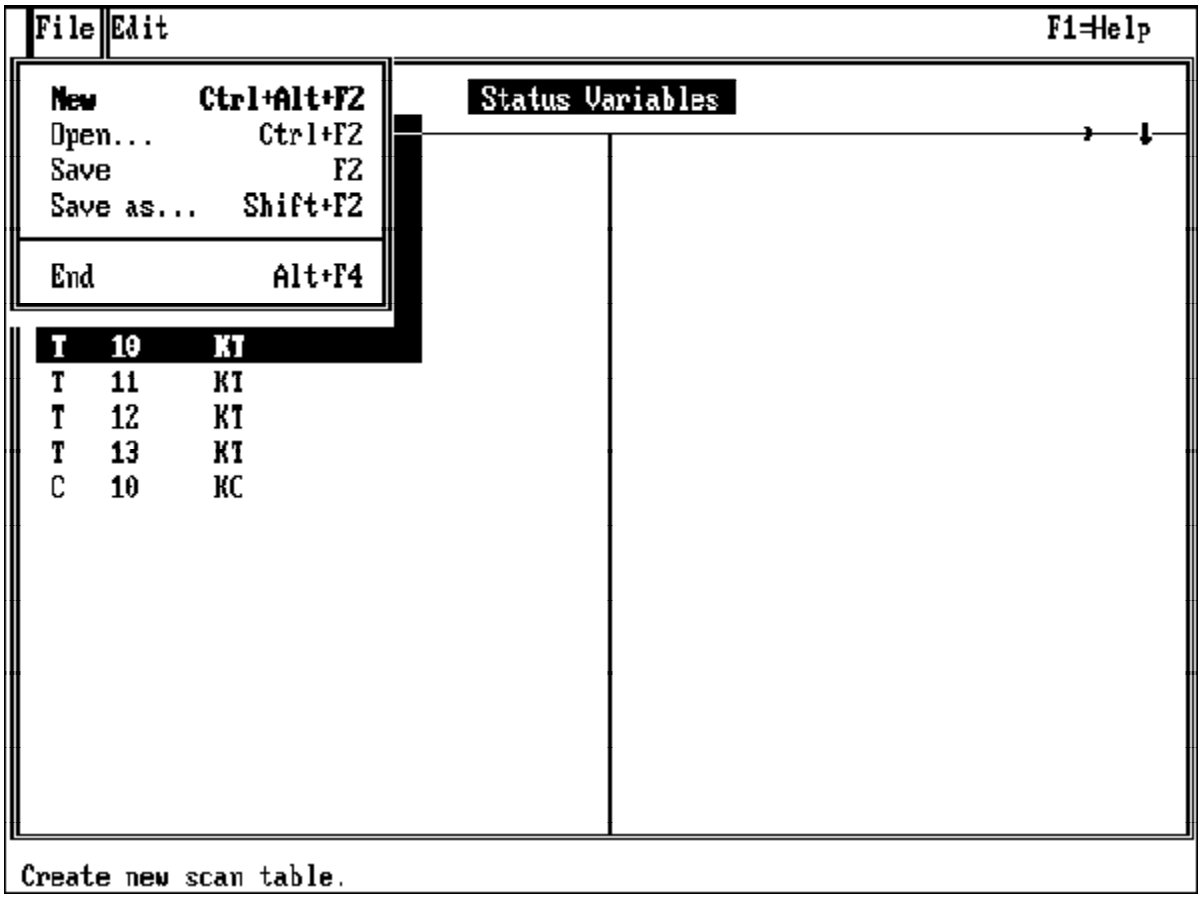

Fig. 15-3: The menu »File«.

15.1.1 Create a new status scan

You can delete the process variables of the current status scan table and start entering a new status scan table, using the menu command »New«. You can undo this action by selecting the menu command »Undo deletion of scan« in the menu »Edit«.

15.1.2 Load a status scan

Selecting the menu command »Open« resp. typing the hot key Ctrl + F2 causes a file-selection dialog box to appear from which you can select an existing »*.ST« file containing a status scan. The status scan which has perhaps been in the editor before will be lost (no confirmation!).

15.1.3 Save a status scan

Selecting the menu command »Save« resp. typing the hot key F2 lets you save the current status scan. If a file name has not yet been specified, the scan will not be saved but a warning beep will be given.

15.1.4 Save a status scan as

Selecting the menu command »Save as« resp. typing the hot key Shift + F2 lets you save the current status scan to a new file or to another file. A file-selection dialog box appears for selecting an existing file resp. creating a new file. Enter the desired file name into the corresponding input field. If the file exists already, you will get a corresponding warning message; so you can choose to overwrite the file or to cancel the operation and select another file name.

15.1.5 End status

Selecting the menu command »End« resp. typing the hot key Alt + F4 lets you end the currently active test function. The current status scan is stored in the file »PG.ST«. You will return to the directory resp. to the main menu, depending on the point from which you called the function.

15.2 Edit

The menu »Edit« shown in the below figure contains the functions for editing a status scan.

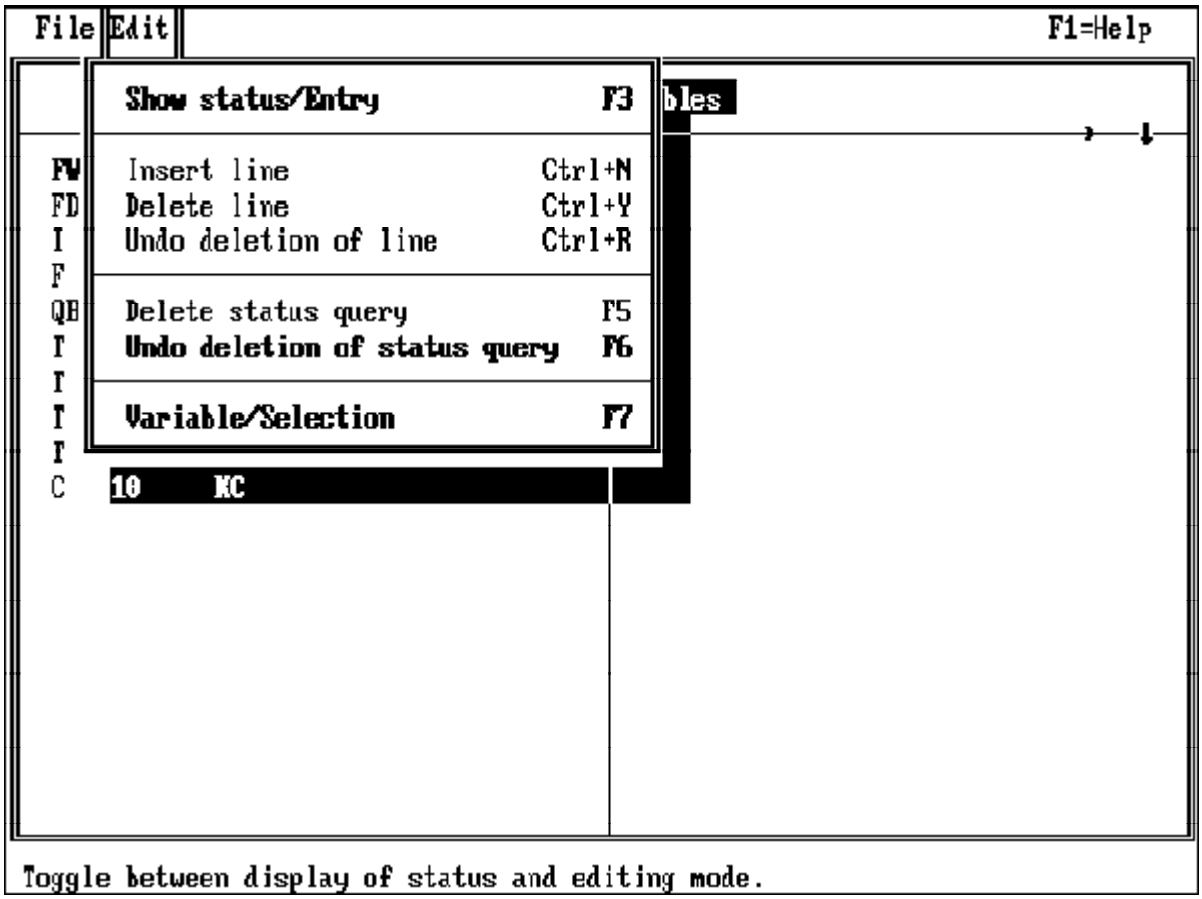

Fig. 15-4: The menu »Edit«.

15.2.1 Show status and entering variables

When the function »Status Variables« or »Force Variables« is active, you can switch between viewing the current status scan and editing process variables using the menu command »Show Status« resp. the hot key F3. When the viewing mode is selected, as shown below, the message »Cycling...« appears blinking at the bottom of the screen. If there is no PLC connected, the message will be »No PLC« instead.

```
File Edit                                                    F1=Help

                          Status Variables

FW  44     KF -14892
FD  46     KG +4239900+05
I   14.0   KM 0
F   10.0   KM 0
QB  18     KM 10000100
T   10     KT Stopped
T   11     KT Stopped
T   12     KT 045.1
T   13     KT Stopped
C   10     KC 065

[Alt]  or  [F10] = Menu                                  Cycling...
```

Fig. 15-5: Show Status in »Status Variables«.

When the function »Force Variables« is active, the entered new values will be transferred to the PLC before starting each status scan. In the editing mode, you can edit the process variables or enter new values.

When the function »Force Outputs« is active, the entered new values will be transferred with this menu command to the output of the PLC. There will be no status display in the following. If the message “No I/O module” appears in the value field after transferring the scan to the PLC, this means that the corresponding process variable has no real equivalent (output) in the PLC.

```
File Edit                                                    F1=Help

                          Force Outputs

 QW  14     KH No I/O module
 QW  16     KN 10101010 01010101
 QW  18     KF +246B
 QW  20     KY No I/O module
 QW  22     KS No I/O module

 [Alt]  or  [F10] = Menu                                Cycle aborted
```

Fig. 15-6: Message after »Force Outputs«.

For the function »Force Outputs«, the PLC has to be in the Stop mode. This function is not available with the PLCs PLC90, PLC95, PLC100 CPU100 and PLC100 CPU102.

15.2.2 Insert line

Select the menu command »Insert line« resp. type the hot key Ctrl + N to insert a new line before the current line. The following lines will be moved down one position. If there is not enough space at the end of the status scan table, you will get a warning beep and no line will be inserted.

15.2.3 Delete line

Select the menu command »Delete line« resp. type the hot key Ctrl + Y to delete the current line. The following lines will be moved up one position. The deleted line can be re-inserted using the menu command »Undo deletion of line«.

15.2.4 Undo deletion of line

Select the menu command »Undo deletion of line« resp. type the hot key Ctrl + R to insert the last deleted line. The following lines will be moved down one position.

15.2.5 Delete the whole status scan

Select the menu command »Delete scan table« resp. type the hot key F5 to delete the current status scan table. The deleted scan table can be restored using the menu command »Undo deletion of scan table«.

15.2.6 Undo deletion of scan table

Select the menu command »Undo deletion of scan table« resp. type the hot key F6 to restore the deleted scan table. Attention: the current process variables will be lost (no confirmation!).

15.2.7 Enter process variables / values

Select the menu command »Variable/Selection« resp. type the hot key F7 to go to the right input field (for entering values) and back. You cannot enter a value if the function »Status Variables« is active. Entered values are displayed inverse.

```
File Edit                                                    F1=Help

                          Force Variables

FW  44     KF  +1234
FD  46     KG  +1200000+02
I   14.0   KM
F   10.0   KM
QB  18     KM  01101000
T   10     KT
T   11     KT
T   12     KT
T   13     KT
C   10     KC

[Alt]  or  [F10] = Menu                                  Cycle aborted
```

Fig. 15-7: Entering values in »Force Variables«

The entered values must be in the expected data format; otherwise they are not accepted.