

# HITACHI

SOFTWARE MANUAL

OPERATION

# S10V LADDER CHART For Windows<sup>®</sup>

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**S10V**  
Programmable Controller

SVE-3-131(L)

SOFTWARE MANUAL

OPERATION

# S10V LADDER CHART

## For Windows<sup>®</sup>

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The logo for S10V Programmable Controller is displayed on a blue textured rectangular background. The text "S10V" is in a large, bold, white sans-serif font. Below it, the words "Programmable Controller" are written in a smaller, white sans-serif font.

**S10V**  
Programmable Controller

First Edition, November 2003, SVE-3-131(B) (out of print)  
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## SAFETY PRECAUTIONS



- Read this manual thoroughly and follow all the safety precautions and instructions given in this manual before operations such as system configuration and program creation.
- Keep this manual handy so that you can refer to it any time you want.
- If you have any question concerning any part of this manual, contact your nearest Hitachi branch office or service engineer.
- Hitachi will not be responsible for any accident or failure resulting from your operation in any manner not described in this manual.
- Hitachi will not be responsible for any accident or failure resulting from modification of software provided by Hitachi.
- Hitachi will not be responsible for reliability of software not provided by Hitachi.
- Make it a rule to back up every file. Any trouble on the file unit, power failure during file access or incorrect operation may destroy some of the files you have stored. To prevent data destruction and loss, make file backup a routine task.
- Furnish protective circuits externally and make a system design in a way that ensures safety in system operations and provides adequate safeguards to prevent personal injury and death and serious property damage even if the product should become faulty or malfunction or if an employed program is defective.
- If an emergency stop circuit, interlock circuit, or similar circuit is to be formulated, it must be positioned external to the programmable controller. If you do not observe this precaution, equipment damage or accident may occur when this programmable controller becomes defective.
- Before changing the program, generating a forced output, or performing the RUN, STOP, or like procedure during an operation, thoroughly verify the safety because the use of an incorrect procedure may cause equipment damage or other accident.
- This manual contains information on potential hazards that is intended as a guide for safe use of this product. The potential hazards listed in the manual are divided into four hazard levels of danger, warning, caution, and notice, according to the level of their severity. The following are definitions of the safety labels containing the corresponding signal words DANGER, WARNING, CAUTION, and NOTICE.

 **DANGER** : This safety label identifies precautions that, if not heeded, will result in death or serious injury.

 **WARNING** : Identifies precautions that, if not heeded, could result in death or serious injury.

 **CAUTION** : Identifies precautions that, if not heeded, could result in minor or moderate injury.

**NOTICE** : This safety label without a safety alert symbol identifies precautions that, if not heeded, could result in property damage or loss not related to personal injury.

Failure to observe any of the  **CAUTION** and  **NOTICE** statements used in this manual could also lead to a serious consequence, depending on the situation in which this product is used. Therefore, be sure to observe all of those statements without fail.

The following are definitions of the phrases “serious injury,” “minor or moderate injury,” and “property damage or loss not related to personal injury” used in the above definitions of the safety labels.

***Serious injury:*** Is an injury that requires hospitalization for medical treatment, has aftereffects, and/or requires long-term follow-up care. Examples of serious injuries are as follows: vision loss, burn (caused by dry heat or extreme cold), electric-shock injury, broken bone, poisoning, etc.

***Minor or moderate injury:*** Is an injury that does not require either hospitalization for medical treatment or long-term follow-up care. Examples of minor or moderate injuries are as follows: burn, electric-shock injury, etc.

***Property damage or loss not related to personal injury:*** Is a damage to or loss of personal property. Examples of property damages or losses not related to personal injury are as follows: damage to this product or other equipment or their breakdown, loss of useful data, etc.

The safety precautions stated in this manual are based on the general rules of safety applicable to this product. These safety precautions are a necessary complement to the various safety measures included in this product. Although they have been planned carefully, the safety precautions posted on this product and in the manual do not cover every possible hazard. Common sense and caution must be used when operating this product. For safe operation and maintenance of this product, establish your own safety rules and regulations according to your unique needs. A variety of industry standards are available to establish such safety rules and regulations.

1.  Hazard Warning Statement

The following is the hazard warning statement contained in this manual.

1.1 NOTICE Statement

(chapter 1, page 1-3)

***NOTICE***

This product allows rewriting programs and internal-register values while the PCs is running. However, you should notice that careless rewriting may lead to a serious accident, such as breakdown of the equipment. If any of such items needs to be rewritten, be sure to check the condition of the equipment first. You may rewrite it only when you are sure that the equipment has no problem.

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This manual provides information on the following program product:

<Program product>

S-7895-02, S10V LADDER CHART SYSTEM, 01-35



## Revision record

(1/3)

Revision No.	Revision record (revision details and reason for revision)	Month, Year	Remarks
E	<ul style="list-style-type: none"> <li>• Description of the addition of ladder symbol search function</li> <li>• Description of the addition of cross-reference function</li> <li>• Description of the addition of name replacement function</li> <li>• Description of the addition of real I/O conversion function</li> <li>• Change in the maximum number of timer points (from 512 points to 2,048 points)</li> <li>• Description of the addition of comment display size change function</li> </ul>	October 2005	S10V Ladder Chart System, 01-09 or later
F	<ul style="list-style-type: none"> <li>• The “Device usage list” option to display a list of the hardware devices currently used is newly added.</li> <li>• The “Ladder execution speed priority” option to compile ladder programs while giving priority to their execution speed is newly added.</li> <li>• A support of preconversion check of ladder programs is newly added.</li> </ul>	November 2006	S10V Ladder Chart System, 01-11 or later
	The OPTET module is newly added as an Ethernet communication module.		S10V Ladder Chart System, 01-12 or later
	The user-friendliness of this ladder chart system has been improved.		S10V Ladder Chart System, 01-14 or later

Revision No.	Revision record (revision details and reason for revision)	Month, Year	Remarks
G	Ladder conversion extended function is added (such as an NX support).	October 2007	S10V Ladder Chart System, 01-16 or later
H	<ul style="list-style-type: none"> <li>• Non-synchronous process-end instruction is newly supported.</li> <li>• Delayed run-status rewriting (or run-time editing) of a process, waiting for its process end to be reached, is newly supported.</li> </ul>	April 2009	S10V Ladder Chart System, 01-19 or later S10V HI-FLOW System, 02-05 or later
	<ul style="list-style-type: none"> <li>• TUC (ON-delay timer, one-shot timer, up-down counter) set-value listing and editing is newly supported.</li> <li>• “Only for online monitor” mode is newly added.</li> <li>• Man-Machine Communication System (MCS) is added.</li> </ul>		S10V Ladder Chart System, 01-20 or later
I	<ul style="list-style-type: none"> <li>• The model LWA435 (14-bit) AI module is newly added as a module type that can be registered as an analog counter.</li> <li>• The HSC-2100 Series of I/O modules are newly added as module types that can be registered as analog counters. (These I/O modules are covered in a separate manual, numbered SME-1-126.)</li> </ul>	July 2009	S10V Ladder Chart System, 01-21 or later
J	An additional feature (excluding from printing) is added to a menu option that prints (and displays in a preview) a type(s) of devices currently used.	April 2010	S10V Ladder Chart System, 01-30 or later

Revision No.	Revision record (revision details and reason for revision)	Month, Year	Remarks
K	<ul style="list-style-type: none"> <li>• The LIW and LOW registers are newly supported.</li> <li>• The HS.RI/O module is newly supported.</li> <li>• The model LWA423 AI module is newly supported.</li> </ul>	October 2011	S10V Ladder Chart System, 01-32 or later
	<ul style="list-style-type: none"> <li>• The LIW and LOW registers are newly supported.</li> <li>• A restriction on the use of name replacement function is introduced.</li> <li>• An improvement is added to F/D function and the resulting change in operating procedure is described.</li> <li>• Information on how to use the S10V Duplicated Index Register Search Tool is added.</li> <li>• The messages throughout this manual have been reviewed for more consistency.</li> </ul>		S10V Ladder Chart System, 01-33 or later
L	Windows® 7 (32-bit) operating system is newly supported.	January 2013	

In addition to the above changes, all the unclear descriptions and typographical errors found are also corrected without prior notice.

## PREFACE

Thank you for purchasing Hitachi's S10V Ladder Chart System.

This ladder chart system, running on personal computers, is a tool for creating, editing, etc. of ladder application programs.

This document describes how to operate the S10V Ladder Chart System. It covers the following versions of the ladder chart system:

System name and version
S10V Ladder Chart System for Windows®, 01-35 or later

For information on ladder programs (instructions), refer to the following manual:

<Related manuals>

- SOFTWARE MANUAL PROGRAMMING S10V LADDER CHART For Windows® (manual number SVE-3-121)
- SOFTWARE MANUAL OPERATION HI-FLOW For Windows® (manual number SVE-3-132)

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<Note for storage capacity calculations>

- Memory capacities and requirements, file sizes and storage requirements, etc. must be calculated according to the formula  $2^n$ . The following examples show the results of such calculations by  $2^n$  (to the right of the equals signs).

1 KB (kilobyte) = 1,024 bytes

1 MB (megabyte) = 1,048,576 bytes

1 GB (gigabyte) = 1,073,741,824 bytes

- As for disk capacities, they must be calculated using the formula  $10^n$ . Listed below are the results of calculating the above example capacities using  $10^n$  in place of  $2^n$ .

1 KB (kilobyte) = 1,000 bytes

1 MB (megabyte) = 1,000<sup>2</sup> bytes

1 GB (gigabyte) = 1,000<sup>3</sup> bytes

<Definitions of Terms>

PCs: An abbreviation of Programmable Controllers.

This is a general term for PLC such as the S10V, S10 $\alpha$  and S10mini series.

PLC: An abbreviation of Programmable Logic Controllers.

This is an industrial electronic device to exert sequence control with an incorporated program.

The S10V, S10 $\alpha$  and S10mini series come under this PLC.

N coil: A ladder program converted into a form that can be run on the PCs by pasting symbols on the sheet displayed on a PC.

Compile: To convert an application program such as a ladder chart into a form (N coil [s]) that can be run on the PCs.

Sheet: A form to prepare an application program of ladder chart.

This form is controlled on a PC.

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# 1 BEFORE USE



## 1 BEFORE USE

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This manual is intended for users who are familiar with programming on Windows®-based personal computers.

### 1.1 An Overview of the S10V Ladder Chart System for Windows®

The S10V Ladder Chart System for Windows® (hereinafter simply called the ladder chart system) is a tool for creating, editing, monitoring, and debugging normal-rung ladder programs executable on an S10V programmable controller through operations similar to those of common Windows®-based applications.

### 1.2 Supported Hardware

The ladder chart system supports only S10V Series PCs. None of the conventional 2 $\alpha$  Series, 4 $\alpha$  Series, and S10mini Series PCs are supported.

### 1.3 Hardware and Software Requirements

The ladder chart system requires the following hardware and software for its normal operation.

- A personal computer running Microsoft® Windows® 2000, Microsoft® Windows® XP operating system software or Microsoft® Windows® 7 (32-bit) operating system
- At least 64 MB of RAM (main memory) installed in the personal computer (when Windows® 2000 is used)
- At least 128 MB of RAM installed in the personal computer (when Windows® XP is used)
- At least 1 GB of RAM installed in the personal computer (when Windows® 7 (32-bit) is used)
- At least 20 MB of free storage space on hard disk
- S10V LPU modules
- S10V power module
- S10V mount base
- Connecting cable – RS-232C cross cable with D-sub 9-pin connectors – between the personal computer and PCs (S10V)
- RI/O stations, power supplies, mount bases, cards, and wiring cables, as required

Note: When you connect the personal computer with the S10V via an Ethernet network, install an ET.NET or CMU module on the S10V mount base.

**NOTICE**

This product allows rewriting programs and internal-register values while the PCs is running. However, you should notice that careless rewriting may lead to a serious accident, such as breakdown of the equipment. If any of such items needs to be rewritten, be sure to check the condition of the equipment first. You may rewrite it only when you are sure that the equipment has no problem.

Users of this product must have adequate knowledge of the Windows® environment and user interface. This system conforms to the Windows® standard. This manual is prepared for users who are familiar with the basic Windows® operating procedures.

- If you use a personal computer with the suspend feature, disable the feature. If the suspend feature comes into operation during execution of this system, the system may malfunction.
- An inadequate free memory space available in RAM may cause an application error. In the event of such an error, check the amount of free memory space available. If it is found inadequate, add more RAM.

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# 2 GETTING READY FOR USE

### 2.1 Installing the Ladder Chart System

Before you start installation, check that the CD-ROM you have is the correct one. The ladder chart system is compatible only with Microsoft® Windows® 2000, Microsoft® Windows® XP operating systems and Microsoft® Windows® 7 (32-bit) operating system. If the ladder chart system is installed in any other operating system, normal operation will not be guaranteed.

#### 2.1.1 Prerequisite

Before you install the ladder chart system, ensure that the S10V base system (program product [PP] model: S-7895-38) has been installed in the personal computer. If it has not, install it first. (With no S10V base system installed, installation of the ladder chart system cannot be accomplished.)

#### 2.1.2 Installation

The procedure required is as follows:

- ① Insert the ladder chart system (PP model: S-7895-02) CD-ROM into the CD-ROM drive.
- ② Click [Run] from the **Start** button.

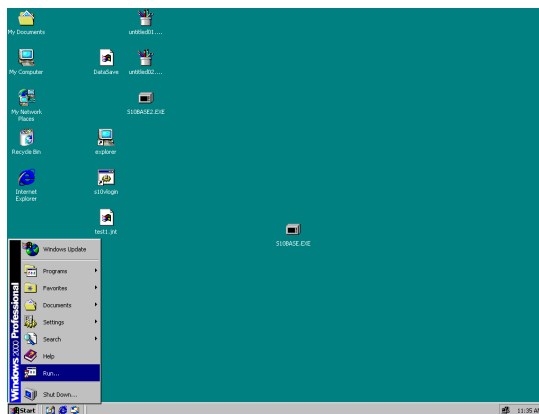


Figure 2-1 Clicking [Run]

- ③ The [Run] dialog box will appear on the screen. Enter the “CD-ROM drive name:\Disk1\setup” into the “Open” box, as shown below (in the figure below, the CD-ROM drive is assigned to G: [G drive]). Click the **OK** button.

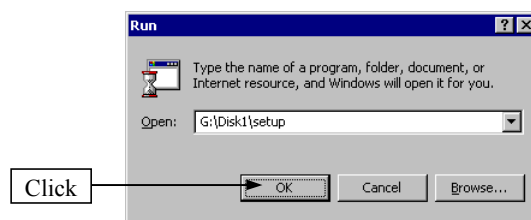


Figure 2-2 [Run] Dialog Box

- ④ The installer's main screen will appear on the computer. Then, follow the displayed guidance.

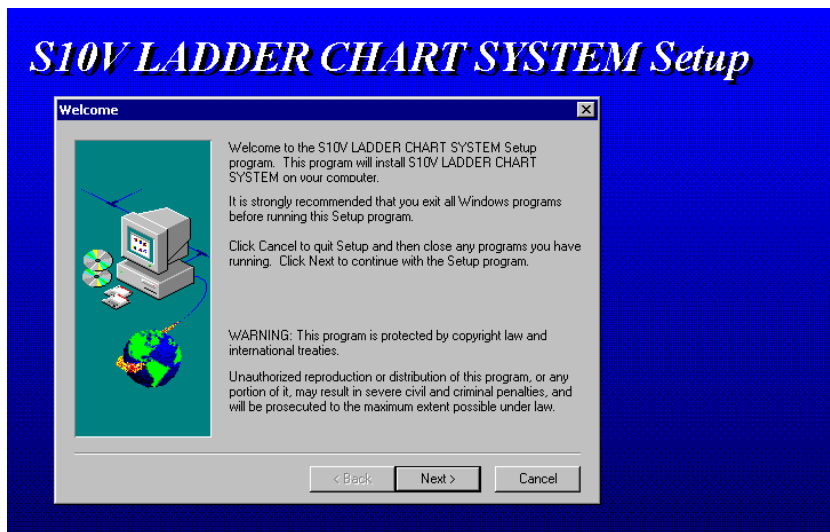


Figure 2-3 Installer's Main Screen

- ⑤ When the installation is ended normally, the completion-of-setup message will be shown below on screen. Click the  button.

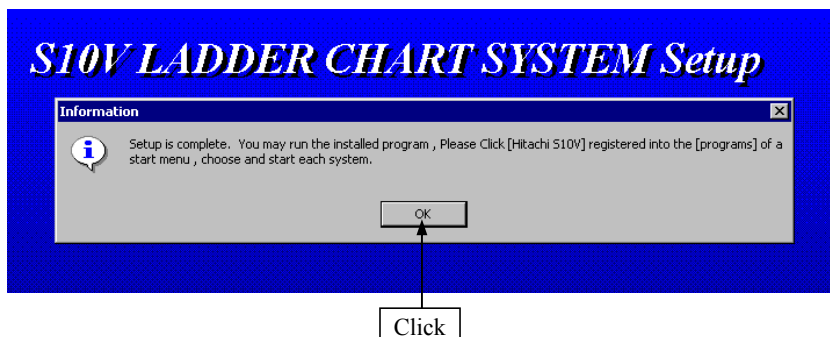


Figure 2-4 Screen Displayed When the Installation Is Completed

- ⑥ The installation of the ladder chart system is completed.

## 2 GETTING READY FOR USE

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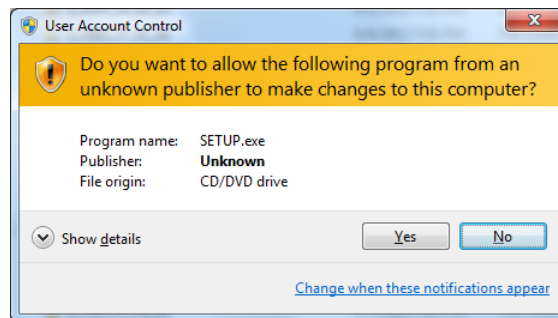
Before installing the ladder chart system, be sure to exit all the currently open Windows®-based programs. Do not forget to exit anti-virus software and other memory-resident programs. If you install the ladder chart system without exiting such programs, an error may occur during installation. If such an error occurs, first uninstall the ladder chart system as directed in Section 2.2, “Uninstalling the Ladder Chart System,” exit all the Windows®-based Programs, and then install the ladder chart system again.

Since no window opens upon completion of installation, attach a shortcut to the desktop as needed.

Click the  button and choose [(All) Programs] - [Hitachi S10V] - [S10V LADDER CHART SYSTEM] - [S10V LADDER CHART SYSTEM] from the [Start] menu on the Windows® screen. Click and hold the right mouse button on the [S10V LADDER CHART SYSTEM] and move the pointer to the desktop. Then, choose [Copy Here] from the pop-up menu.

**<Notes on installing in Windows® 7 (32-bit)>**

Installing the S10V ladder chart system in Windows® 7 (32-bit) operating system requires prior logging onto the operating system with an appropriate Administrator account, which is the Administrator account first created in the initial condition of your personal computer. When you have so logged on, you can then double-click “setup.exe” that is stored in the DISK 1 folder on the S10V ladder chart System CD. When “setup.exe” is started, the dialog box as shown below will appear. Click the  button to continue the execution of the setup program.



The S10V ladder chart system cannot be installed on a per-user basis. To install the S10V ladder chart system successfully, the user must first log onto the operating system with an appropriate Administrator account, which is the Administrator account first created in the initial condition of your personal computer.

The S10V ladder chart system may not be installed properly in any of the following cases: 1) administrator permission is acquired by using User Account Control(\*) with a standard user account and 2) logon is made with an Administrator account that has been created using User Account Control with a standard user account.

If you make a logon with a user account that is different from the one you have used for the installation of the S10V ladder chart system, the installed program may be missing from the program menu displayed. In this case, you should perform the following series of steps: 1) make a logon again with the Administrator account first created in the initial condition of your personal computer; 2) uninstall the installed program; and 3) install the program again. When you want to create a new account, be sure to make a logon with an Administrator account. Do not use User Account Control at that time.

(\*) User Account Control is a Microsoft Windows feature that temporarily grants administrative rights to standard user accounts.

A message reporting a read-only file detected may be displayed during the reinstallation of the S10V ladder chart system. In this case, click the  button to set off overwriting.



### 2.2 Uninstalling the Ladder Chart System

The existing S10V ladder chart System needs to be uninstalled when, for instance, you want to upgrade it. The procedure required for uninstalling it is as follows:

(1) Uninstalling from Windows® 2000

Click on  button on your Windows desktop and choose [Settings] - [Control Panel]. When the Control Panel opens, double-click on [Add/Remove Programs]. Then, choose “S10V LADDER CHART SYSTEM” in the [Change or Remove Programs] tab and click the  button. When the [Confirm File Deletion] dialog box appears, click the  button.

(2) Uninstalling from Windows® XP

Click on  button on your Windows desktop and choose ([Settings] - ) [Control Panel]. When the Control Panel opens, double-click on [Add/Remove Programs]. Then, choose “S10V LADDER CHART SYSTEM” in the [Change or Remove Programs] tab and click the  button. When the [Confirm File Deletion] dialog box appears, click the  button.

(3) Uninstalling from Windows® 7 (32-bit)

Click on  button on your Windows desktop and choose [Control Panel]. When the Control Panel opens, click [Programs and features]. Then, select “S10V LADDER CHART SYSTEM” and click  button. When the [Confirm File Deletion] dialog box appears, click the  button.

- If Windows® opens a window during the uninstall process to display the question “Remove Shared File?”, click the  button to retain shared files.
- When you want to reinstall the LADDER CHART System, be sure to perform an uninstall and then perform an install.

## 2.3 Starting the System

The installed ladder chart system will be automatically listed in the **Start** button of Windows®. Click [(All) Programs] - [Hitachi S10V] - [S10V LADDER CHART SYSTEM] - [S10V LADDER CHART SYSTEM] from the **Start** button (see Figure 2-5). The ladder chart system will then be started.

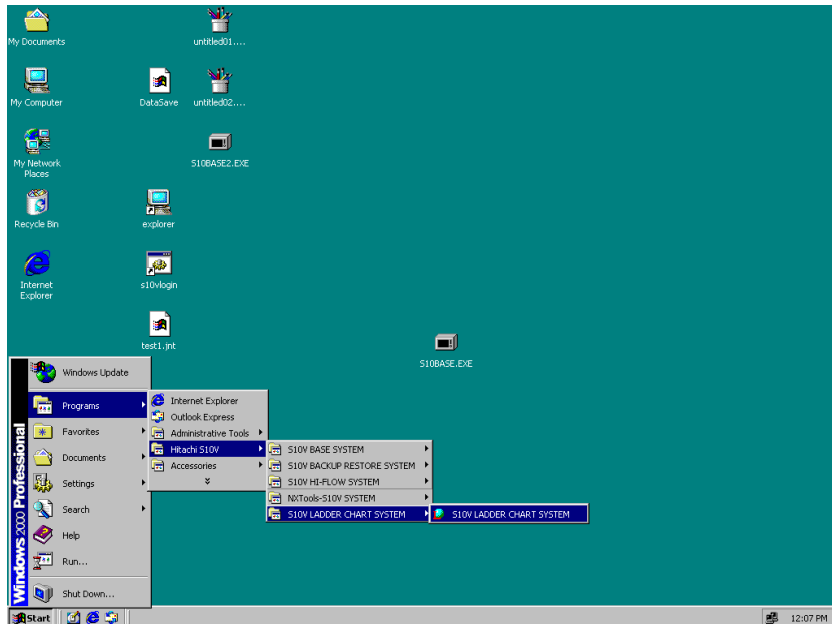


Figure 2-5 Starting the S10V Ladder Chart System

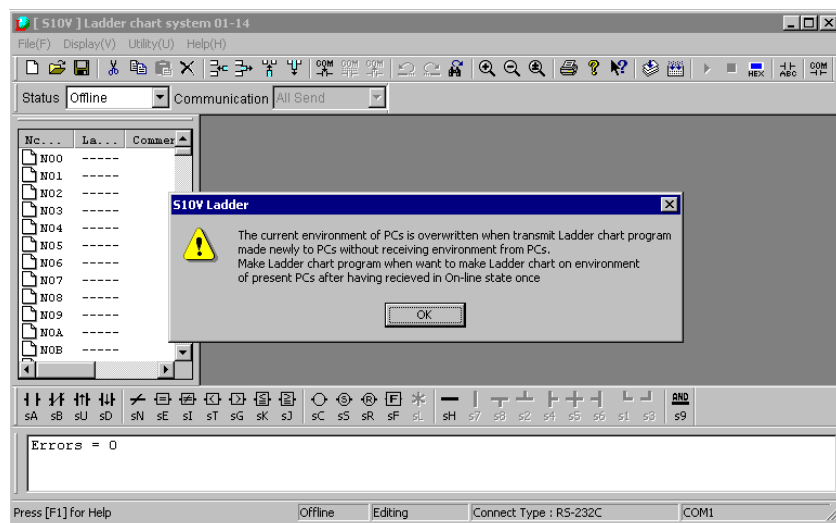


Figure 2-6 Window Displayed When the S10V Ladder Chart System Is Started

## 2 GETTING READY FOR USE

### 2.4 Ending the System

To end the ladder chart system, click [Application termination] from the [File] menu (see Figure 2-7). The system will then stop processing, closing its window, and you will be taken back to Windows®.

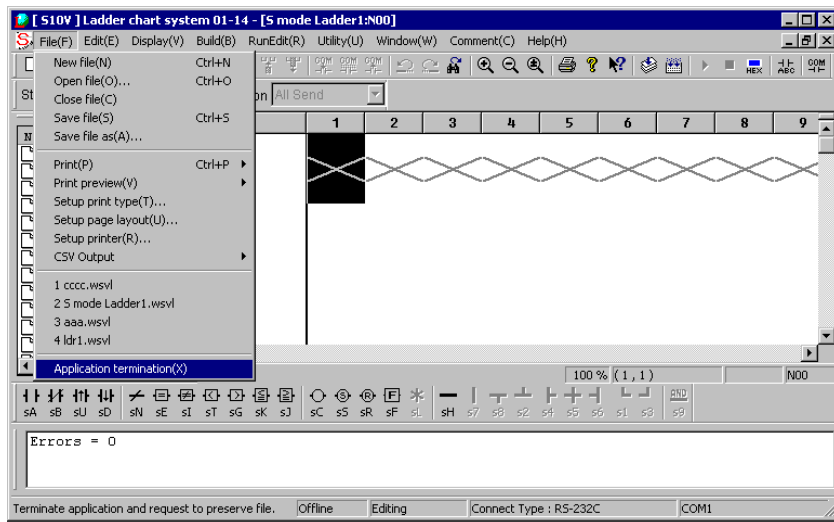


Figure 2-7 Ending the Ladder Chart System

## 2.5 Installing and Uninstalling the S10V S10Tools System

The S10V S10Tools system (hereinafter simply called the S10Tools system) is installed by performing the same procedure as used for the ladder chart system. For information on how to install the S10Tools system, see Section 2.1, “Installing the Ladder Chart System.”

The S10Tools system installed is of the model S-7895-01. It runs under the same operating system, and is subject to the same prerequisite as the ladder chart system. The S10Tools system is uninstalled by performing the same procedure as used for the ladder chart system. For details, see Section 2.2, “Uninstalling the Ladder Chart System.”

The S10Tools system is the ladder chart system and HI-FLOW system combined into a single package and is supplied on CD-ROM. For information on how to use the S10Tools, refer to the software manuals for each product.

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# 3 LADDER CHART SHEETS

### 3 LADDER CHART SHEETS

The ladder chart system processes application programs running on the personal computer, called ladder programs, in the form of series of ladder sheets.

#### 3.1 Ladder Sheets

Each ladder sheet is managed as a single N coil. Up to 256 N coils numbered N00 through NFF (hexadecimal) can be created for each project. Switching between N coils can be accomplished by double-clicking the desired N coil number in the N coil list displayed (double-clicking an N coil makes its corresponding ladder sheet active). No more than one sheet can be edited at a time.

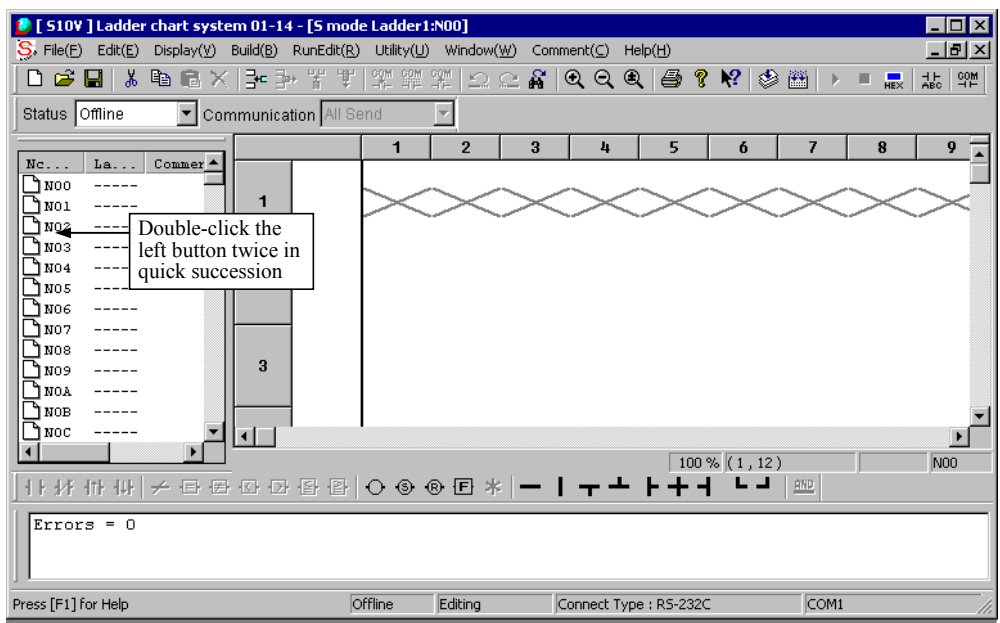


Figure 3-1 Example of a Ladder Sheet

A ladder program can be created by pasting ladder symbols (selectable from the ladder symbol bar as shown below) into ladder sheets or, simply, sheets. For details, see Section 4.3, “Ladder Sheet Editing Functions.”

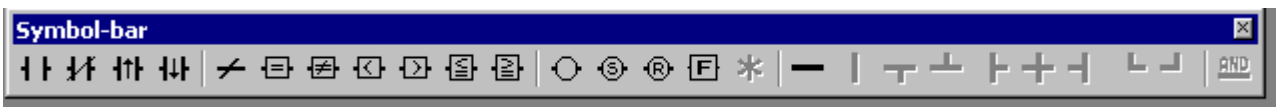


Figure 3-2 Ladder Symbol Bar

# 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

This chapter describes the ladder chart system's functionality for processing ladder sheets and explains how to use it. For details, refer to the ladder chart system's online help.

### 4.1 Ladder Chart System's Main Window

The ladder chart system's main window is shown in the Figure 4-1. As shown, the main window consists of the following items: the menu, tool bar, mode bar, ladder symbol bar, N coil window, ladder sheet, output window, status bar, and the cross-reference window.

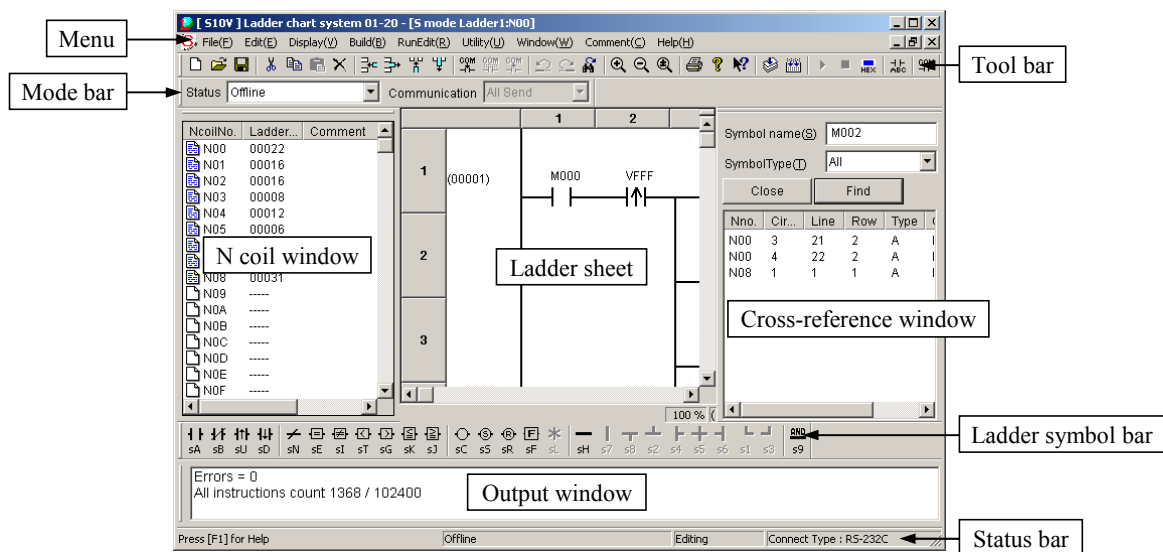


Figure 4-1 Ladder Chart System's Main Window

#### 4.1.1 Menu

The menu offers the following functions:

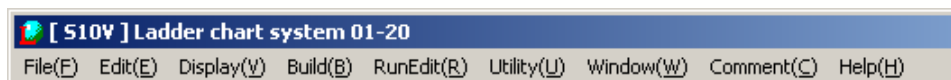


Figure 4-2 Main-Window Menu

- File: A sub-menu of file processing functions such as saving, reading, and printing of ladder sheets.
- Edit: A sub-menu of editing functions to edit displayed components of a ladder circuit.
- Display: A sub-menu of functions relating to the display format of ladder circuits.
- Build: A sub-menu of functions relating to the sending and receiving of ladder programs to and from the PCs.
- RunEdit: A sub-menu of editing functions to edit a ladder circuit during run.

- Utility: A sub-menu of a variety of utility functions.
- Window: A sub-menu of functions relating to ladder sheet windows.
- Comment: A sub-menu of PI/O comment-related functions.
- Help: A sub-menu of help functions.

### 4.1.2 Tool bar

The tool bar offers the following functions:

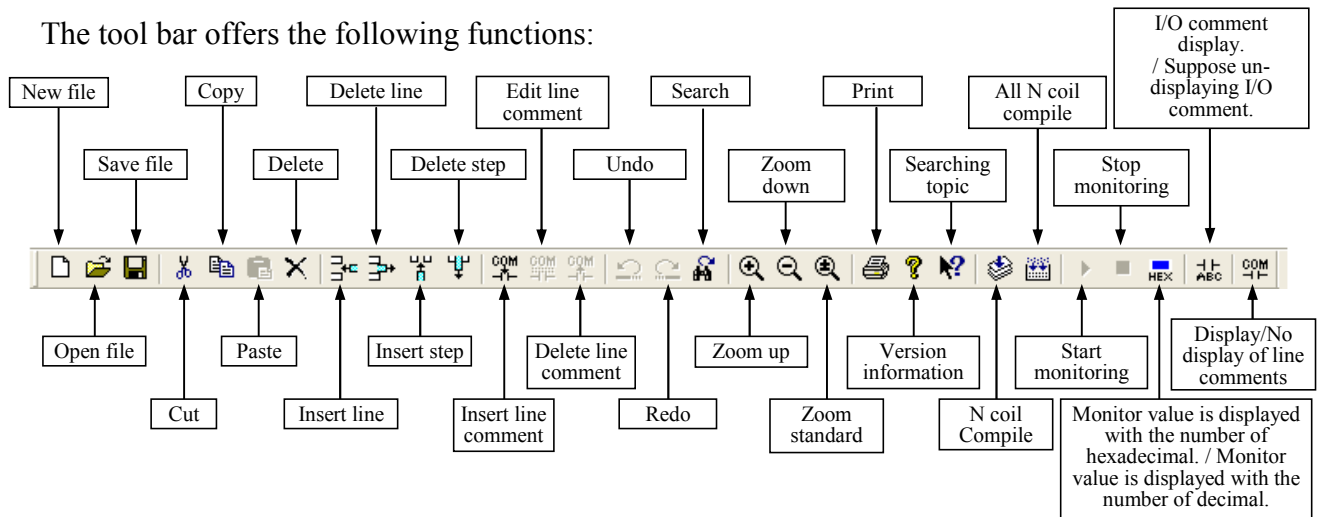


Figure 4-3 Tool Bar

- New file: Opens a new ladder program (sheets).
- Open file: Opens a selected normal-rung ladder program.
- Save file: Saves the currently open ladder program file.
- Cut: Cuts the ladder symbol at the cursor in a ladder sheet.
- Copy: Copies the ladder symbol at the cursor in a ladder sheet.
- Paste: Pastes a copied or cut ladder symbol into the position at the cursor in a ladder sheet.
- Delete: Deletes the ladder symbol at the cursor in a ladder sheet.
- Insert line: Adds a new line before the one at the cursor in a ladder sheet.
- Delete line: Deletes the line at the cursor in a ladder sheet.
- Insert step: Adds a step (cell) to the left of the cursor in a ladder sheet. This occurs only when there is a free area in the ladder sheet.
- Delete step: Deletes the cell at the cursor in a ladder sheet and moves the cell(s) which follow to the left in order to fill the empty space after the deletion. This movement has no effect on coils.
- Insert line comment: Inserts a line comment into the currently open ladder program file.
- Edit line comment: Edits a selected line comment in the currently open ladder program file.
- Delete line comment: Deletes a selected line comment from the currently open ladder program file.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

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- Undo: Reverses the last operation performed. This Undo command cannot be applied if the last operation performed is a line-comment insertion, editing, or deletion.
- Redo: Reverses the last undo operation performed. This Redo command cannot be applied if the last undo operation performed is the undoing of a line-comment insertion, editing, or deletion.
- Search: Searches for ladder symbols matching the value of a specified register.
- Zoom up: Increases the scale factor for displaying ladder sheets.
- Zoom down: Decreases the scale factor for displaying ladder sheets.
- Zoom standard: Sets the scale factor for displaying ladder sheets to its standard value (100%).
- Print: Displays the print type window.
- Version information: Presents version information.
- Searching topic: Displays the topic search window.
- N coil compile: Compiles only the currently active N coil (ladder sheet).
- All N coil compile: Compiles all N coils in the N coil list displayed.
- Start monitoring: Starts monitoring ladder circuits in the S10V's memory. Selectable only when the ladder chart system is running online with the S10V.
- Stop monitoring: Stops monitoring ladder circuits in the S10V's memory. Selectable only when the ladder chart system is running online with the S10V.
- Monitor value is displayed with the number of hexadecimal./Monitor value is displayed with the number of decimal: Switches the display format of monitored values that is used during ladder circuit monitoring between hexadecimal and decimal.
- I/O comment display./Suppose un-displaying I/O comment:  
Switches the I/O comment display mode between display and no-display.
- Display/No display of line comments:  
Switches the line comment display mode between display and no-display.

### 4.1.3 Mode bar

The mode bar offers the following functions:



Figure 4-4 Mode Bar

- Status: Indicates or changes the communication status of the ladder chart system. The communication status is either “Offline”, “Online”, or “Only for online monitor”.
- Communication: Effective only in the online mode, offers the two modes: All Send and Run-Edit Send. Usually, the All Send mode is selected.

### 4.1.4 Ladder symbol bar

The ladder symbol bar contains ladder-symbol templates, including connecting-line templates, which can be pasted into ladder sheets. For details, see Section 4.3, “Ladder Sheet Editing Functions.”

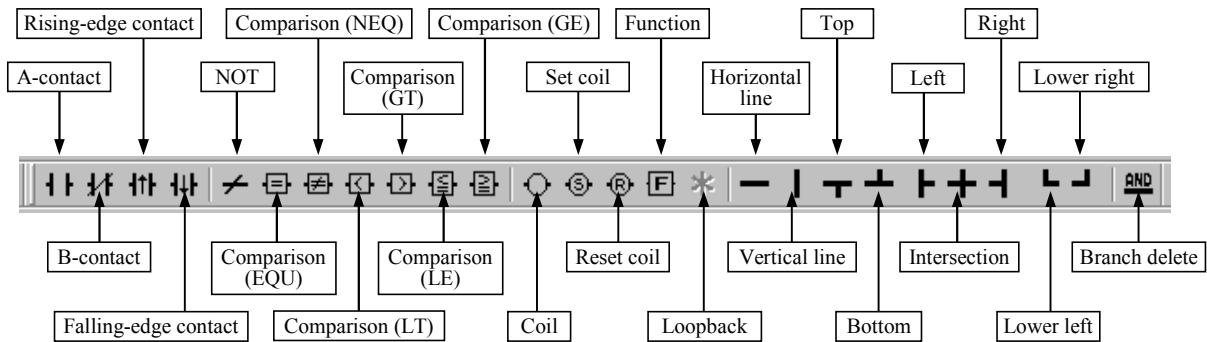


Figure 4-5 Ladder Symbol Bar

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.1.5 N coil window

The N coil window presents a list of N coils. This list contains N coil number icons in the “NcoilNo.” column, ladder line counts in the “Ladder...” column, and comments in the “Comment” column.

The N coil number icons in the list are displayed in one of the three colors: the background color when the N coils have no ladder program created; red color when the ladder program created for the N coils is not compiled yet; or blue color when the ladder program created for the N coils is already compiled.

Each N coil comment displayed consists of up to 32 characters. If no comment is given to the N coil, the comment field will remain empty.

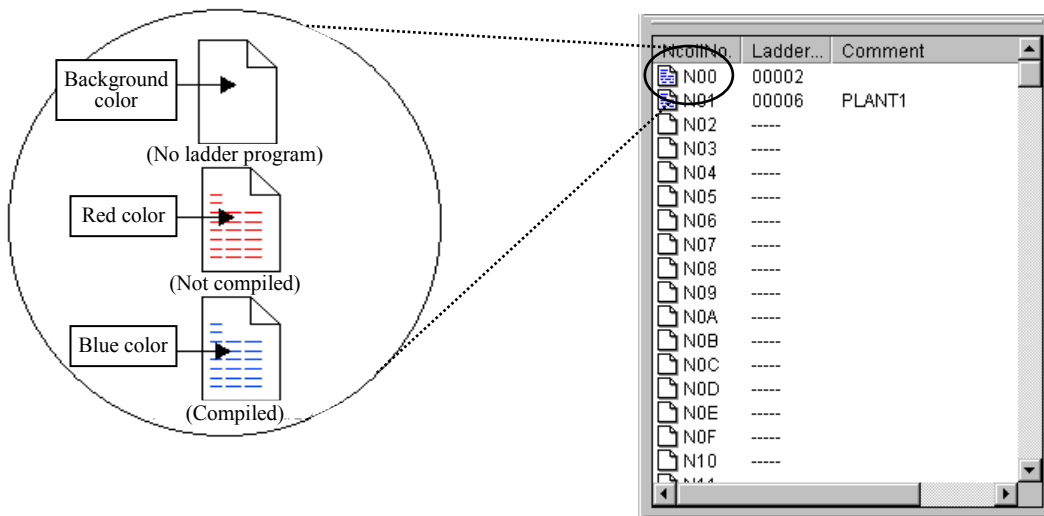


Figure 4-6 N Coil Window

### 4.1.6 Output window

The output window presents information about the result of compilations.

### 4.1.7 Status bar

The status bar presents the following four pieces of information:

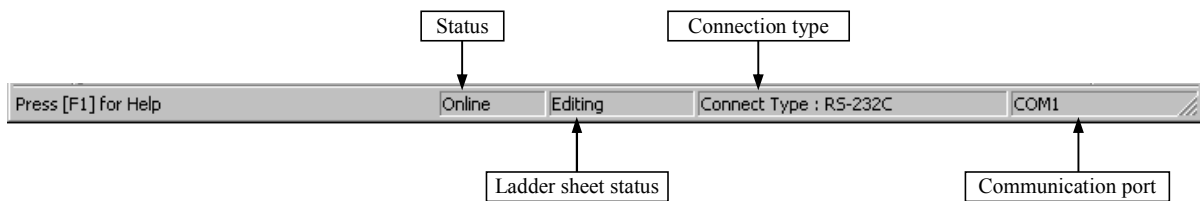


Figure 4-7 Status Bar

- **Status:** Indicates the communication status of the ladder chart system. For more information, see Subsection 4.5.2, “Switching between ‘online’, ‘offline’, ‘only for online monitor’, and ‘online waiting’ modes.”
- **Ladder sheet status:** If a ladder sheet(s) are open, indicates the condition by displaying “Editing”; if all the ladder sheets are closed, indicates the condition by displaying “No program”.
- **Connection type:** Indicates the type of communication connection used between the S10V and personal computer. The connection type indicated is either RS-232C or Ethernet and can be changed in the [Connect Type] window. To display the [Connect Type] window, click [Change connection of PCs] from the [Utility] menu.
- **Communication port:** Indicates the port used in communications between the S10V and personal computer:
  - For RS-232C: One of the ports COM1 through COM4 is indicated which is the personal computer’s COM port that has been selected in the [Connect Type] window.
  - For Ethernet: The IP address of the S10V is indicated which is the one that has been set for the CMU or ET.NET module in the [Connect Type] window.

### 4.1.8 Cross-reference window

The cross-reference window enables you to obtain cross-reference information for a desired symbol name. For details, see Subsection 4.3.3, “Cross-referencing ladder only.”

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.2 Ladder Sheet File Processing Functions

Each ladder sheet file processing function can be click from the pull-down menu shown below.

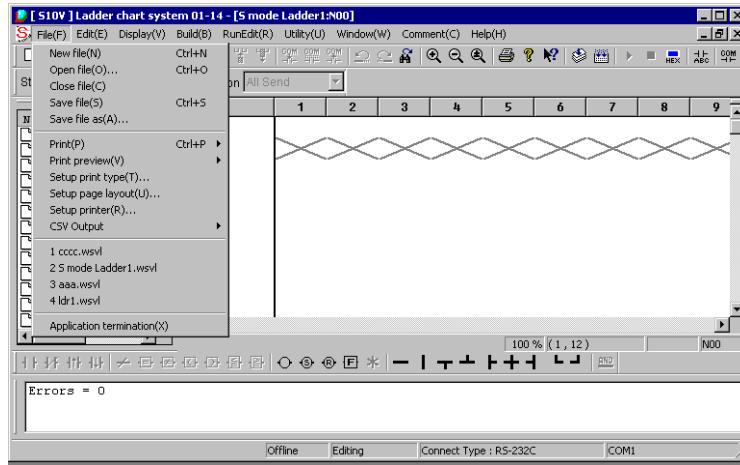


Figure 4-8 Clicking the [File] Option

These [File] menu options are listed below along with descriptions of their functions.

Table 4-1 [File] Menu Options (1/2)

No.	Level 1	Level 2	Level 3	Description
1	File	New file		Opens the ladder program creation window.
2		Open file		Reads in a specified ladder program file.
3		Close file		Closes the currently active window (file).
4		Save file		Saves the contents (data) of the currently active window (file) and allows you to continue editing.
5		Save file as		Saves the contents (data) of the currently active window (file) with a specified name and allows you to continue editing.
6	Print		Circuit	Prints circuit diagrams drawn.
7			Memory status	Prints current memory usages.
8			LPET	Prints LPETs (ladder program edition tables) used.
9			TUC	Prints TUC (T, U, and C coils) set values.
10			Device usage	Prints devices used.
11			Cross reference	Prints cross-references used.
12			Coil reference	Prints coil references used.
13			EXFET	Prints system extension functions used.
14			UFET	Prints UFETs (user function edition tables) used.
15			I/O comment	Prints I/O comments used.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

Table 4-1 [File] Menu Options (2/2)

No.	Level 1	Level 2	Level 3	Description
16	File (continued from the previous page)	Print (continued from previous page)	Analog counters	Prints information on the analog counter(s) currently assigned (if any) to an I/O data area(s) in an open program file.
17			Ethernet communication setting	Prints information on the existing Ethernet communication settings.
18		Print preview	Circuit	Displays print images of circuit diagrams drawn.
19			Memory status	Displays print images of current memory usages.
20			LPET	Displays print images of LPETs used.
21			TUC	Displays print images of TUC set values.
22			Device usage	Displays print images of devices used.
23			Cross reference	Displays print images of cross-references used.
24			Coil reference	Displays print images of coil references used.
25			EXFET	Displays print images of system extension functions used.
26			UFET	Displays print images of UFETs used.
27			I/O comment	Displays print images of I/O comments used.
28			Analog counters	Displays print images of the currently assigned analog counter(s) information to be printed.
29			Ethernet communication setting	Displays print images of the existing Ethernet communication settings information to be printed.
30			Setup print type	
31		Setup page layout		Sets a page layout.
32		Setup printer		Sets up the printer.
33		CSV Output	Memory status	Outputs current memory usages to a file in CSV format.
34			TUC	Outputs TUC set values to a file in CSV format.
35			Cross-reference	Outputs cross-references used to a file in CSV format.
36			Coil reference	Outputs coil references used to a file in CSV format.
37	I/O comment		Outputs I/O comments used to a file in CSV format.	
38	Analog counters		Outputs the currently assigned analog counter(s) information to a file in CSV format.	
39	Ethernet communication setting		Outputs the existing Ethernet communication settings information to a file in CSV format.	
40	File names 1, 2, 3, 4, ...		Displays the file(s) that have been created or used in the past.	
41	Application termination		Exits this application.	



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.2.1 Printing a circuit diagram with cross-references

A circuit diagram with cross-references can be printed by clicking [Setup print type] from the [File] menu as shown below and then checking the [Ladder Cross Reference] checkbox in the [Setup print type] window. After this checking, click [Print] - [Circuit] from the [File] menu. A circuit diagram with cross-references will then be printed on the printer.

Before printing, a circuit diagram with cross-references can be displayed on screen by clicking [Print preview] - [Circuit] from the [File] menu.

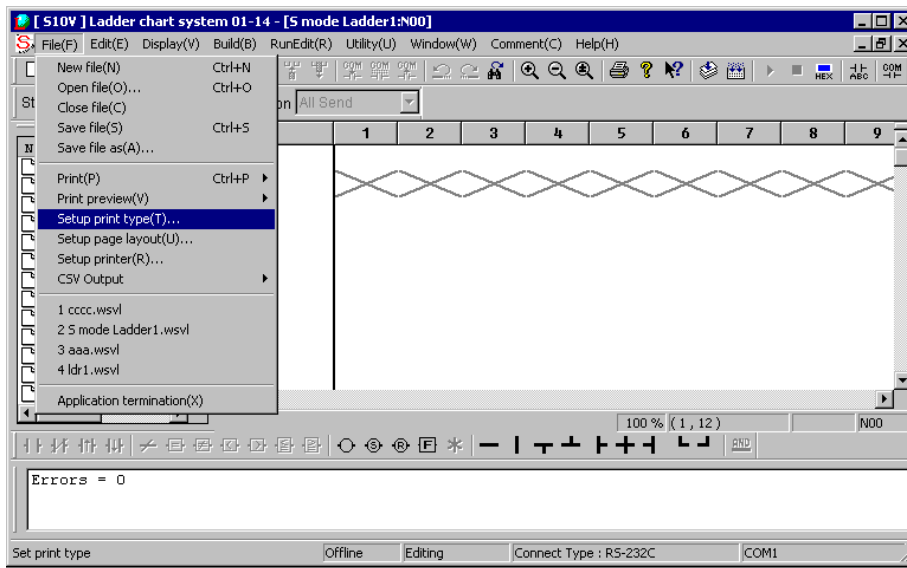


Figure 4-9 Clicking [Setup print type] from the [File] Menu

#### (1) Setting a print type for printing a circuit diagram with cross-references

Before you print a circuit diagram with cross-references, specify a print command and a print format. To do this, click the [Circuit] tab in the [Setup print type] window, and then check the [Ladder Cross Reference] checkbox and, if necessary, set additional items below the checkbox. Then, the system is ready to print a circuit diagram with cross-references (the N coils subjected to this printing have been selected in the N coil list of the window).

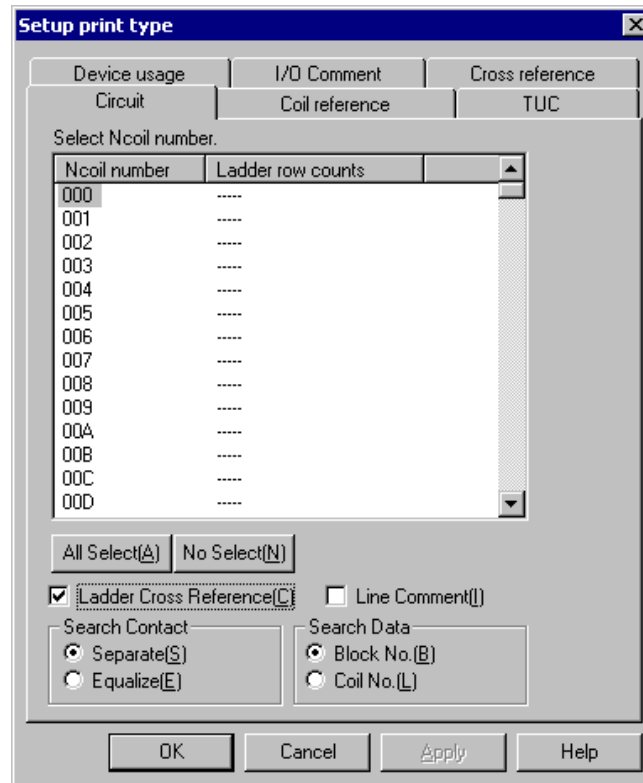


Figure 4-10 [Setup print type] Window

- **[All Select]** button  
Clicking the [All Select] button selects all N coils in the N coil list which have a ladder sheet created (whether a ladder sheet has been created or not is indicated by the presence of a ladder line count in the same display line). When you wish to subject only some of the created N coils to printing, click the desired N coil(s), rather than using this button.
- **[No Select]** button  
Clicking the [No Select] button deselects all the selected N coils in the N coil list.
- **[Ladder Cross Reference]** checkbox  
Checking the [Ladder Cross Reference] checkbox causes a circuit diagram with cross-references to be printed on the printer. The clicking also makes it possible to specify a print format (search contact and search data) to be used during printing.
- **[Search Contact]** group box  
The [Search Contact] group box allows you to specify a print format for the search contact(s) to be printed along with cross-references. The print formats that can be specified for printing are “Separate” (default) and “Equalize”.
- **[Search Data]** group box  
The [Search Data] group box allows you to specify a type of search data to be printed. The types of search data that can be specified for printing are “Block No.” (default) and “Coil No.”.

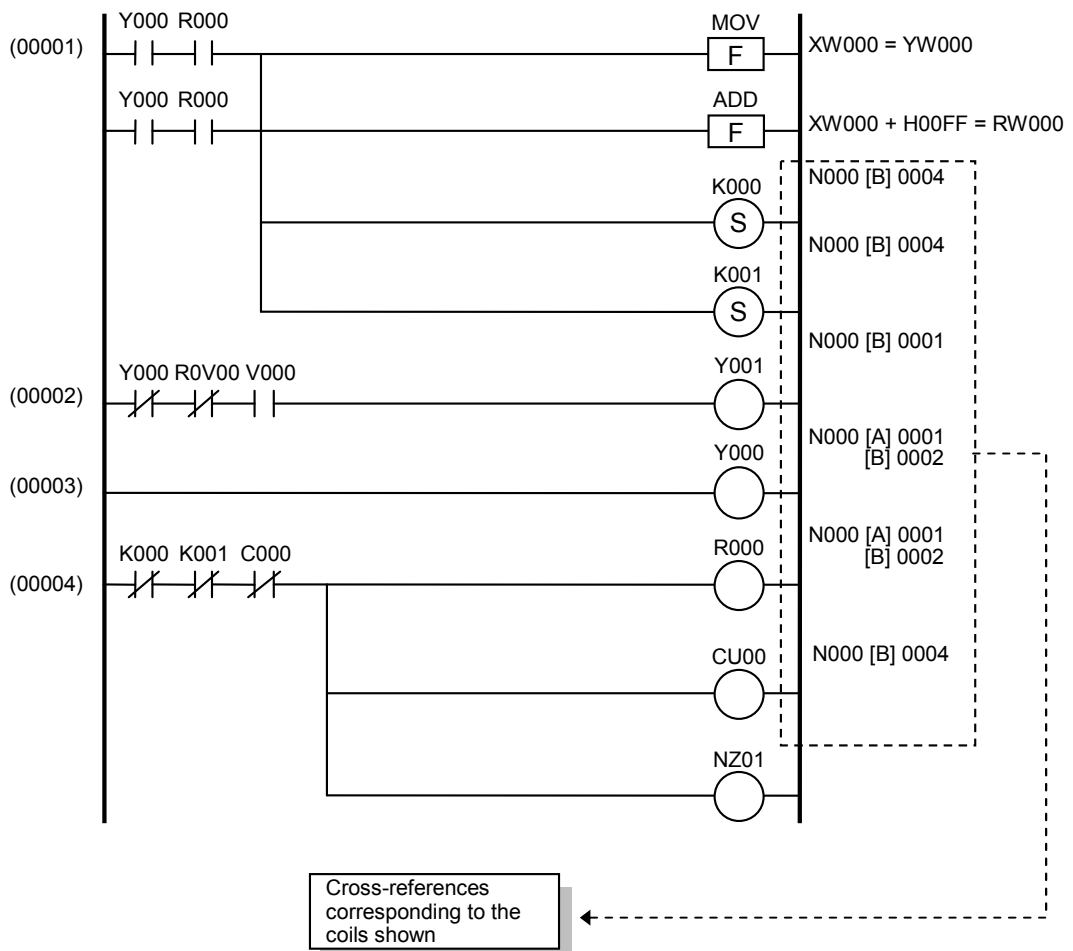
## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

- [Line Comment] checkbox

Checking the [Line Comment] checkbox prints the selected N coil(s) along with the inserted line comment(s), if any.

(2) Printing a circuit diagram with cross-references

On the [Setup print type] window shown in (1), click [Print] - [Circuit] from the [File] menu with the [Ladder Cross Reference] checkbox checked. The following circuit diagram with cross-references is output to the printer.



Note 1: Cross-references subjected to printing:

The cross-references printed along with a circuit diagram are those which are in correspondence with the coils used in the ladder program. These coils are any of the following:

<Coils subjected to cross-reference printing>

Symbol	Subjected to printing or not
—(R)— Keep relay reset coil	Subjected
—(S)— Keep relay set coil	Subjected
—( )— Output coil (*1)	Subjected
—[F]— Function	Not subjected

(\*1) This output coil is one of the following:

- Y: External output.
- R: Internal register.
- M: Extension internal register.
- T: On-delay timer.
- U: One-shot timer.
- C: Up-down counter.
- G: Global-link register.
- N: Nesting coil.
- P: Process register.
- E: Event register.
- Z: Z register.
- LB: Work register.
- LR: Ladder converter-dedicated work register.

Note 2: Items printed as cross-references:

The items printed as cross-references along with a circuit diagram are listed below.

**Table 4-2 Items Printed as Cross-References**

No.	Item	Print format	Remarks
1	Nesting number of a nesting where the register for the coil is used	N***	***: 3-digit hexadecimal number
2	Type of a symbol where the register for the coil is used	[A]: A-contact [B]: B-contact [C]: Coil	Functions are not included among these symbols. (*2)
3	Block number of a block where the register for the coil is used.	****	****: 4-digit decimal number
4	Output coil name in a block where the register for the coil is used	Output coil name (the coil and the register used with that coil are printed in the format below) Example: —( )— R050	Functions are not included among these coils.

(\*2) The “[C]: Coil” format is used in cases where any two nestings (N coils) use the same coil. This double use of a coil is allowed in any two nestings.

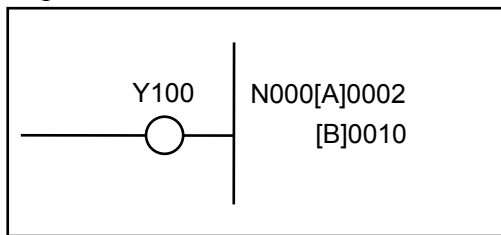
Note 3: Cross-reference print formats:

Any of the print formats below can be selected (in the [Setup print type] window shown in Figure 4-10) when printing cross-references.

(1) Print formats for search contacts

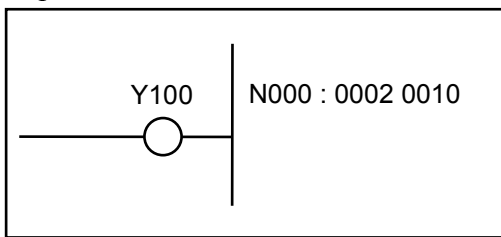
- A print format can be specified for search contacts to be printed along with cross-references.
- The print formats you can specify for search contacts are the following two: “Separate” and “Equalize”.

“Separate” format:



The contacts for Y100 are classified either as A contacts or B contacts and printed.

“Equalize” format:

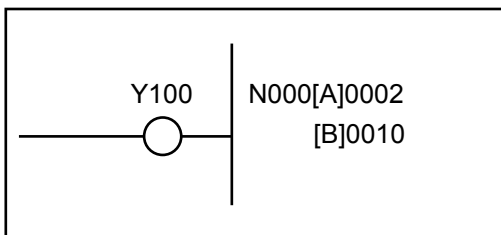


The contacts for Y100 are printed without any classification.

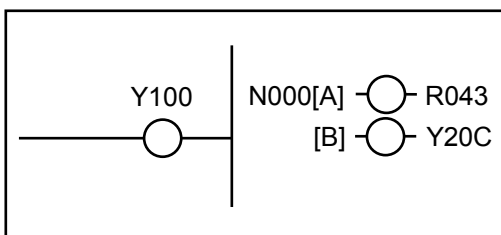
(2) Print formats for search data

- A print format can be specified for search data to be printed along with cross-references.
- The print formats you can specify for search data are the following two: “Block No.” and “Coil No.”.

“Block No.” format:



“Coil No.” format:



All output coil names in the blocks internally using detected contacts are printed in this format.

## 4.2.2 Printing a list of the devices currently used (or displaying its preview)

## (1) Overview

The [File] menu offers options for searching all N coils used in a currently open ladder program file for the hardware devices (registers) currently used therein and listing the found devices along with their status information indicating they are currently used. The [File] menu also offers an option for selecting a desired type(s) of devices before printing or displaying in a preview. With this option you can also exclude any type(s) of devices currently not used from among those types of devices selected to be printed (and displayed in a preview).

Note: The above [File] menu options do not support the printing and displaying in a preview of lists of IW, OW, and/or A-registers currently used.

## (2) Operation procedure

The general operation procedure for printing (and displaying in a preview) a list of the devices currently used is described below. If you want to view such a list for the previously selected type(s) of devices, skip Steps ① through ④ in the procedure below and start it directly from Step ⑤.

① Click [File] - [Setup print type] from the menu bar in the main window.

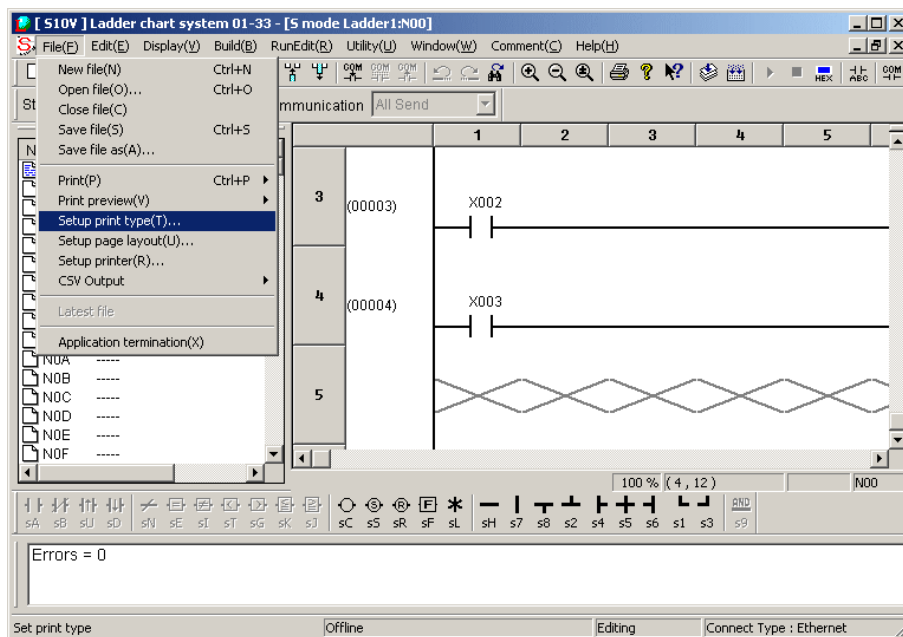


Figure 4-11 Choosing [Setup print type] from the [File] Menu

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- ② The [Setup print type] window as shown below appears. Double-click the [Device usage] tab in the window.

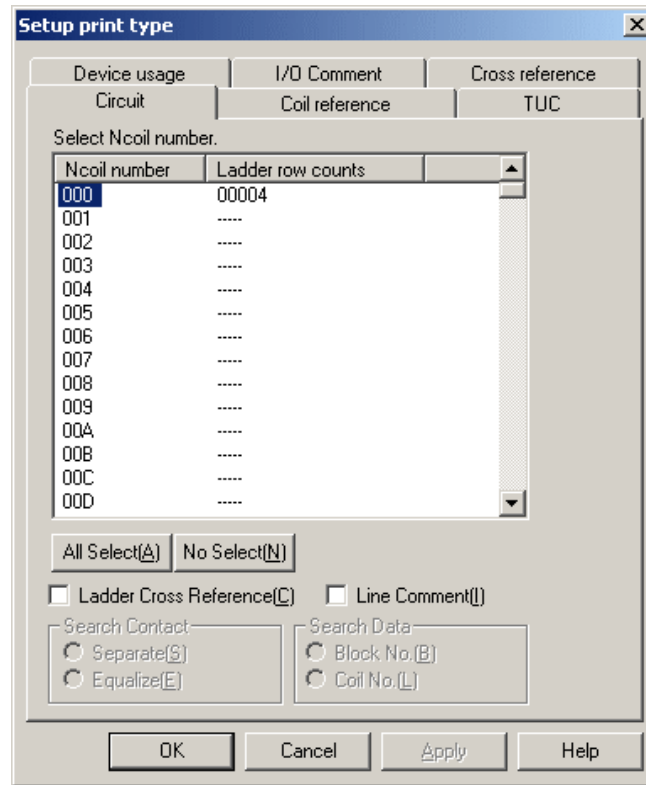


Figure 4-12 [Setup print type] Window

- ③ Check the type(s) of devices you want to print (and display in a preview). All device types with a check mark will be printed (and displayed in a preview).

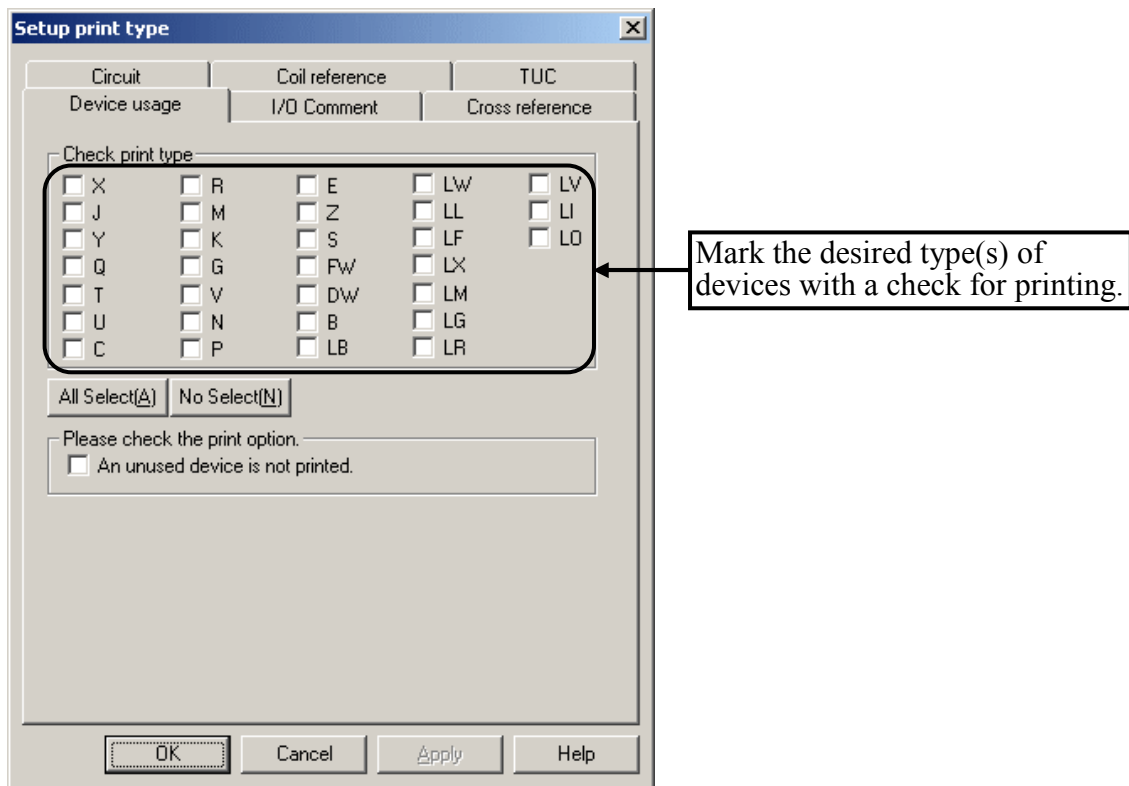


Figure 4-13 [Device usage] Tab of the [Setup print type] Window -- Example 1

In this window, if you click the **All Select** button, a check mark will be entered in every displayed check box at once. If you want to remove all the check marks from the displayed check boxes at once, click the **No Select** button in place of [All Select]. If you click the **All select** button in the [Setup print type] window, check-marks will be automatically entered in the checkboxes of all the types of devices that can be subjected to list printing or displaying in a preview. If you click the **No select** button in that same window, any check marks already entered will be removed from the checkboxes of all the types of devices that can be subjected to list printing or displaying in a preview.



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<Setting for excluding any type(s) of devices currently not used from printing>

There may be cases where you want to print (and display in a preview) only the types of devices that are used in the ladder program currently open and that are included among those selected to be printed (and displayed in a preview). In these cases, as shown below, check the [An unused device is not printed.] check box that is provided as a print option.

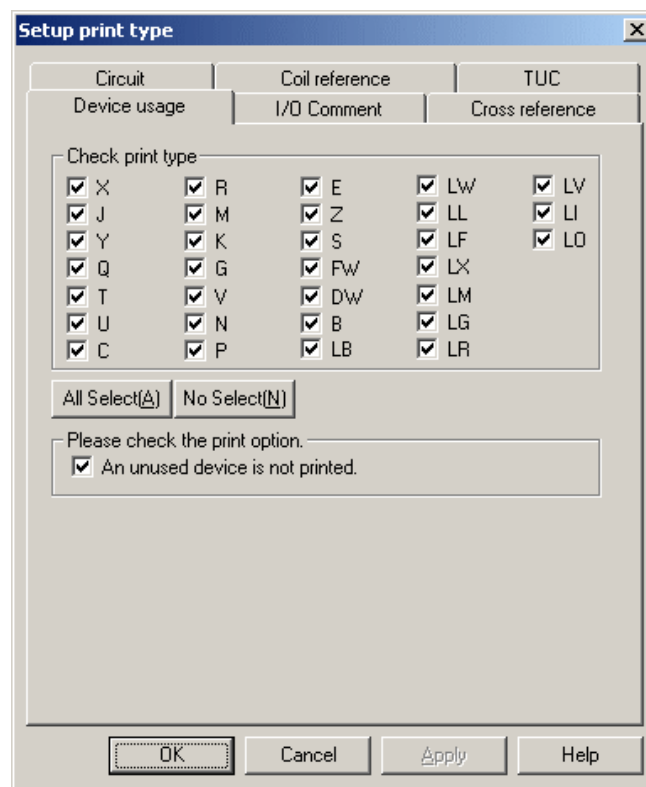


Figure 4-14 [Device usage] Tab of the [Setup print type] Window -- Example 2

For example, if you check the [An unused device is not printed.] check box in the above window and the “J” and “Q” registers are not used in the ladder program, then the “J” and “Q” registers will be excluded from printing (and displaying in a preview).

The check boxes and print option in the [Setup print type] window, once selected, will remain selected until you deselect them. (This is true even when the ladder chart system is restarted.)

- ④ Click one of the following buttons in the [Setup print type] window:

button: Sets the type(s) of devices that you have selected in the [Device usage] tab, and closes the [Setup print type] window.

button: Ignores the type(s) of devices that you have selected in the [Device usage] tab, and closes the [Setup print type] window.

<Printing a list of the devices currently used>

- ⑤ Click [File] - [Print] - [Device usage] from the menu bar in the main window. The [Print] window will then appear. If you click the  button in the [Print] window, the [Print] window will close and a list of the currently used devices will print on the printer. If you click the  button instead in the [Print] window, the [Print] window will close but no such list will print on the printer.

<Displaying a list of the currently used devices in a preview>

- ⑥ Click [File] - [Print preview] - [Device usage] from the menu bar in the main window. The [Print Preview] window will then appear. Click one of the following buttons in the preview window:

: Prints the displayed preview.

: Displays the next page of the preview.

: Displays the previous page of the preview.

: Displays the preview in units of two pages.

: Displays the preview in units of one page.

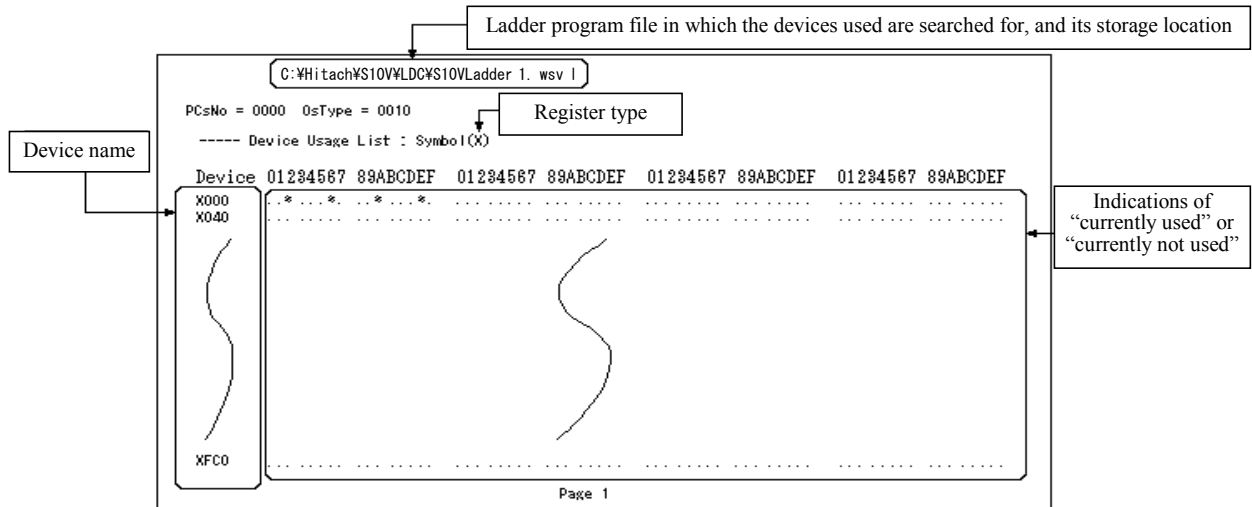
: Displays an enlarged image of the preview.

: Displays a reduced image of the preview.

: Closes the preview window.

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### (3) How to read the printed list or displayed preview



#### Register type:

Identifies the type or one of the types of register selected. This type of register is one that has been selected in the [Setup print type] window for list printing or display in a preview.

#### Indications of "currently used" or "currently not used":

An indication of "currently used" is made by an asterisk ("\*") if a given register is used one or more times in the ladder circuit.

If the register is not used at all in the ladder circuit, however, this status is indicated by a period (".").

### (4) Other information

- The CR, CU, and CD registers are all listed in the printed or displayed list as C0 registers.
- The NM and NZ registers are all listed in the printed or displayed list as N0 registers.

### 4.3 Ladder Sheet Editing Functions

The ladder sheet editing functions are contained in the ladder symbol bar or [Edit] pull-down menu. The basic procedure for using ladder sheet editing functions is as follows:

- (1) Select a ladder symbol template (e.g., an A contact), specify a position into which you wish to paste it, and then paste the symbol.
- (2) Set parameters for the pasted symbol.
- (3) Repeat Steps (1) and (2) above, or edit the ladder sheet by specifying an individual line or a range of lines.

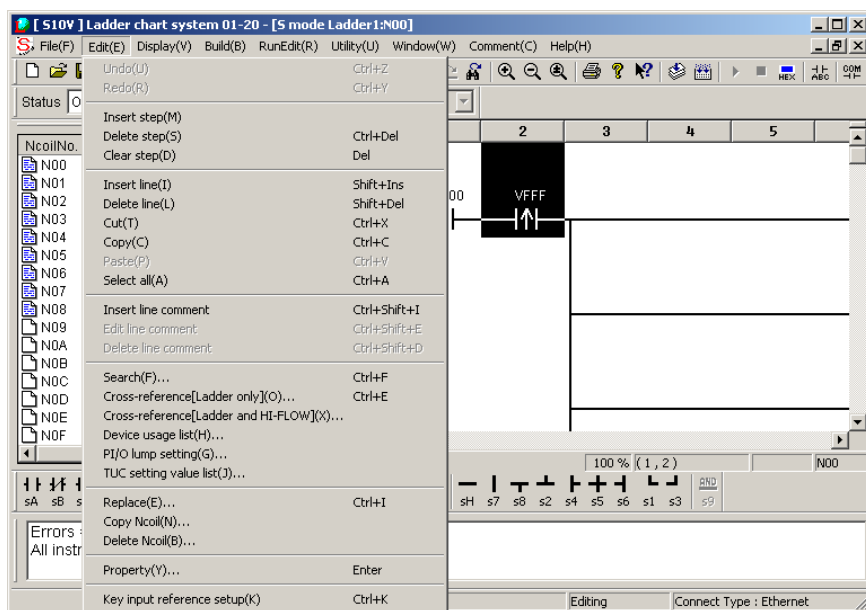


Figure 4-15 Clicking the [Edit] Option

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The editing functions provided in the [Edit] menu are listed below along with their descriptions.

Table 4-3 [Edit] Menu Options

No.	Level 1	Level 2	Level 3	Description
1	Edit	Undo		Reverses the last operation performed.
2		Redo		Repeats the last operation performed.
3		Insert step		Adds an empty step to a specified position.
4		Delete step		Deletes a specified step and moves the step(s) which follow to the left to fill the empty space after the deletion.
5		Clear step		Clears the contents of a specified step.
6		Insert line		Adds a new line before a specified line position.
7		Delete line		Deletes a specified line.
8		Cut		Removes a selected range and copies it to the clipboard.
9		Copy		Copies a selected range to the clipboard.
10		Paste		Pastes the content of the clipboard into a specified position.
11		Select all		Selects the entire circuit being displayed on the screen.
12		Insert line comment		Inserts a new line comment into the currently open ladder program file.
13		Edit line comment		Edits a selected line comment in the currently open ladder program file.
14		Delete line comment		Deletes a selected line comment from the currently open ladder program file.
15		Search		Searches the current open N coil for a specified symbol.
16		Cross-reference [Ladder only]		Searches a specified ladder program file for all symbols using a specified symbol.
17		Cross-reference [Ladder and HI-FLOW]		Searches both a specified ladder and a specified HI-FLOW program file for all symbols using a specified symbol.
18		Device usage list		Displays status information indicating whether selected hardware devices are currently used or not.
19		PI/O lump setting		Changes all the assigned registers of symbols at a time.
20		TUC setting value list		Presents a list of all the set values of existing TUC registers you have selected, and allows their editing.
21		Replace		Replaces every occurrence of a specified string of characters with a new one in all the existing N coils.
22		Copy N coil		Copies a specified N coil.
23		Delete N coil		Deletes a specified N coil.
24		Property		Sets properties.

The symbols that can be used in editing are contained in the ladder symbol bar:



Figure 4-16 Ladder Symbol Bar

The names of the symbol templates running from left to right in the ladder symbol bar are as follows:

- A-contact
- B-contact
- Rising-edge contact
- Falling-edge contact
- NOT
- Comparison (EQU)
- Comparison (NEQ)
- Comparison (LT)
- Comparison (GT)
- Comparison (LE)
- Comparison (GE)
- Coil
- Set coil
- Reset coil
- Function
- Loopback

All the symbols other than the above are branch symbols.

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### 4.3.1 Pasting ladder symbols into the sheet

Ladder symbols can be pasted into the sheet by more than one method. You can select the method you like.

#### (1) Pasting to the symbol cursor position by using the mouse

Clicking a symbol template in the symbol bar pastes the selected symbol to the position of the symbol cursor in the sheet.

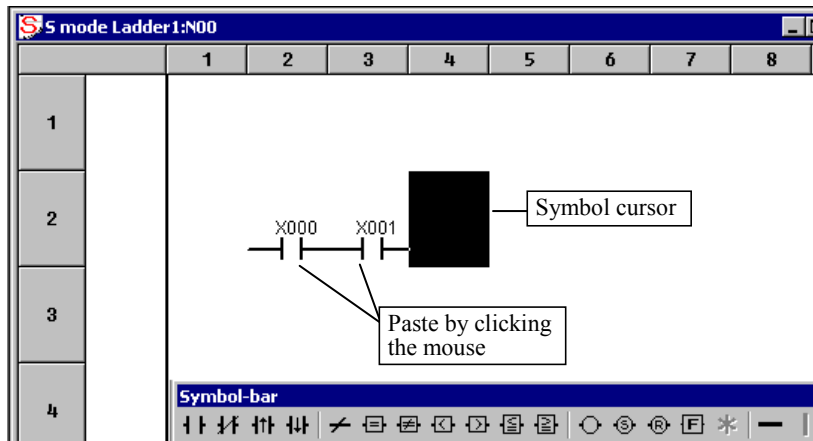


Figure 4-17 Pasting a Ladder Symbol

#### (2) Pasting by operating keyboard keys

Carrying out a selected key operation pastes its associated symbol to the position of the symbol cursor in the sheet. The symbol cursor can be moved by operating the [←], [→], [↑], and [↓] keys on the keyboard and each defined key operation can be customized at your own discretion (by clicking [Keyboard] from the [Utility] menu).

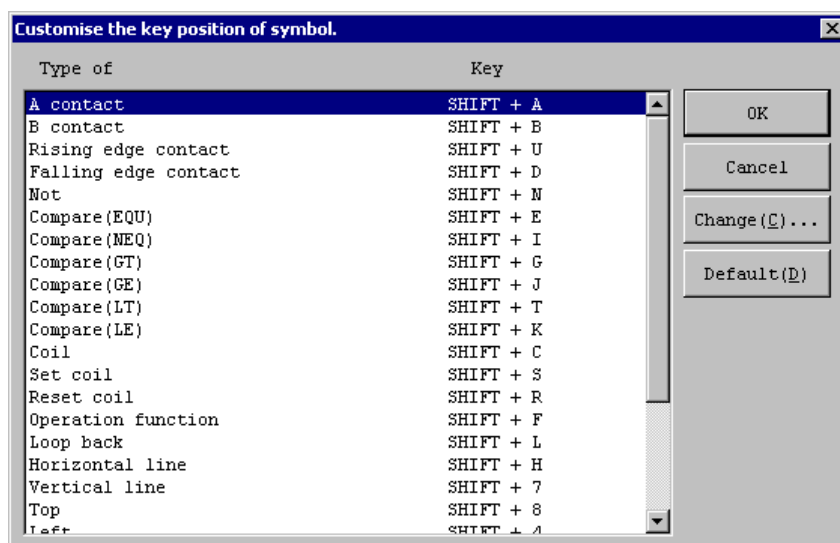


Figure 4-18 [Customize the key position of symbol] Window

## (3) Input boxes displayed

When a symbol is pasted into the sheet, the parameter input box will be automatically displayed on the screen. For existing symbols, the parameter input box can be opened by double-clicking the symbol or by moving the symbol cursor to the symbol and hitting the [Enter] key.

Parameter input box for contacts:

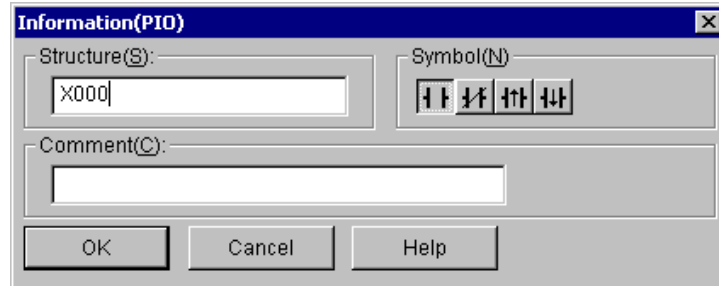


Figure 4-19 [Information (PIO)] Window

In this input box, you can enter the syntactical structure of a contact and a comment. You can also change the symbol to some other type of contact, which is one of the A, B, and edge ( $\uparrow$  and  $\downarrow$ ) contacts.

Parameter input box for functions:

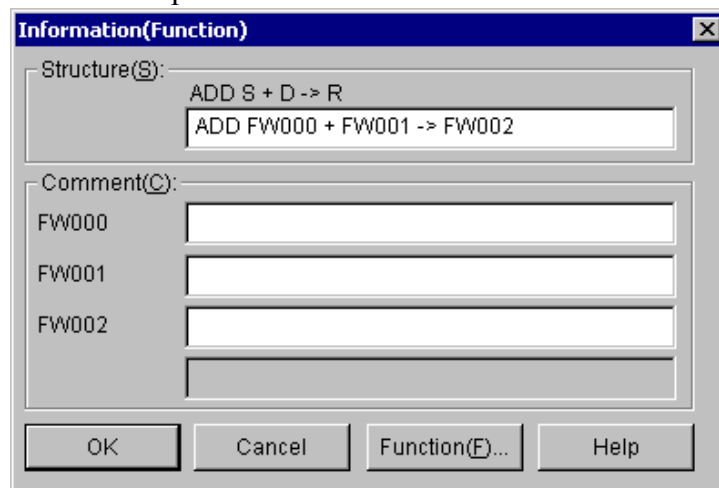


Figure 4-20 [Information (Function)] Window

In this input box, you can enter the syntactical structure of a function and comments for the parameters. The syntactical structure can be entered according to the format that is presented when the name of the function is entered (symbols should be delimited from each other by a space character, and the assignment symbol may be either “->” or “=”).



Parameter input box for comparisons:

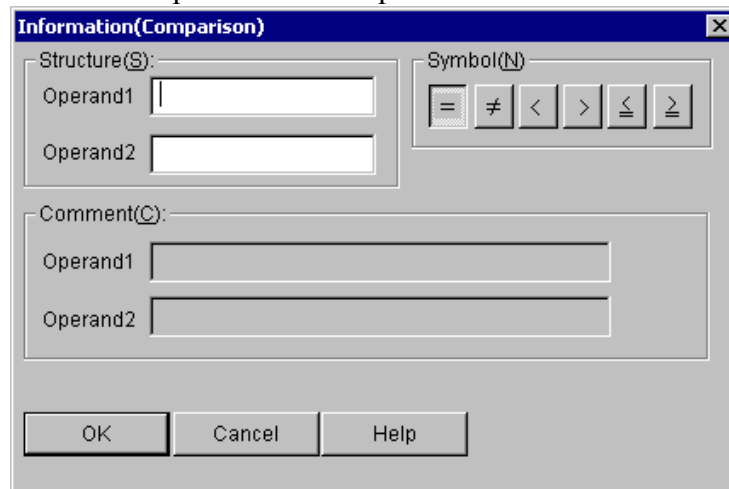


Figure 4-21 [Information (Comparison)] Window

This input box allows you to enter the syntactical structure of a comparison and comments for the parameters. It also allows you to change the symbol to some other type of comparison operator, which is one of the EQU (equal to), NEQ (not equal to), GT (greater than), LT (less than), GE (greater than or equal to), and LE (less than or equal to) operators.

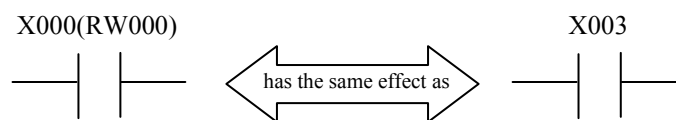
(4) Specifying indices

You can index any register that is used as a parameter for an A contact, B contact, edge contact, coil, comparison, or a system function. This indexing can be accomplished by using one of the following formats:

① “Base register (index register)” format

This indexing format can be used in conjunction with the following 10 types of ladder symbol: A contact, B contact, rising-edge contact, falling-edge contact, normal coil, set coil, reset coil, comparison, and system function. Of these symbols, the normal coil may not be used with an indexed register if its register (base) has one of the register symbols T, U, C, N, and P.

Example: If you wish to use the X000 for an A contact as its base register and the RW000 as its index register, specify the indexed register as shown below. If the content of RW000 is 3, this indexed register has the same effect as a non-indexed register X003 that would otherwise be specified for the A contact.



Notes:

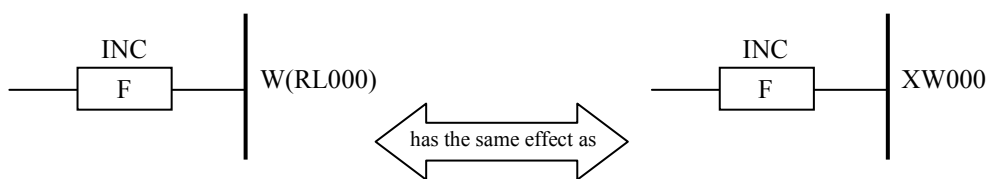
- The only type of register that can be specified as an index register is word. No other type may be used as an index register.
- There is no limitation on the type of register symbol that can be specified as an index register.
- The content of an index register must be within the range -32768 to 32767.
- If the register symbol used is BW, the register may not be indexed.
- There is no limitation on the type of register that can be specified as a base register.

② “Reference (indirect register)” format

This format can be used only with system functions. The reference identifies a sequence of locations and the content of the indirect register determines the location to be accessed among the referenced locations. The reference is one of the letters W, L, and F, as used in the following variations of this format:

- (a) For word-type references: W (indirect register)
- (b) For long-word-type references: L (indirect register)
- (c) For single-precision floating-point type references: F (indirect register)

Example: The figure below shows an example of the INC system function’s parameter specified in this format. The parameter uses RL000 as the indirect register and references a word-type location. If the content of RL000 indicates the location of XW000, then the reference has the same effect as INC’s parameter for which XW000 would otherwise be specified directly, as shown below (right).



Notes:

- The only type of register that can be specified as an indirect register is long word. No other type may be used as an indirect register.
- There is no limitation on the type of register symbol that can be specified as an indirect register.
- The content of an indirect register may specify addresses within the range 0x00000000 to 0xFFFFFFFF.
- If the register symbol used is BL, the register may not be indexed (with an indirect register).

### 4.3.2 Searching for ladder symbols

#### (1) Outline of symbol search

The ladder symbol search function searches the currently active ladder sheet to find the ladder symbol specified in the “String for search” and “Target for search” boxes in the [Search character string] window (see Figure 4-22). For details of the target for search, see item (5), “Target for search.”

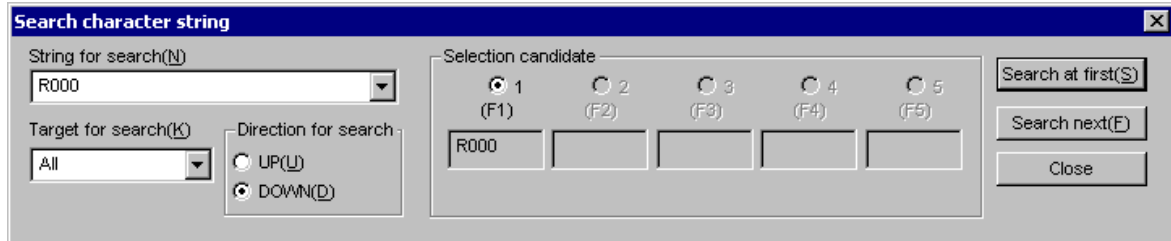


Figure 4-22 [Search character string] Window

When a matching ladder symbol is found, the cursor moves to the position of the ladder symbol found on the ladder sheet.

When the active ladder sheet is searched to the end, the message dialog box shown in Figure 4-23 appears.

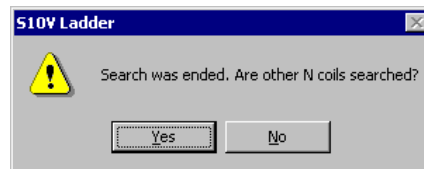


Figure 4-23 Dialog Box Asking Whether to Search Other N Coils

Clicking the **Yes** button starts searching the next N coil. When a matching string is found, the ladder sheet is switched automatically and the cursor moves to the position of the string found. After all N coils (256 coils) are searched, a message dialog box then appears to show the search result (see Figures 4-24 and 4-25).

Clicking the **No** button ends the search and displays a message dialog box to show the search result (see Figures 4-24 and 4-25).



Figure 4-24 Message Dialog Box Displayed after Fully Searching the Ladder Sheet



Figure 4-25 Search Result Message Dialog Box Displayed When Not Finding Matching Ladder Symbol

Clicking the  or  button closes the [Search character string] window.

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### (2) How to call the [Search character string] window

You can call [Search character string] window in any of the five ways described below.

- Calling from a menu in the main window

Click [Search] from the [Edit] menu in the main window.

- Calling from the tool bar in the main window

Click “Search” on the tool bar in the main window.

- Calling from the pop-up menu displayed by right-clicking

Place the mouse pointer on the ladder sheet, right-click to display the pop-up menu, and then click “Search” from the menu.

- Calling by standard key input

When [Key input reference setup] on the [Edit] menu is enabled (with a check mark displayed) (see Figure 4-26), the [Search character string] window can be called by standard key input. With the key input reference setup function enabled, pressing a standard key (alphanumeric key only) while the cursor is blinking on the ladder sheet displays the character corresponding to the pressed key in the “String for search” box in the [Search character string] window.

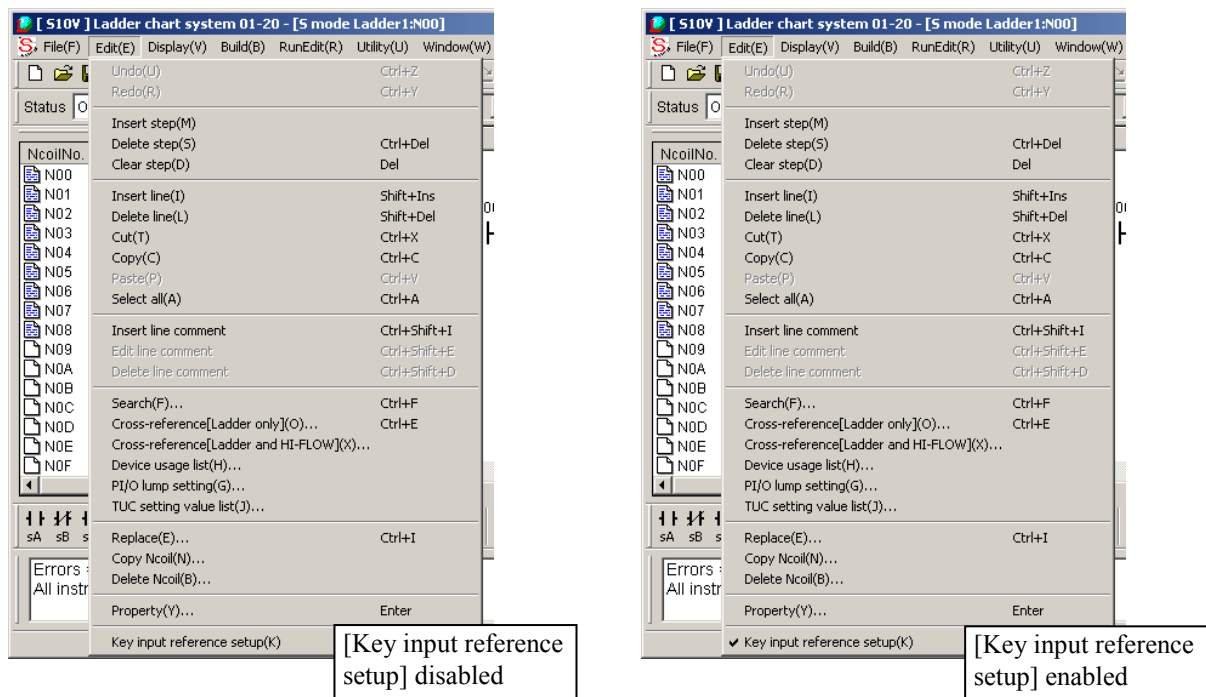


Figure 4-26 Key Input Reference Setup

- Calling by shortcut key operation

Press the [Ctrl] + [F] keys as a shortcut for calling the [Search character string] window.

## (3) Default of the string for search

If the ladder symbol at the current cursor position on the ladder sheet is one of the components listed below when calling the [Search character string] window, the register name corresponding to the ladder symbol appears in the “String for search” box in the [Search character string] window. (Specifying a register with an index register for the register name displays both the register name and index register name.)

- A-contact
- B-contact
- Rising-edge contact
- Falling-edge contact
- Normal coil
- Set coil
- Reset coil

For a ladder symbol indicating an operation function (also called an arithmetic function), the operation function name will appear in the “String for search” box in the [Search character string] window. For a ladder symbol indicating comparison (EQU, NEQ, LT, GT, LE, or GE), the first parameter of the comparison symbol (along with an index register name if it has an index register) will appear in the “String for search” box in the [Search character string] window.

For ladder symbol indicating a connection line, NOT, or loopback, blanks will appear in the “String for search” box in the [Search character string] window.

## (4) Selecting the string for search

You can enter a string directly in the “String for search” box and also select a string used previously (see Figure 4-27). Up to 10 of the latest strings used previously are stored automatically. Specifying a new string as the eleventh string deletes the oldest string among those stored in memory.

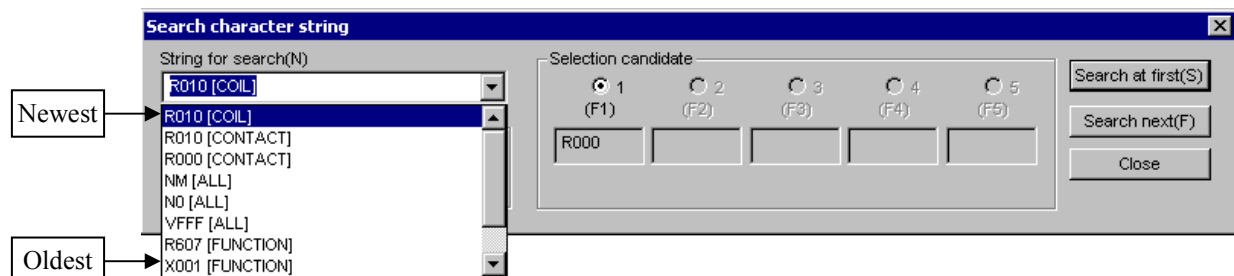


Figure 4-27 Selecting the String for Search

### (5) Target for search

The string specified in the “String for search” box is searched for under the condition selected in the “Target for search” box. (For example, when “Coil” is selected as the target for search, only the coils [normal, set, and reset coils] are searched to find the string specified in the “String for search” box.) You can select a target for search from among six kinds: Coil, Contact, Coil & Contact, Function, Comparison, and All. At system startup, the default setting is “All”. When the [Search character string] window subsequently opens, the default is the target for search specified for the preceding search operation.

Coil: Searches normal, set, and reset coils to find a matching string (i.e., register name).

Contact: Searches a-, b-, rising-edge, and falling-edge contacts to find a matching string (i.e., a register name).

Coil & Contact: Searches coils and contacts to find a matching string (i.e., a register name).

Function: Searches operation functions to find a matching string (i.e., an operation function name and a register name).

Comparison: Searches comparison symbols (EQU, NEQ, LT, GT, LE, and GE) to find a matching string (i.e., a register name and a constant).

All: Searches all of the above coils, contacts, operation functions, and comparison symbols to find a matching string.

## (6) Direction for search

You can select the direction for search from “DOWN” and “UP” (see Figure 4-28).

The default setting is “DOWN” (with the [DOWN] radio button in the [Direction for search] group box selected).

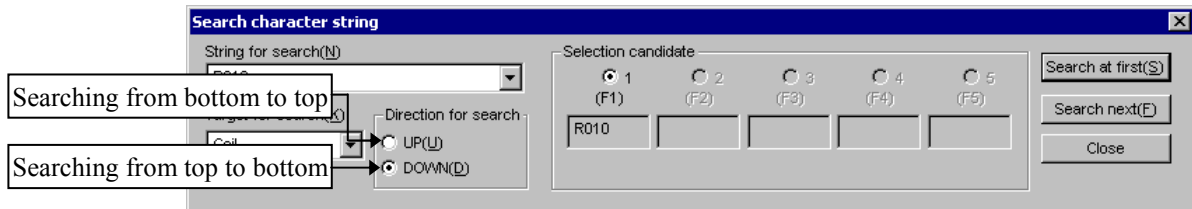


Figure 4-28 Direction for Search

UP: Searches symbols in descending order of ladder circuit numbers. On the same line, symbols are searched from right to left.

Clicking the  button starts searching in the upward direction from the last ladder circuit line .

Clicking the  button starts searching in the upward direction from the current cursor position in the ladder circuit.

DOWN: Searches symbols in ascending order of ladder circuit numbers. On the same line, symbols are searched from left to right.

Clicking the  button starts searching in the downward direction from the first ladder circuit line .

Clicking the  button starts searching in the downward direction from the current cursor position in the ladder circuit.



### (7) Selection candidate

When the [Search character string] window opens, register and/or operation function names are shown in the candidate boxes (candidate 1, candidate 2,..., candidate 5 [from left to right]) in the [Selection candidate] group box. The names shown in the candidate boxes depend on the ladder symbol where the cursor is positioned when the [Search character string] dialog box opens (see Table 4-4). The names shown in the candidate boxes do not change automatically according to the ladder symbol at the cursor position during searching. Figure 4-29 shows an example of displaying candidate names in the candidate boxes under “Selection candidate” based on the assumption that the cursor is currently positioned at operation function “ADD DW000 + DW001 → DW002”.

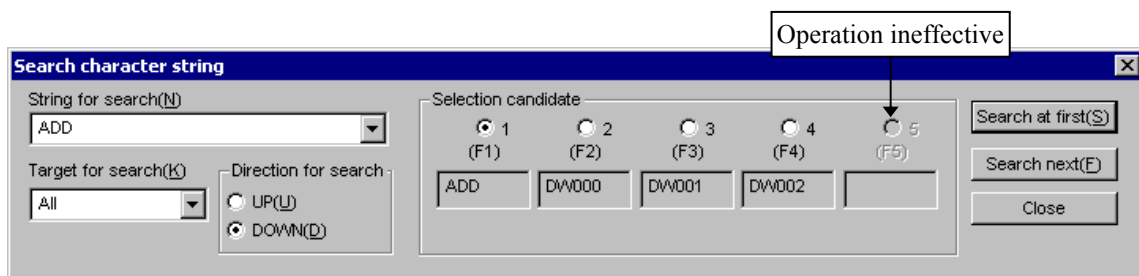


Figure 4-29 Example of Name Display in Candidate Boxes under “Selection Candidate”

The radio button (hereinafter called a “candidate box selection button”) above a selectable candidate box can be used to select the candidate box. Clicking the candidate box selection button also displays the name shown in the corresponding candidate box in the “String for search” box. The candidate box selection button above a non-selectable candidate box is ineffective.

You cannot enter data in the read-only candidate boxes.

Table 4-4 Candidate Data for the Ladder Symbols at Current Cursor Positions

Ladder symbol	Candidate 1	Candidate 2	Candidate 3	Candidate 4	Candidate 5
Contact (*1)	Register name (*4)	–	–	–	–
Coil (*2)	Register name (*4)	–	–	–	–
Comparison symbol	Register name (*4)	Register name (*4) or constant	–	–	–
Operation function	Operation function name	Register name (*5)	Register name (*5)	Register name (*5)	Register name (*5)
Other (*3)	Previously searched string	–	–	–	–

(\*1) A contact indicates an a-, b-, rising-edge, or falling-edge contact.

(\*2) A coil indicates a normal, set, or reset coil.

(\*3) Others indicate a connection line (horizontal line, vertical line, top, bottom, left, intersection, right, or lower left), no symbol, or circuit end mark.

(\*4) A register name is displayed with an index register name if the register has an index register.

(\*5) A register name is displayed with an index register name if the register has an index register. If the operation function indicates a constant, the constant is displayed. Since the number of parameters varies depending on the operation function, blanks (indicating that the candidate boxes are non-selectable) appear in the candidate boxes for which parameters are omitted. When displayed, parameters are left-justified on the line of candidate boxes.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (8) Fuzzy searching

If a question mark (?) is included in the string specified in the “String for search” box, the wild card character substitutes for a character of the string. You can specify one or more wild card characters in the “String for search” box. This system does not support the wild card character “\*”, which indicates multiple characters. (For example, to search for all register names that include character “X”, you need only specify “X” to search for X000 to XFFF without specifying “X\*”.)

The following shows an example of fuzzy search using wild card character “?”.

If the string specified in the “String for search” only consists of “?”, fuzzy searching will not be performed; standard search will be performed instead. (The string of question marks “?” will be searched for.)

(Example) Searching the ladder circuit to find contacts X010, X020, X030, X040, X050, X060, X070, X080, X090, X0A0, X0B0, X0C0, X0D0, X0E0, and X0F0 (see Figure 4-30.)

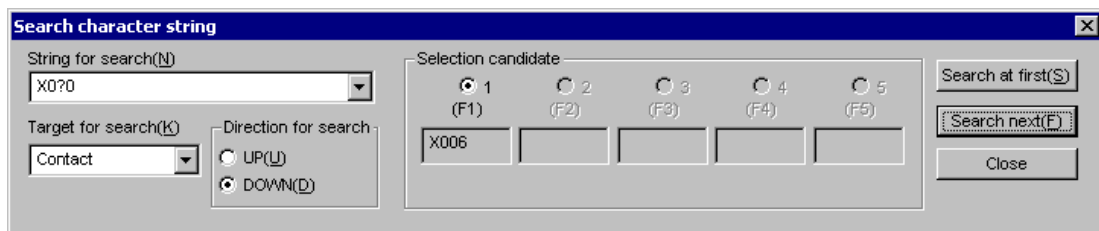
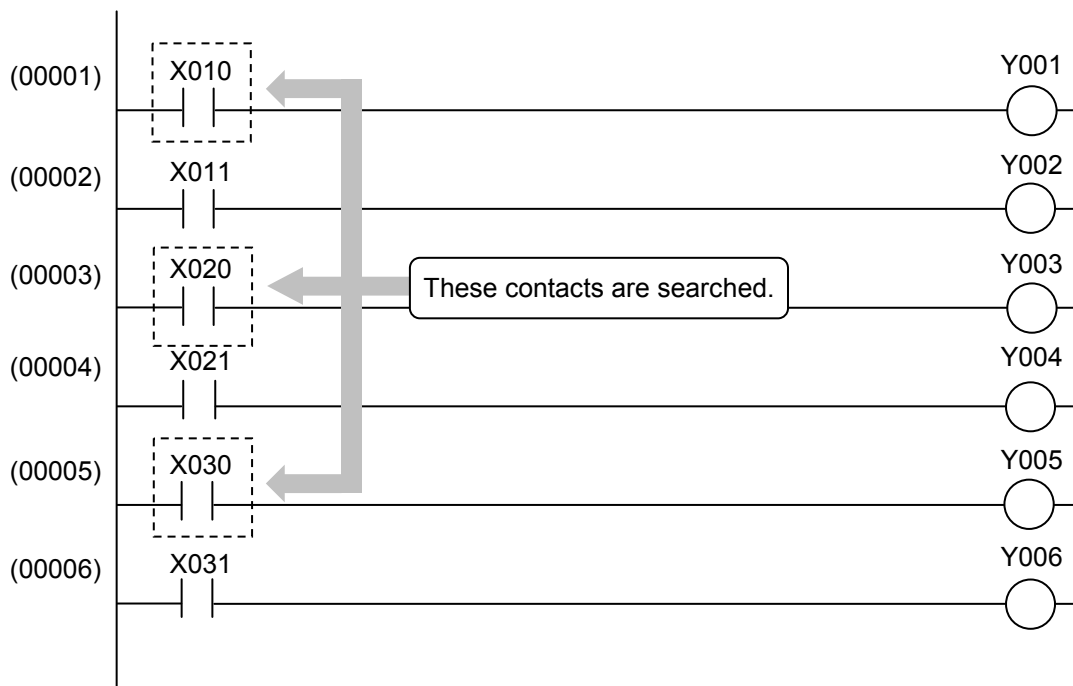


Figure 4-30 Example of Fuzzy Searching



## 4.3.3 Cross-referencing ladder only

## (1) Outline of cross reference

The cross-reference function searches all N coils (256 N coils) to find the symbols that use a specified symbol name, and displays the search result in a list (see “Display information” below). You can also select arbitrary information in the search result list (see ② of Item (5), “Operation”), and move the cursor to the relevant symbol on the ladder sheet corresponding to the information selected.

The output coil of the relevant circuit is also displayed only when the symbol found by searching is an a- or b-contact.

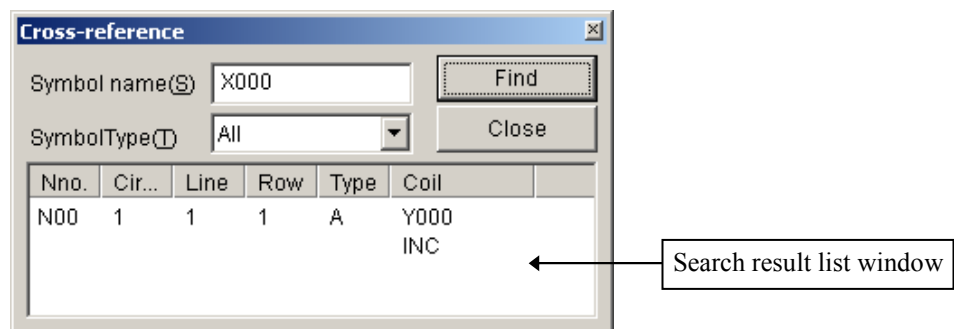


Figure 4-31 [Cross-reference] Window

## [Display information]

Nno.: N coil number of the symbol found

Circuit: Circuit number in the N coil of the symbol found

Line: Line number in the N coil of the symbol found

Row: Row number in the N coil of the symbol found

Type: Type of symbol found (see Table 4-5.)

Coil: Output coil of the circuit found by searching with a contact specified

Table 4-5 List of Types

No.	Symbol	Meaning
1	A	A-contact
2	B	B-contact
3	U	Rising-edge contact
4	D	Falling-edge contact
5	C	Coil
6	S	Set coil
7	R	Reset coil
8	F	Operation function
9	CEQ	Comparison (EQU)
10	CNE	Comparison (NEQ)
11	CLT	Comparison (LT)
12	CGT	Comparison (GT)
13	CLE	Comparison (LE)
14	CGE	Comparison (GE)
15	L	Label

(2) How to call the [Cross-reference] window

You can call [Cross-reference] window in one of the three ways described below.

- Calling from a menu in the main window

Select [Cross-reference] from the [Edit] menu. The [Cross-reference] window (see Figure 4-31) is then displayed.

- Calling from a popup menu

Move the mouse pointer to a desired place in the ladder sheet displayed on the screen and right-click the mouse to display a popup menu. From the displayed popup menu, select [Cross-reference [Ladder only]]. The [Cross reference] window (Figure 4-31) is then displayed.

- Calling by shortcut key operation

Press the [Ctrl] + [E] keys as a shortcut. The [Cross-reference] window (see Figure 4-31) is then displayed.

### (3) Default of symbol name

If the ladder symbol at the current cursor position on the ladder sheet is one of the components listed below when calling the [Cross-reference] window, the register name corresponding to the ladder symbol appears in the “Symbol name” box in the [Cross-reference] window. (Note that, even when a register with an index register is specified, the index register name is not shown.)

- A-contact
- B-contact
- Rising-edge contact
- Falling-edge contact
- Normal coil
- Set coil
- Reset coil

For a ladder symbol indicating an operation function, the operation function name will appear in the “Symbol name” box in the [Cross-reference] window. For a ladder symbol indicating comparison (EQU, NEQ, LT, GT, LE, or GE), the first parameter of the comparison symbol will appear (without an index register name even if it has an index register) in the “Symbol name” box in the [Cross-reference] window.

For a ladder symbol indicating a ruled line, NOT, or loopback, blanks will appear in the “Symbol name” box in the [Cross-reference] window.

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### (4) Symbol type

The string specified in the “Symbol name” box is searched for under the condition selected in the “SymbolType” group box. (For example, when “Coil” is selected as the symbol type, only the “All” kinds of coils [normal, set, and reset coils] are searched to find the string specified in the “Symbol name” box.)

You can select the symbol type from among the seven listed below. The default setting is “All”.

Symbol type	Description
Contact	Searches the register names of a- and b-contacts in all N coils to find the register name that matches the register name specified in the “Symbol name” box. When a matching register name is found, the N coil number, circuit number, line number, row number, type, and output coil (e.g., normal coil, set coil, reset coil, operation function name) corresponding to the symbol found are displayed.
Edge	Searches the register names of rising-edge and falling-edge contacts in all N coils to find the register name that matches the register name specified in the “Symbol name” box. When a matching register name is found, the N coil number, circuit number, line number, row number, and type corresponding to the symbol found are displayed (without output coil information).
Coil	Searches the register names of normal, set, and reset coils in all N coils to find the register name that matches the register name specified in the “Symbol name” box. When a matching register name is found, the N coil number, circuit number, line number, row number, and type corresponding to the symbol found are displayed (without output coil information).
Label	Searches the labels in all exiting N coils to find the label that matches the label name specified in the “Symbol name” box. When a matching label is found, the N coil number, circuit number, row number, column number, type, and output coil corresponding to the label found are displayed.
Function	Searches the operation function names and register names of operation function parameters in all N coils to find the register name that matches the register name specified in the “Symbol name” box. When a matching register name is found, the N coil number, circuit number, row number, column number, and type corresponding to the symbol found are displayed (without output coil information).
Index/Comp	Searches the index register names and register names of comparison symbol parameters in all N coils to find the register name that matches the register name specified in the “Symbol name” box. When a matching register name is found, the N coil number, circuit number, row number, column number, and type corresponding to the symbol found are displayed (without output coil information).
All	Searches the register names (including index register names) and operation function names in all N coils to find the name that matches the register name specified in the “Symbol name” box. When a matching string is found, the N coil number, circuit number, row number, column number, type, and output coil corresponding to the symbol found are displayed (along with output coil information only when the matching symbol is an a- or b-contact).

## (5) Operation

## ① Performing cross-reference operation

Enter a symbol name (you can omit the entry when using the default symbol name) in the “Symbol name” box, select a symbol type in the “SymbolType” group box, and then click the  button to perform cross reference. When a string that matches the specified symbol name is found, the relevant cross-reference information appears in the search result list in the [Cross-reference] window (see Item (4), “Symbol type”). If no matching symbol is found, the message dialog box shown below then appears.



Figure 4-32 Message Dialog Box Displayed When Not Finding Matching Symbol

## ② Moving the cursor to a symbol found

Select cross-reference information in the search result list in the [Cross-reference] window, and then double-click on the selected cross-reference information. The cursor then moves to the corresponding symbol on the ladder sheet.

## ③ Closing the [Cross-reference] window

Click the  or  button in the [Cross-reference] window. The [Cross-reference] window then closes.

Cross-referencing LADDER only is not usable when you are editing your program. It can be used only when you have compiled the program.





Description of the displayed result:

■ Cross-Referencing of Ladder

“N no.”: Each is the coil number of the N coil in which an instance of the specified symbol is found.

“Circuit”: Each is the circuit number of the circuit in which an instance of the specified symbol is found within the N coil.

“Line”: Each is the line number of the line in which an instance of the specified symbol is found within the circuit of the N coil.

“Row”: Each is the column number of the column in which an instance of the specified symbol is found within the circuit of the N coil.

“Type”: Each indicates the type of a found instance (see Table 4-5).

“Coil”: Each, displayed only when the specified symbol type is contact or label, is the output coil of the circuit in which an instance of the specified symbol is found.

■ Cross-Referencing of HI-FLOW

“process”: Each is the process number of a searched PI/O process.

“PI/O”: Each is the register name of a found PI/O register instance.

“Step”: Each is the step number of a step (symbol) in which the found PI/O register instance is present.

“Comment”: Each is a comment given to the found PI/O register instance.

(4) Operation method

① Specifying a symbol name

In the “Symbol name” edit box, specify as a search key a PI/O register name (e.g., X000) for which to obtain cross-reference information. If nothing is specified in the edit box, all existing PI/O registers are assumed by default.

② Specifying what to search in ladder

- “File name”: An edit box in which to specify a ladder program file, or a wsvl file, to be searched for cross-reference information.

- “SymbolType”: An edit box in which to specify (select) a type of “relay”, such as contact, coil, or edge, to be searched for cross-reference information. For information on the symbol type you can specify, see “(4) Symbol type” in Subsection 4.3.3, “Cross-referencing ladder only.”

③ Specifying what to search in HI-FLOW

- “File name”: An edit box in which to specify a HI-FLOW program file, or an hifv file, to be searched for cross-reference information.

- “All process” or “Specified process”:

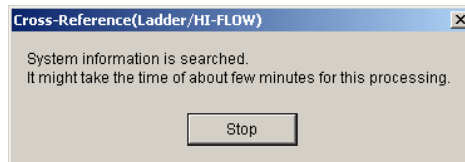
Each is a radio button that is selected to specify a process, a range of processes, or all existing processes to be searched for cross-reference information.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

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### ④ Searching for cross-reference information

To search for cross-reference information, click the **Find** button. Then, the search process starts, displaying the message shown below. If you want to stop the search process in progress, click the **Stop** button in the dialog box.



### ⑤ Search result displayed

If any instance(s) of the specified symbol are found, they will be displayed in a list form. Otherwise, nothing will be displayed.

### ⑥ Sorting the search result (only in HI-FLOW)

To sort the search result, click any one of the column titles (“proc...”, “PI/O”, “Step”, or “Comment”) of the search result list pane. Then, the search result is sorted in terms of the selected column title.

### ⑦ Displaying the program

Click a desired line of cross-reference information in the search result. Then, the corresponding step in the program appears on the screen.

By default, the [Cross-Reference (Ladder/Hi-Flow)] dialog box is displayed foremost. If you want to view the whole display of the corresponding step, deselect the [Foremost] check box.

At the end of Step ⑦, you can repeat Steps ① through ④ to make another search.

- Cross-referencing both ladder and HI-FLOW is not usable when you are editing your program. It can be used only when you have compiled the program.
- The requested search of a specified file is started only when the Ladder Chart or HI-FLOW system is up and running. If they are not up and running, or the ladder or HI-FLOW program file to be searched is not displayed on-screen yet, then the requested search of that program file will be started upon the completion of their start.
- Cross-referencing both ladder and HI-FLOW is not available if the installed ladder chart system is not of Ver-Rev 02-05 or later.

### 4.3.5 Name replacement

#### (1) Outline of name replacement

The name replacement function searches for symbols of the specified target type (coil, contact, or operation function) in the target N coil(s), those symbols that use the old name specified in the “Source” box, and then replaces the old name of the specified number (/1 to /100) of the symbols found with the new name specified in the “Destination” box. You can also move comments simultaneously with name replacement.

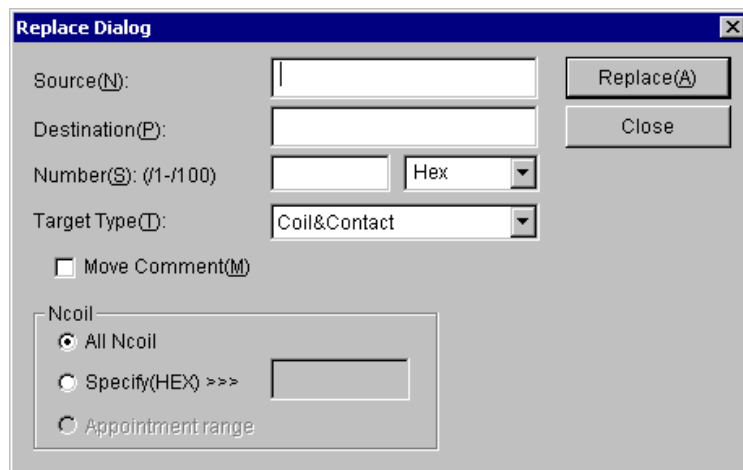


Figure 4-34 [Replace Dialog] Window

Enter values in the “Source”, “Destination”, and “Number” boxes, select a target type in the “Target Type” box, and then click the **Replace** button. The message dialog box shown in Figure 4-35 then appears.

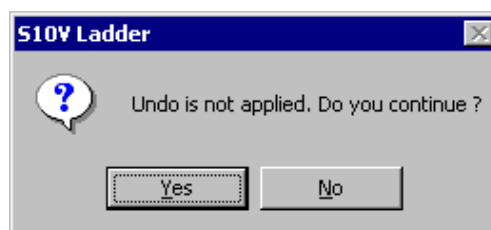


Figure 4-35 Message Dialog Box Asking Whether to Execute Name Replacement

Clicking the **Yes** button starts name replacement in the target N coil(s). When name replacement ends, a message dialog box then appears to show the search result (see Figure 4-36).



Figure 4-36 Message Dialog Box to Indicate the Normal End of Name Replacement

Clicking the  button with the checkbox for [Move comment] selected displays the message dialog box shown in Figure 4-35. Clicking the  button in the dialog box displays a dialog box for confirming the moving of a comment as shown in Figure 4-37.

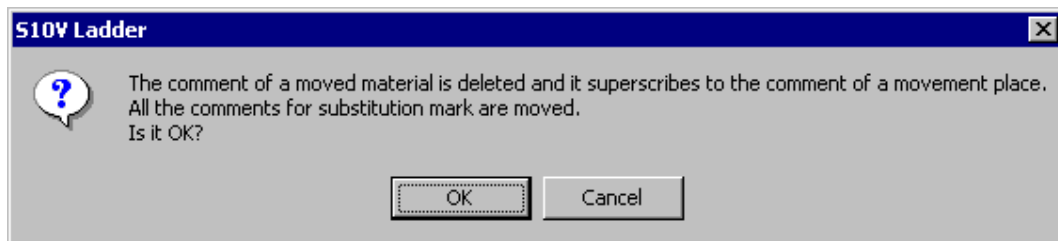


Figure 4-37 Message Dialog Box Asking Whether to Move the Comment

Clicking the  button starts name replacement (and moving of a comment) in the target N coil(s). When name replacement ends, a message dialog box then appears to show the search result (see Figure 4-36).

(2) How to call the [Replace Dialog] window

You can call the [Replace Dialog] window in one of the two ways described below.

- Calling from a menu in the main window

<Operation>

Click [Replace] from the [Edit] menu. The [Replace Dialog] window (see Figure 4-34) is then displayed.

- Calling by shortcut key operation

<Operation>

Press the [Ctrl] + [I] keys as a shortcut. The [Replace Dialog] window (see Figure 4-34) is then displayed.

(3) Entry of the number of points (hexadecimal or decimal number)

Select between hexadecimal or decimal (HEX/DECIMAL) to specify the type of the number of points to be entered, and then enter the number of points in the “Number” box.

DECIMAL: Enter a decimal number from 1 to 256 in the “Number” box.

HEX: Enter a hexadecimal number from 1 to 100 in the “Number” box.

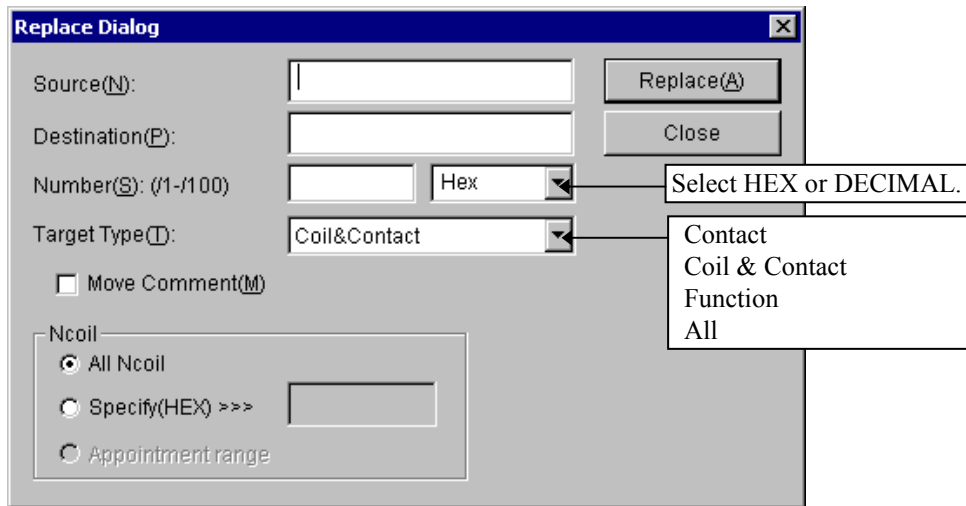


Figure 4-38 [Replace Dialog] Window

Note that entering a number outside the valid range and clicking the **Replace** button displays the error message dialog box shown in Figure 4-39.

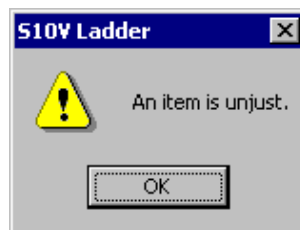


Figure 4-39 Error Message Dialog Box Indicating the Entry of Invalid Number

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### (4) Selecting a target type

Select the relay type as the target of name replacement in the “Target Type” box.

Contact: Specifies only the coil as the target type.

Coil & Contact: Specifies contact and coil as target types.

Function: Specifies only the operation function as the target type.

All: Specifies all relay types (contact, coil, and operation function) as target types.

(Note) When selecting “Coil & Contact” as the target type, you cannot perform name replacement with the register names of different types of relays specified as the old and new names in the “Source” and “Destination” boxes. Always specify the register names of the same type of relays for name replacement.

### (5) Moving the comment

When the checkbox for “Move Comment” is selected, the comment on the old name (“Source”) is moved to the comment on the new name (“Destination”).

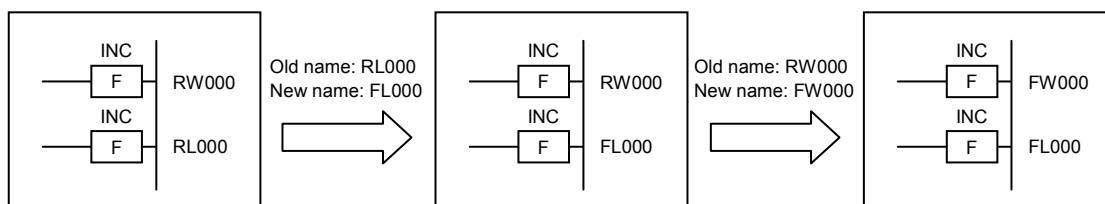
### (6) Specifying target N coil(s)

Specify the N coil(s) as the target(s) of name replacement in the “Ncoil” group box.

All Ncoil: Specifies all N coils as targets.

Specify (HEX): Specifies an N coil number (a hexadecimal number from 0 to FF) as the target.

- Name replacement does not work on comparison instructions and index registers, without regard to whatever relay type you specify. If you want to apply name replacement to comparison instructions and index registers, search for a specified string and replace every instance of the matching string in the symbol without any omission. (For information on how to search for ladder symbols, see Subsection 4.3.2, “Searching for ladder symbols.”)
- Care must be taken when you apply name replacement to symbols in a ladder program that use both word-type and long-word-type (or, simply, long-type) data. If you want to apply name replacement to such symbols, first apply it to the names that identify long-type data in the symbols and then to the names that identify word-type data in them, as shown in an example below. If this order is reversed, the names that identify long-type data will be automatically changed to the names that identify word-type data.



4.3.6 Displaying a list of the devices currently used

(1) Outline

The [Device usage list] option under [Edit] finds all devices (registers) used in both a specified set of ladder programs and a specified set of HI-FLOW programs and displays a list of usage information for those devices.

(2) How to display the [Device usage list] dialog box

Choose [Device usage list] from the [Edit] menu. The [Device usage list] dialog box will then appear.

(3) [Device usage list] dialog box

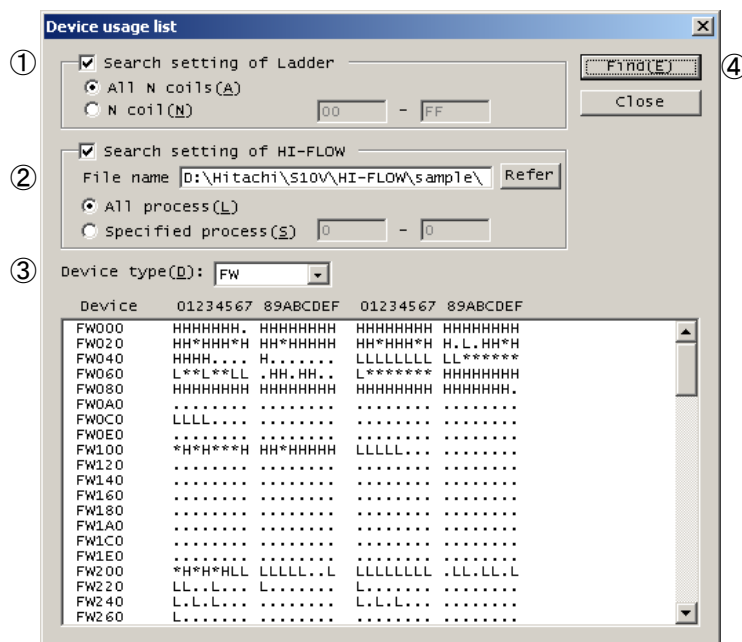


Figure 4-40 The [Device usage list] Dialog Box

where:

① The [Search setting of Ladder] check box:

Is selected when you want to find the devices used in a desired set of ladder programs.

This check box, when selected, allows you to specify the following:

- All N coils: A radio button that is selected when you want to search all N coils used in the programs -- this option setting is the default.
- N coil: A radio button that is selected to specify an N coil or a range of N coils (with their coil numbers in the range 0 to FF [hexadecimal]) to be searched. The coil number of the first N coil in the given range specification must be smaller than or equal to that of the last N coil in the same range specification.



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

② The [Search setting of HI-FLOW] check box:

Is selected when you want to find the devices used in a desired set of HI-FLOW programs. This check box, when selected, allows you to specify the following:

- File name: The file name of a HI-FLOW program (hifv) file to be searched.
- “All process”: A radio button that is selected when you want to search all the existing processes -- this option setting is the default.
- “Specified process”: A radio button that is selected to specify a process or a range of processes (with their process numbers in the range 0 to 255 [decimal]) to be searched. The process number of the first process in the given range specification must be smaller than or equal to that of the last process in the same range specification.

③ The “Device type” list box:

Allows you to select from the displayed pulldown list the desired type of devices that you want to view in a list form. The Table 4-6 shows all specifiable types of devices, any one of which you can specify for search in the ladder or HI-FLOW programs.

Table 4-6 Device Type List (1/2)

Device name	Device type	Ladder	HI-FLOW
External input	X	√	√
Transfer register	J	√	√
External output	Y	√	√
Receive register	Q	√	√
ON-delay timer	T	√	–
One-shot	U	√	–
Counter	C	√	–
Internal register	R	√	√
Internal register	M	√	√
Keep	K	√	√
Global register	G	√	√
Communication link register	A	√	√
Edge contact	V	√	–
N coil	N	√	–
Process coil	P	√	–
Event register	E	√	√
Z register	Z	√	√
System register	S	√	√

Table 4-6 Device Type List (2/2)

Device name	Device type	Ladder	HI-FLOW
Function work register	FW	√	√
Internal register	B	√	–
Function data register	DW	√	√
Work register	LB	√	√
Extension function work register	LWW	√	√
Long-word work register	LLL	√	–
Single-precision floating-point work register	LF	√	–
Backup word work register	LXW	√	√
Backup long-word work register	LML	√	–
Backup single-precision floating-point work register	LG	√	–
Converter-use internal register	LR	√	–
Converter-use edge contact register	LV	√	–
Register for HS.RI/O input	LIW	√	–
Register for HS.RI/O output	LOW	√	–
Other register	HH	–	√
Parallel timer	PT	–	√
Wait timer	WT	–	√
Counter	CN	–	√

④ The Find button:

Is clicked to start a search for the employed devices.

⑤ The device usage list pane:

Presents a list of usage information for the devices found by a search. The use of each device found is indicated by the following information:

- Used only in ladder: “L”
- Used only in HI-FLOW: “H”
- Used in both ladder and HI-FLOW: “\*” (asterisk)
- Not used in either: “.” (period)

- Device usage listing is not usable when you are editing your program. It can be used only when you have compiled the program.
- Search for the devices used in a HI-FLOW program requires the HI-FLOW System, Ver-Rev 02-05 or later, installed in your user system.

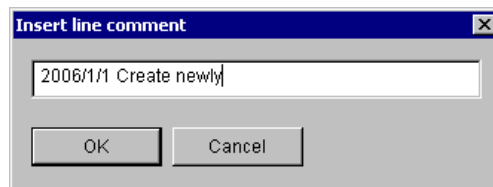
### 4.3.7 Line comment support

#### (1) Overview

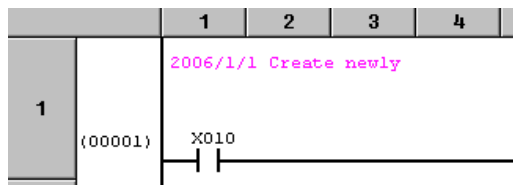
The S10V Ladder Chart System's line comment support allows you to enter comments into individual lines in a ladder chart on-screen. You can enter a comment of up to 80 alphanumeric characters or 40 double-byte characters into a single line and a maximum of 1000 comment lines into a single ladder program. Each entered comment is displayed on top of the circuit.

#### (2) Operation procedure

- ① If you are editing an N coil, the line comment support does not allow you to edit line comments in it. In this case, you have to compile the ladder program on which you are editing, and then proceed to the next step. Also, the line comment support does not allow you to edit line comments during the monitoring of ladder circuits. In this case, stop the monitoring and then proceed to the next step.
- ② Move the cursor to the desired circuit into which you want to insert a comment. Then, click [Insert line comment] from the [Edit] menu. When the [Insert line comment] dialog box appear, enter the desired comment into the input box, as shown below.

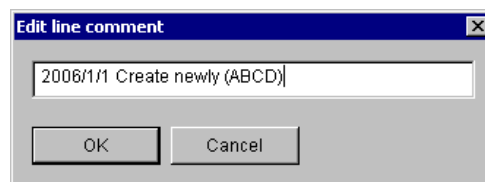


- ③ Click the  button in the dialog box. The entered comment will then appear on top of the circuit, as shown below.

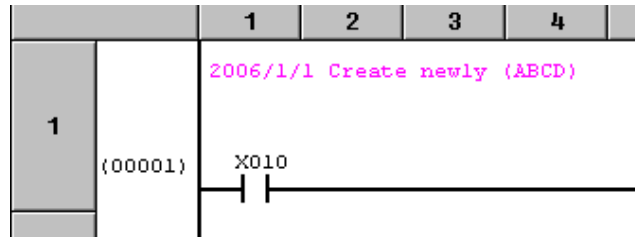


Note: If you have clicked [Display] from the [Comment] menu and checked the [Nothing] checkbox, the comment entered in this step will not appear on-screen.

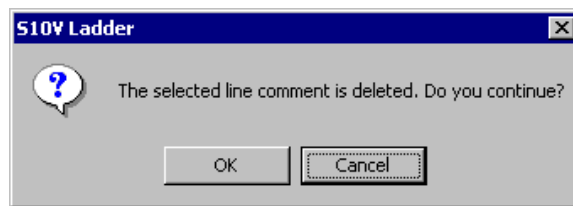
- ④ If you want to edit the line comment just entered, you can use the line-comment edit command. To accomplish this, first click [Edit line comment] from the [Edit] menu. The [Edit line comment] dialog box will appear. Then, edit the displayed comment in the dialog box.



- ⑤ Click the  button. The result of the editing will then appear on top of the circuit, as shown below.



- ⑥ If you want to delete the line comment just edited, you can use the line-comment deletion command. To accomplish this, first move the cursor to the circuit from which you want to delete the comment, and then click [Delete line comment] from the [Edit] menu. The deletion confirmation dialog box shown below will appear. Then, click the  button in the dialog box. The line comment will then be deleted.



- ⑦ If you want to hide the displayed line comment by reducing the circuit display area, click [Display] - [Nothing] from the [Comment] menu. If you want to reverse the result, click [Display] - [Display] from the [Comment] menu.

### (3) Notes

- Line comments cannot be handled by any of circuit edit operations and copy, paste, undo, and redo operations. For example, even if you try to copy and paste a line comment, your attempt will fail because the copying of line comments is not supported.
- The copying of N coils does not copy any line comments provided in them.
- If a circuit line is inserted into or deleted from a given N coil, the line comment that has been displayed in the insertion or deletion line position, if any, remains in the same line position as before the insertion or deletion performed. The movement or deletion of such a line comment will be done during later compilation or recompilation of that circuit.
- Line comments are supported only by the version-revision 01-14 or later of the ladder chart system. Thus, if you open or receive a ladder program file with line comments in it by using its non-supporting version-revision, the message shown below will appear in the output window, with the line comments deleted.  
 “SQET information is damaged. SQET information is made from the ladder program.”

4.3.8 TUC set-value listing and editing

The [TUC setting value list] option available from the [Edit] menu presents a list of all the set values of existing TUC registers you have selected, and allows their editing. The term “TUC” here is a combination of three distinctive PI/O register-typing letters: “T”, “U”, and “C”. “T” refers to ON-delay timers, “U” one-shot timers, and “C” up-down counters. For information on these three types of PI/O registers, refer to the SOFTWARE MANUAL PROGRAMMING S10V LADDER CHART For Windows® (manual number SVE-3-121).

When you want to print the set values of desired TUC registers, choose [Print] - [TUC] from the [File] menu in the main window with a ladder sheet displayed in it. None of them can be printed via the [TUC setting value list] dialog box.

<Operation procedures>

(1) Displaying the [TUC setting value list] dialog box

- ① Choose [TUC setting value list] from the [Edit] menu in the main window.  
Alternatively, move the mouse pointer into the displayed ladder sheet and right-click the mouse. From the displayed popup menu, choose [TUC setting value list].
- ② The [TUC setting value list] dialog box as shown in Figure 4-41 appears.

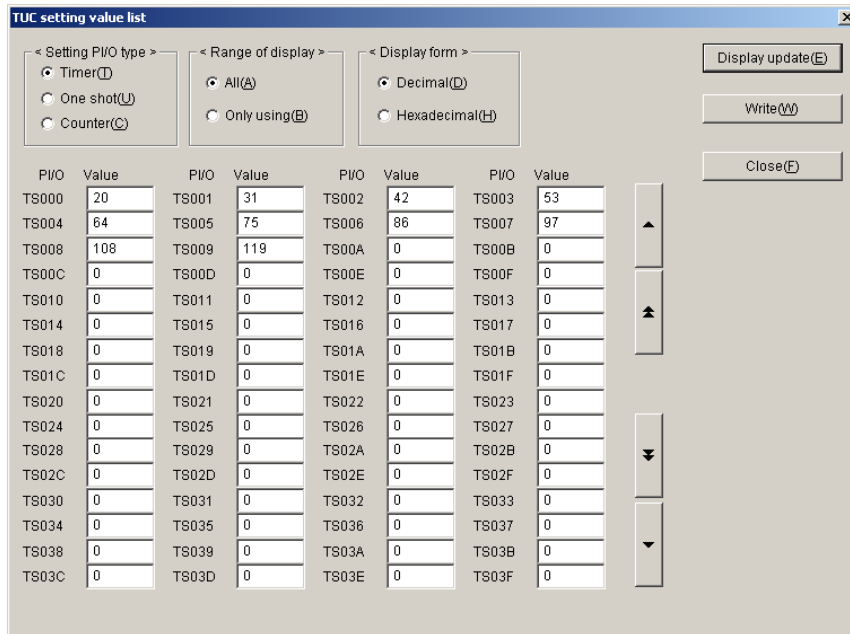


Figure 4-41 The [TUC setting value list] Dialog Box

- ③ From the [Setting PI/O type] group box in the above dialog box, choose the desired PI/O register type for which to display a list of the set values. The set values that can be displayed for each PI/O register type are as follows:

“Timer”: The set values of ON-delay timers in the range TS000 to TS7FF (up to 2048 cases)

“One shot”: The set values of one-shot timers in the range US000 to US0FF (up to 256 cases)

“Counter”: The set values of up-down counters in the range CS000 to CS0FF (up to 256 cases)

The default option is “Timer”.

- ④ From the [Range of display] group box in the above dialog box, choose one of the following ranges of display:

“All”: Displays the set values of all existing PI/O registers whose type is selected from the [Setting PI/O type] group box.

“Only using”: Displays the set values of the existing PI/O registers whose type is selected from the [Setting PI/O type] group box and that are given a set value larger than zero (0).

The default option is “All”.

- ⑤ From the [Display form] group box in the above dialog box, choose one of the following forms of displaying:

“Decimal”: Displays the set values in decimal format. If this option is selected, enter a new value in decimal format later when you are editing a displayed TUC set value.

“Hexadecimal”: Displays the set values in hexadecimal format. If this option is selected, enter a new value in hexadecimal format later when you are editing a displayed TUC set value.

The default option is “Decimal”.

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- ⑥ Click the **Display update** button in the dialog box. Then, the set values of the PI/O registers that have been selected in Steps ③ through ⑤ are read from the PCs and displayed as shown in Figure 4-42.

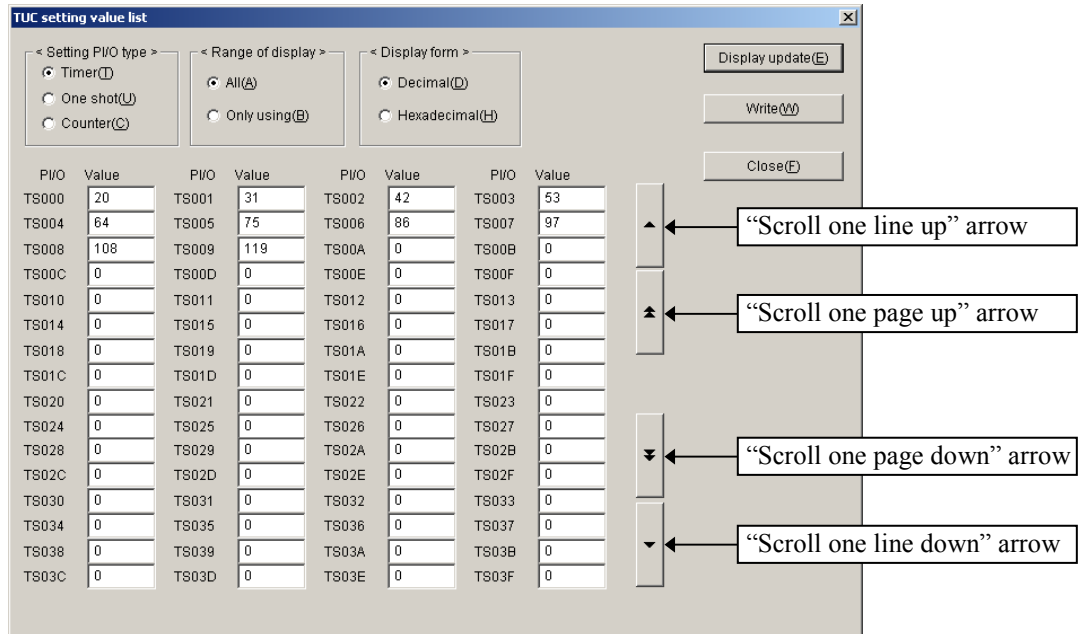


Figure 4-42 The [TUC setting value list] Dialog Box with Set Values Displayed

If you cannot view all the displayed set values at a time in the dialog box, click any of the scroll buttons to view the hidden set value(s). Scrolling is possible only within the range that is determined from your selections from both the [Setting PI/O type] and [Range of display] group boxes. The scroll buttons function as described below.

“Scroll one line up”: Scrolls line-by-line(\*1) in the upward direction(\*2).

“Scroll one page up”: Scrolls page-by-page(\*3) in the upward direction(\*2).

“Scroll one line down”: Scrolls line-by-line (\*1) in the downward direction(\*4).

“Scroll one page down”: Scrolls page-by-page (\*3) in the downward direction(\*4).

(\*1) Four cases are scrolled at a time.

(\*2) This is the direction toward the smallest register number.

(\*3) A total of 64 cases are scrolled at a time.

(\*4) This is the direction toward the largest register number.

(2) Editing displayed set values

- ① Select a desired input box in the “Value” column of the displayed TUC set-value list and enter a new value in that input box. If you have selected [Decimal] in the [Display form] group box, you can enter it in decimal format. If you have selected [Hexadecimal] instead of [Decimal], you can enter it in hexadecimal format. You may change this selection if necessary.
- ② When you press either of the [Tab] and [Enter] keys at the end of the value entry, a check is automatically made to see if the entered value is within allowable range. If so, the entered value is written as a new value of the PI/O register to the destination. If any other means, such as the mouse or a shortcut key, is used in place of the [Tab] and [Enter] keys, the selected input box, called the focus position, containing the old set value will not be rewritten with the entered value.

Table 4-7 The Allowable Ranges of TUC Set Values

Display format	Allowable range
Decimal	0 to 9999
Hexadecimal	0 to 270F

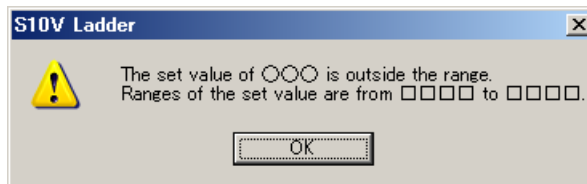
The destination to which the entered value is written varies depending on the status of data communication:

<Status of data communication>

= online: Writing is made to the corresponding PI/O set-value storage location in the LPU module’s PI/O-RAM.

= offline: Writing is made to the corresponding PI/O set-value storage location in the PCs’ internal memory.

However, if the entered value is found to be out of range, the error-message dialog box shown in Figure 4-43 appears.



where:

○○○: Is the register name of the PI/O register whose entered value is out of range.

□□□-□□□: Is the allowable range of the set value (Table 4-7).

Figure 4-43 The Error-Message Dialog Box Reporting on an Out-of-Range Value Detected



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In the [TUC setting value list] dialog box, you can click the  button to write all entered values to the destination at once. When you click it, the message dialog box shown in Figure 4-44 appears if the status of data communication is online and the LPU's LADDER switch is set in "RUN" position (the RUN LED is lit). This message dialog box informs you that the PCs are currently in RUN state.

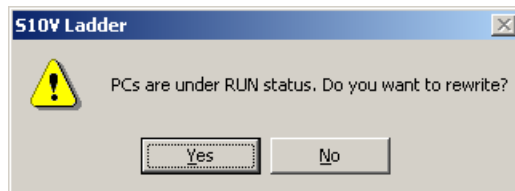


Figure 4-44 The Message Dialog Box Reporting a "PCs in RUN State" Condition

Clicking either of the  and  buttons in the above message dialog box produces one of the following effects:

Clicking  : Writes all the entered values to the destination.

Clicking  : Does not write them at all.

In "only for online monitor" mode, neither the editing of TUC set values nor their writing is possible via the [TUC setting value list] dialog box.

## 4.4 Ladder Sheet Display Functions

The ladder sheet display functions are contained in the [Display] pull-down menu or standard tool bar, as shown below.

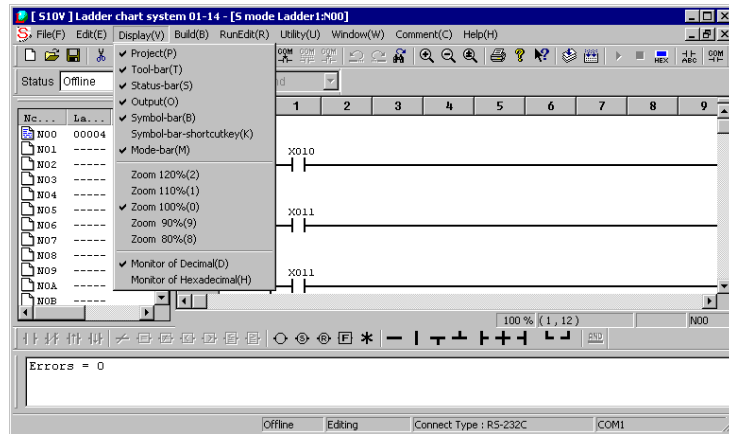


Figure 4-45 Clicking the [Display] Option

The display functions provided in the [Display] menu are listed below along with their descriptions.

Table 4-8 [Display] Menu Options

No.	Level 1	Level 2	Level 3	Description
1	Display	Project		Switches the N coil list display mode between display and no-display.
2		Tool-bar		Switches the tool bar display mode between display and no-display.
3		Status-bar		Switches the status bar display mode between display and no-display.
4		Output		Displays the area used for presenting the result of compilations.
5		Symbol-bar		Switches the symbol bar display mode between display and no-display.
6		Symbol-bar-shortcutkey		Switches the symbol-bar shortcut-key display mode between display and no-display.
7		Mode-bar		Switches the mode bar display mode between display and no-display.
8		Zoom 120%		Sets the scale factor of the ladder sheet being displayed to 120%.
9		Zoom 110%		Sets the scale factor of the ladder sheet being displayed to 110%.
10		Zoom 100%		Sets the scale factor of the ladder sheet being displayed to 100%.
11		Zoom 90%		Sets the scale factor of the ladder sheet being displayed to 90%.
12		Zoom 80%		Sets the scale factor of the ladder sheet being displayed to 80%.
13		Monitor of Decimal		Displays monitoring-time monitored values in decimal format.
14		Monitor of Hexadecimal		Displays monitoring-time monitored values in hexadecimal format.

4.5 Ladder Sheet Build Functions

The ladder sheet build functions are contained in the [Build] pull-down menu, as shown below.

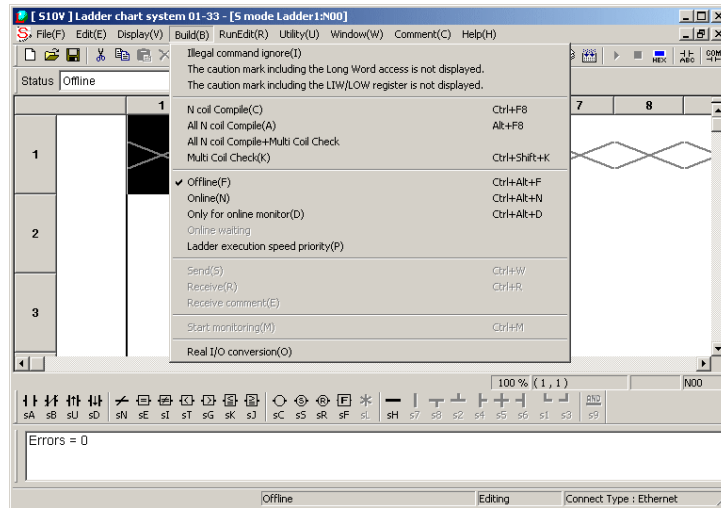


Figure 4-46 Clicking the [Build] Option

The build functions provided in the [Build] menu are listed below along with their descriptions.

Table 4-9 [Build] Menu Options

No.	Level 1	Level 2	Level 3	Description
1	Build	Illegal command ignore		Compiles ladder programs, ignoring any invalid instruction codes.
2		The caution mark including the Long Word access is not displayed.		Switches between display and non-display of the caution display window when an odd-numbered long-word access or PSHO/POPO is contained.
3		The caution mark including the LIW/LOW register is not displayed.		Switches between display and non-display of the caution display window when including the LIW/LOW register.
4		N coil Compile		Compiles only the current open N coil.
5		All N coil Compile		Compiles all the existing N coils.
6		All N coil Compile + Multi Coil Check		Compiles all given N coils and check them for any multiply shared coils.
7		Multi Coil Check		Checks all given N coils for any multiply shared coils.
8		Offline		Switches the operation mode to offline.
9		Online		Switches the operation mode to online.
10		Ladder execution speed priority		Compiles ladder programs while giving priority to their execution speed.
11		Send		Sends processes to the PCs.
12		Receive		Receives processes from the PCs.
13		Receive comment		Receives comment files from the PCs.
14		Start monitoring/ Stop monitoring		Starts or stops monitoring of ladder circuits.
15		Real I/O conversion		Converts contacts and coils, and combines circuits.

### 4.5.1 Compiling ladder programs

#### (1) About compilation

Compiling a ladder program (a collection of symbols pasted into the ladder sheets) produces a sequence of ladder instructions executable on the S10V. You can compile existing N coils one by one or all such N coils at a time.

- Compiling N coils one by one

To compile existing N coils one by one, click [N coil Compile] from the [Build] menu or tool bar. Then, only the currently active ladder sheet will be compiled.

- Compiling all N coils at a time

To compile all existing N coils at a time, click [All N coil Compile] from the [Build] menu or tool bar. Then, the ladder program file currently subjected to editing (i.e., all ladder sheets or coils in the range N00 to NFF) will be compiled at a time.

The results of compilations will be displayed in the output window. If a compilation is terminated abnormally, or there remain an N coil(s) that are not yet compiled, then the result of the compilation cannot be sent to the S10V.

When zero detected errors are reported, this indicates that the compilation has been terminated normally.

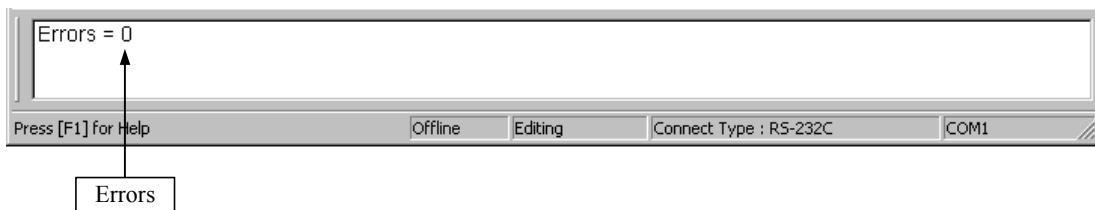


Figure 4-47 A Message Presented in the Output Window  
When the Compilation Is Terminated Normally

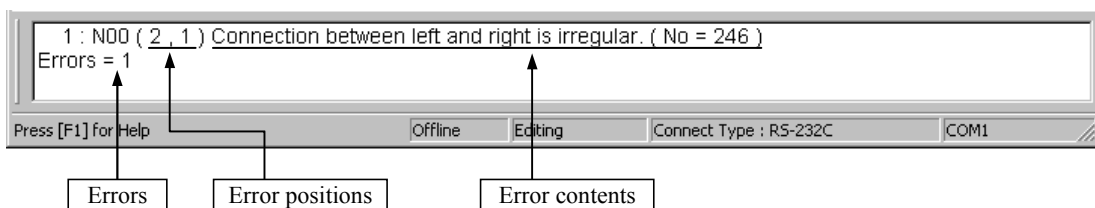


Figure 4-48 A Message Presented in the Output Window  
When the Compilation Is Terminated Abnormally

When you point to the message body in the output window by using the mouse and double-click it, the mouse cursor will move to the location (erroneous line) of the detected error.

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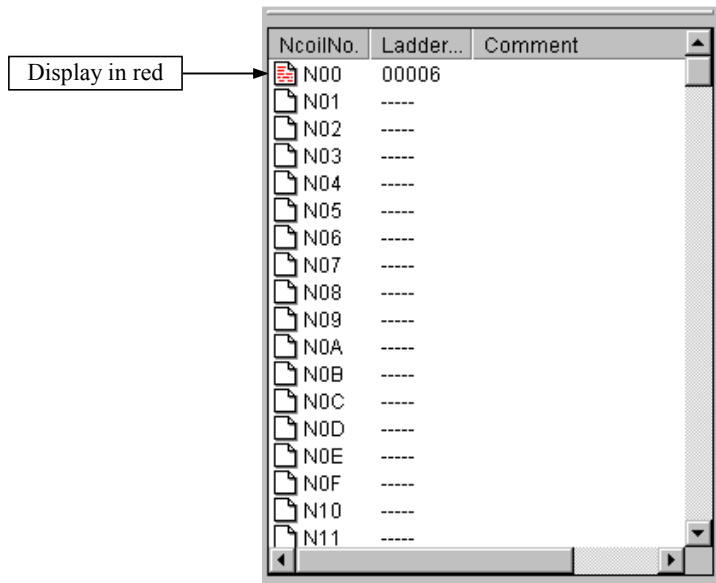


Figure 4-49 An N Coil Not Yet Compiled

When an N coil is compiled successfully, its display color will change from red to blue.

### (2) Compile option

<Ladder execution speed priority>

The [Ladder execution speed priority] option is provided as one of the compile options for compiling ladder programs. If this option is used to compile a ladder program, and the object generated by the compilation is sent to the S10V, then the object (ladder) will be executed faster than the object generated from the same ladder program without using the [Ladder execution speed priority] option (\*), provided the following conditions are met:

- The compiled ladder program contains system arithmetic functions (operation functions provided by the system), and the data types of parameters to those functions ensure that the compilation of the containing ladder program using the “Ladder execution speed priority” option will generate an object whose execution speed is increased (for details, see Table 4-10; however, this is not the case with jump instructions).
- One or more system arithmetic functions in the ladder program are not executed if their given conditions are not met (i.e., their given contacts for execution are turned off) -- these system arithmetic functions are ones that will contribute to the speed-up of ladder execution if compiled using the “Ladder execution speed priority” option.

(\*) Compilation without using this compile option is done by version-revision 01-10 or earlier of the ladder chart system.

Table 4-10 System Arithmetic Functions That Can Contribute to the Speed-Up of Ladder Execution (1/3)

System arithmetic function name	Data types			
	Word	Long word	Floating	Indexed
ADD	×	√	√	√
SUB	×	√	√	√
INC	×	√	–	√
DEC	×	√	–	√
MUL	√	√	√	√
DIV	√	√	√	√
MOD	√	√	–	√
SCL	√	–	–	√
AND	×	√	–	√
OR	×	√	–	√
EOR	×	√	–	√
NOT	×	√	–	√
EQU	×	√	√	√
NEQ	×	√	√	√
GT	×	√	√	√
LT	×	√	√	√
GE	×	√	√	√
LE	×	√	√	√
TST	×	√	√	√
MOV	×	√	√	√
MOM	√	√	–	√
INI	√	√	–	√
EXC	√	√	–	√
PSH	√	–	–	√
POP	√	–	–	√
AST	√	√	–	√
SCH	√	√	√	√
BTF	√	√	√	√
FTB	√	√	√	√
BTD	√	√	–	√

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Table 4-10 System Arithmetic Functions That Can Contribute to the Speed-Up of Ladder Execution (2/3)

System arithmetic function name	Data types			
	Word	Long word	Floating	Indexed
DTB	√	√	–	√
SEG	√	√	–	√
ASP	√	–	–	√
ASU	√	–	–	√
APB	√	–	–	√
AUB	√	–	–	√
STD	√	√	–	√
DTS	√	√	–	√
ABS	√	√	√	√
NEG	√	√	√	√
DCD	√	√	–	√
ECD	√	√	–	√
LSR	×	√	–	√
LSL	×	√	–	√
ASR	×	√	–	√
ASL	×	√	–	√
ROR	×	√	–	√
ROL	×	√	–	√
LIM	√	√	√	√
BND	√	√	√	√
ZON	√	√	√	√
SQR	√	√	√	√
SIN	–	–	√	√
COS	–	–	√	√
TAN	–	–	√	√
ASIN	–	–	√	√
ACOS	–	–	√	√
ATAN	–	–	√	√
EXP	–	–	√	√
LOG	–	–	√	√

Table 4-10 System Arithmetic Functions That Can Contribute to the Speed-Up of Ladder Execution (3/3)

System arithmetic function name	Data types			
	Word	Long word	Floating	Indexed
MAX	√	√	√	√
MIN	√	√	√	√
XCLR (*)	–	–	–	–
YCLR (*)	–	–	–	–
GCLR (*)	–	–	–	–
RCLR (*)	–	–	–	–
KCLR (*)	–	–	–	–
TCLR (*)	–	–	–	–
UCLR (*)	–	–	–	–
CCLR (*)	–	–	–	–
VCLR (*)	–	–	–	–
ECLR (*)	–	–	–	–
FCLR (*)	–	–	–	–
JT	–	–	–	–
JMP	–	–	–	–
JSE	–	–	–	–

√: Indicates that this combination of a system arithmetic function and a data type, if compiled with the “Ladder execution speed priority” option, will contribute to the speed-up of ladder execution.

×: Indicates that this combination of a system arithmetic function and a data type, if compiled with the “Ladder execution speed priority” option, will not contribute to the speed-up of ladder execution.

–: Indicates that this system arithmetic function does not support parameters of this data type.

(\*) This system arithmetic function, if compiled with the “Ladder execution speed priority” option, will contribute to the speed-up of ladder execution.



<Compilation procedure using the “Ladder execution speed priority” option>

- ① Click [Ladder execution speed priority] from the [Build] menu if it is not selected yet.  
(If it is already selected, skip this step.)
- ② Click [N coil compile] or [All N coil compile] from the [Build] menu. The [Confirmed compile] message dialog box will then appear unless you checked the [It isn't indicated after next time.] checkbox last time when that message dialog box was displayed and clicked the  button. (\*1)

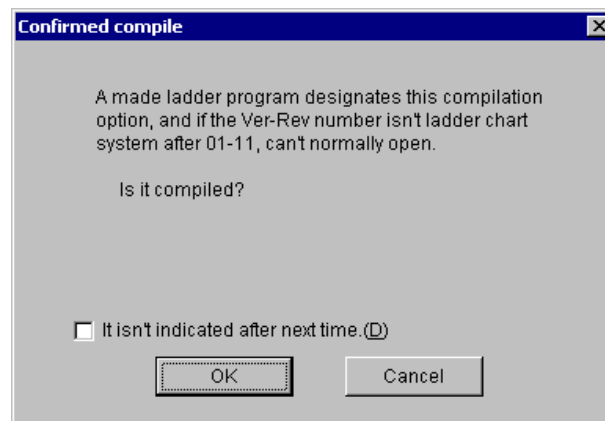


Figure 4-50 The [Confirmed compile] Message Dialog Box

- (\*1) There is an exception to this. The [Confirmed compile] message dialog box will appear again even if you checked the [It isn't indicated after next time] checkbox last time at that time and clicked the  button. This occurs in cases where you have compiled a ladder program with the [N coil compile] or [All N coil compile] option without choosing [Ladder execution speed priority] from the [Build] menu.

- (3) Ladder program files compiled with [Ladder execution speed priority] selected and their use in conventional ladder chart systems

<Opening the ladder program file>

Ladder program files compiled with [Ladder execution speed priority] selected cannot be opened in conventional ladder chart systems (Ver-Rev 01-10 or earlier). (\*2) The ladder program files that can be opened in such ladder chart systems are those which have been compiled without choosing [Ladder execution speed priority].

<Receiving the ladder program online>

If a conventional ladder chart system receives from the S10V controller any of the ladder program objects that have been generated with [Ladder execution speed priority] selected and have been stored in that controller, it is unable to display that object on-screen upon completion of its reception. (\*2)

The ladder program objects that can be displayed upon completion of their reception are those which have been compiled without choosing [Ladder execution speed priority].

(\*2) The result of this differs depending on whether [Illegal command ignore] has been selected from the [Build] menu or not. If [Illegal command ignore] has been selected, an application error will occur, resulting in an abortion of the ladder chart system. If [Illegal command ignore] has not been selected, an illegal instruction symbol (“?”) will be displayed for an unacceptable operation function found, and the following message will appear in the output window:

“NXX (YY, ZZ) : Instruction is damaged. (No = 131)”

where:

XX: The N coil number (from 00 to FF in hexadecimal) of the N coil involved

YY: The row position of the destroyed instruction word detected

ZZ: The column position of the destroyed instruction word detected

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- (4) About the option [The caution mark including the Long Word access is not displayed.]  
<Opening a ladder program file>

In an offline state of the ladder chart system, if the [The caution mark including the Long Word access is not displayed.] option is not selected, any compilation using [N coil Compile] or [All N coil Compile] will have the [Confirmed compile] message dialog box (Figure 4-51) displayed when an odd-numbered long-word register or a PSHO/POPO instruction is detected in the ladder program. However, this window is not displayed if you have checked the [It isn't indicated after next time.] check box and have clicked the  button when the [Confirmed compile] message dialog box in Figure 4-50 appeared last time(\*).

In its online state, on the other hand, the ladder chart system first checks out the Ver.-Rev. of the LPU module with which it currently has a communication connection established, and then chooses automatically the compilation method suited to the LPU module, which is described under <Compilation> below. This is done regardless of the current selection (selected or deselected) status of the [The caution mark including ..... not displayed.] option. If you want to use the other compilation method for the LPU module, first switch the operation mode to offline and then select [N coil Compile] or [All N coil Compile] as you want. Then, the [Confirmed compile] message dialog box appears again and allows you to select the other compilation method.

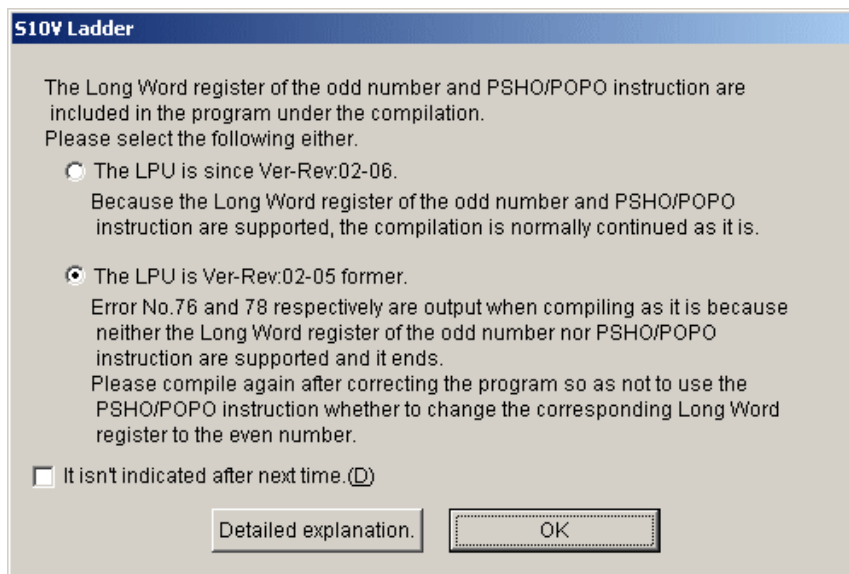


Figure 4-51 The [Confirmed compile] Message Dialog Box

- (\*). Deselecting [The caution mark including the Long Word access is not displayed.] on the [Build] menu redisplays the [Confirmed compile] message dialog box at execution of [N coil Compile] or [All N coil Compile].

### <Compilation>

Some S10V ladder instructions run only when an LPU Ver.-Rev. is 02-06 or later. From the [Confirmed compile] message dialog box displayed during compilation, select the compilation method appropriate to the LPU module revision.

- The LPU is since Ver-Rev: 02-06.

Select this method for LPU Ver.-Rev. 02-06 or later, in which the LPU supports the odd-numbered long-word register and PSHO/POP instruction.

- The LPU is Ver-Rev: 02-05 former.

Select this method for LPU Ver.-Rev. 02-05 or earlier, in which the LPU does not support the odd-numbered long-word register and PSHO/POPO instruction.

- (5) About the option [The caution mark including the LIW/LOW register is not displayed.]:  
Background and Use

<Opening a ladder program file>

Ladder program files can be opened normally in any conventional ladder chart system (Ver-Rev 01-03 or earlier) as long as they have none of LIW and LOW registers used in them. No ladder program file with LIW and LOW registers used in it can be so opened. (\*)

(\*) The result of an attempt to perform such file opening differs depending on whether the [Illegal command ignore] option has been selected from the [Build] menu or not. If [Illegal command ignore] has been selected, an application error will occur, resulting in abortion of the ladder chart system. Alternatively, if [Illegal command ignore] has not been selected, an illegal instruction symbol (“?”) will be displayed for an operation function found that uses an LIW and/or an LOW register(s), and the following message will appear in the output window:

“NXX (YY, ZZ): Instruction is damaged. (No = 131)”

where:

XX: The N coil number (from 00 to FF in hexadecimal) of the N coil involved

YY: The row position of the destroyed instruction word detected

ZZ: The column position of the destroyed instruction word detected

<Compilation>

One of the messages shown below will be displayed if an attempt is made to compile a ladder program file with LIW and LOW registers used in it. Which of the messages will be displayed depends on the operation mode (online or offline) used. In either operation mode, the attempt is preceded by the selection of one of the options [N coil Compile] or [All N coil Compile].

- In offline mode

The confirmation message dialog box as shown in Figure 4-52 will be displayed, which asks you whether to compile the ladder program along with the LIW and LOW registers.

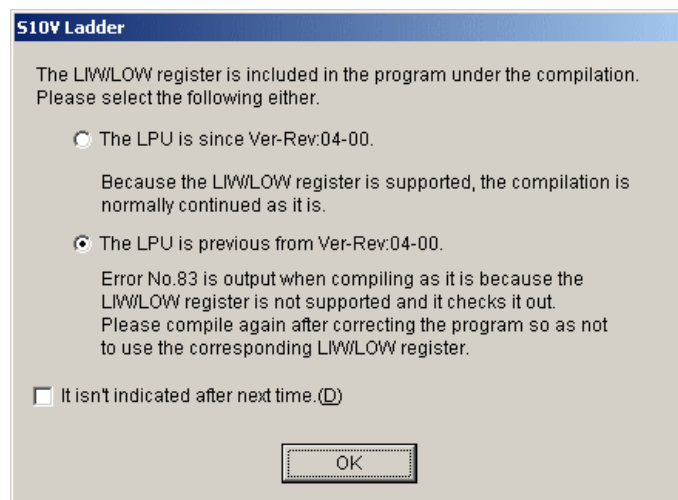


Figure 4-52 The [Program-with-LIW-and-LOW-Registers Compilation Confirmation] Message Dialog Box

Then, if you select [The LPU is since Ver-Rev: 04-00.] radio button -- an option to specify that the LPU is Ver-Rev 04-00 or later -- and click the  button, compilation will start. Once it starts, the compilation will proceed without displaying the [Confirmed compile] message dialog box as shown in Figure 4-51. This is the case even when an odd-numbered long-word register or PSHO/POPO instruction that is supported by LPU modules of Ver-Rev 02-06 or later is detected in the ladder program.

Alternatively, if you select [The LPU is previous from Ver-Rev: 04-00.] radio button instead -- an option to specify that the LPU is earlier than Ver-Rev 04-00 -- and click the  button, compilation will start, but it will fail, resulting in displaying the following compile error message in the output window:

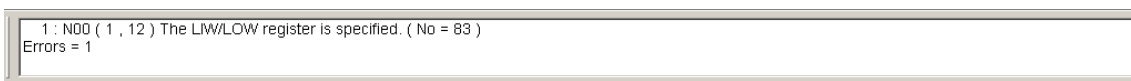


Figure 4-53 [The LIW/LOW register is specified.] Compile Error Message

In addition, if you select “It isn't indicated after next time.” check box in the confirmation message dialog box before clicking the  button, the [Program-with-LIW-and-LOW-Registers Compilation Confirmation] message dialog box (Figure 4-52) will not be displayed next time onwards. The suppressed confirmation message can be displayed again by placing a check mark to the left of the option “The caution mark including the LIW/LOW register is not displayed.”

- In online mode

If the LPU module with which the ladder chart system currently has a connection established is not of Ver-Rev 04-00 or later, the error message dialog box as shown in Figure 4-54 will be displayed. In this case, you can solve the problem by taking one of the following actions: 1) replacing the existing LPU module with an LPU module of Ver-Rev 04-00 or later or 2) correcting the ladder program so that it will not use LIW and LOW registers.

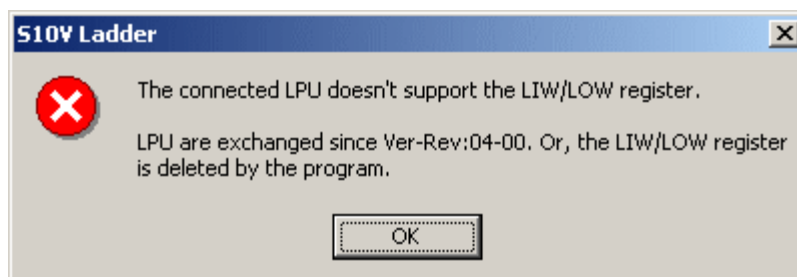


Figure 4-54 The “LPU doesn’t support the LIW/LOW register” Error Message Dialog Box

### Notes:

- Ladder programs consist of a number of ladder circuits and are compiled on a circuit-by-circuit basis. During such compilation, if a single circuit in the ladder program has more than one compile error detected in it, only the first compile error detected is reported in the output window. An example of this is [The LIW/LOW register is specified.] compile error reported by error message (Figure 4-53). If [The LPU is previous from Ver-Rev: 04-00.] radio button is selected and a compile error is detected before a symbol using an LIW/LOW register in the same circuit, the first-mentioned compile error will be reported in the output window, but the second-mentioned ([The LIW/LOW register is specified.]) will not. (Other examples are compile errors caused by an odd-numbered long-word register or PSHO/POPO instruction.) In these cases, first correct the compile error reported in the output window, and then recompile the ladder program. When the next compile error in the circuit is reported, repeat the same two-step remedy until all the compile errors in that circuit are corrected.
- If a symbol is detected that uses all of an odd-numbered long-word register, a PSHO/POPO instruction, and a LIW register, the first two compile errors (odd-numbered long-word register and PSHO/POPO instruction) will be reported in the output window, but the last one (LIW register) will not. In this case, correct the first two compile errors and then recompile the ladder program. When the last compile error (LIW register) is reported in the output window, correct it and recompile the ladder program.
- If you select [The LPU is since Ver-Rev: 04-00.] radio button and check the “It isn't indicated after next time.” check box, [The caution mark including the Long Word access is not displayed.] in the [Build] menu will be automatically deselected if already selected. In this case, the [Confirmed compile] message dialog box (Figure 4-51) will not be displayed even if an odd-numbered long-word register or PSHO/POPO instruction is detected in the ladder program.

#### 4.5.2 Switching between “online”, “offline”, “only for online monitor”, and “online waiting” modes

The ladder chart system can run in one of the following operation modes: “online”, “offline”, “only for online monitor”, or “online waiting”. When started, the ladder chart system always enters into offline mode. You can change the offline mode to any other mode, but “online waiting” mode, by selection either from the [Build] pulldown menu or the menu bar. For information on how to enter into the “online waiting” mode, see “(2) Online mode” below. You can enter into the “only for online monitor” mode not only by selection either from the [Build] pulldown menu or the mode bar, but also by selection in the [Mode selection by online] dialog box (Figure 4-57). For details, see “(2) Online mode” below.

The operation mode you have selected determines what you can process and the functions available for processing. This is expanded below.

##### (1) Offline mode

What you can edit in offline mode is contents of the personal computer’s memory or files, and the following options of the [Build] menu are not available in this mode:

- Send: Sends ladder programs edited on the personal computer to the PCs’ memory (SEQ-RAM).
- Receive: Receives the ladder programs from the PCs’ memory (SEQ-RAM) and stores them on the personal computer’s hard disk.
- Receive comment: Receives I/O comment information from the PCs’ memory (SEQ-RAM) and stores it on the personal computer’s hard disk.
- Start monitoring: Monitors the operating status of ladder programs residing in the PCs’ memory (SEQ-RAM).

##### (2) Online mode

What you can edit in online mode is the contents of the personal computer’s memory or files that match contents of the PCs’ memory. Before you switch the operation mode from offline to online, be sure to make the contents of the personal computer’s memory and files identical to those of the PCs’ memory by using the [Send] or [Receive] option of the [Build] menu. In online mode, if a communication-line abnormality, such as a disconnection of the connecting cable between the personal computer and the PCs, or a power outage of the PCs’ power supply, is detected during operation, the error-message dialog box shown below appears. In this case, remove the cause of the error.



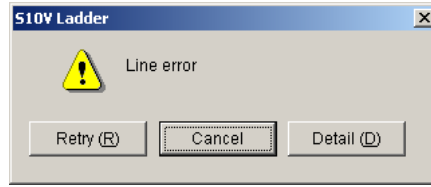


Figure 4-55 The Communication-Line Error-Message Dialog Box

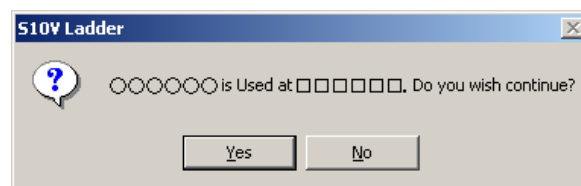
<Exclusive use of the PCs in online mode>

When the operation mode is switched from offline to online, the ladder chart system exclusively uses one single unit of the PCs thereafter. This is a feature to prevent more than one ladder chart system in the network from accessing the same unit of the PCs simultaneously. The exclusive use of one single unit of the PCs is ended when the operation mode is switched from online to offline.

However, depending on the type of data communication used, one of the events listed below will occur when the following conditions are met: 1) a particular unit of the PCs is being exclusively used by the ladder chart system running on another person’s personal computer, and 2) you try to switch the operation mode from offline to online on your personal computer for online operation with that particular unit.

In addition, the “PCs currently used exclusively” message dialog box (Figure 4-56) or [Mode selection by online] dialog box (Figure 4-57) may inform you of a personal computer exclusively using a single unit of the PCs, but the ladder chart system running on that personal computer may not be in online mode (including cases where it is not started yet).

In these cases, the ladder chart system may have been terminated without ending the exclusive use of that single unit of the PCs (\*). To end the exclusive use, choose [Free occupancy] from the [utility] menu. Then, when the following dialog box appears, click the  button. Clicking the  button instead of  will not end it.



(\*) The exclusive use of a single unit of the PCs is not ended in either of the following cases:

- Power to the personal computer is de-energized (due to, for example, a power failure) during the online operation of the ladder chart system and this makes it unable for that ladder chart system to be ended normally.
- The ladder chart system is ended during its online operation, with the PCs powered down.

Event 1 when the type of data communication used is RS-232C:

The following message dialog box appears which reports that the particular unit of the PCs is currently used exclusively:



where:

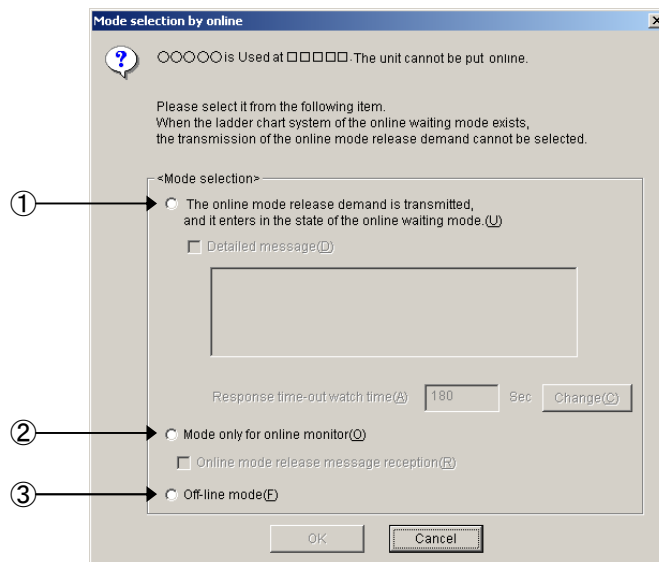
- : The ID name of the personal computer using it exclusively (in online mode).
- : The type of data communication used.

Figure 4-56 The “PCs currently used exclusively” Message Dialog Box

Just click the **OK** button in the dialog box. The issued “switch to online” request produces no effect (the offline mode continues).

Event 2 when the type of data communication used is Ethernet:

The [Mode selection by online] dialog box as shown below appears.



where:

- : The ID name of the personal computer using it exclusively (in online mode).
- : The type of data communication used by the ladder chart system in online mode.

Figure 4-57 The [Mode selection by online] Dialog Box

Then, choose one of the options ①, ②, or ③ shown above and click the  button. If you choose option ① and check the [Detailed message] check box, then you can enter a user-specified message and sent it to the ladder chart system currently running in online mode -- the sending occurs when you click  in the dialog box.

Following are descriptions of the above options:

Option ①: Transmits a request to clear online mode, called an online-mode release request, to the ladder chart system currently running in online mode on another personal computer and places the ladder chart system running on your personal computer into “online waiting” mode. When the online mode is released (cleared), the ladder chart system which has transmitted that request and currently remains in “online waiting” mode enters into online mode.

This option cannot be selected when the ladder chart system running on another personal computer is already in “online waiting” mode.

For details on how to use the online-mode release request, see “(3) How to use the online-mode release request.”

Option ②: Forces the ladder chart system running on your personal computer to enter into “only for online monitor” mode. If you check the [Online mode release message reception] check box, the online mode release message dialog box (Figure 4-67) will be displayed when the online mode is released (cleared). For details on the “only for online monitor” mode, see “(4) ‘Only for online monitor’ mode.”

Option ③: Forces the ladder chart system running on your personal computer to enter into offline mode.

## (3) How to use the online-mode release request

The following illustrates how to use the online-mode release request by employing the sample configuration shown below.

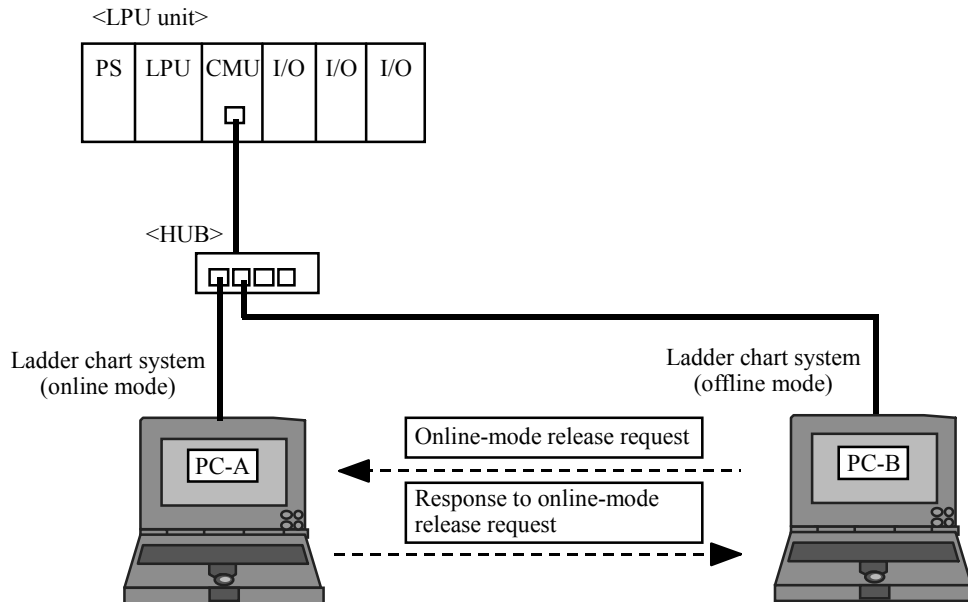


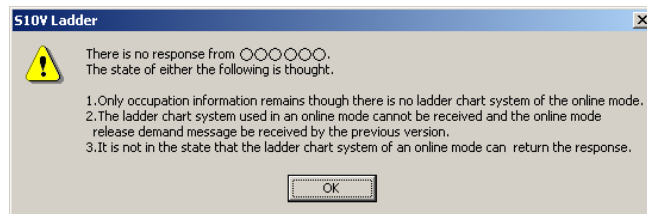
Figure 4-58 Online-Mode Release Message Transmission and Reception

The procedure is as follows:

- ① Personal computer B (PC-B) user tries to place the ladder chart system running on it in offline mode into online mode. However, since personal computer A (PC-A) is already running its ladder chart system in online mode, the [Mode selection by online] dialog box (Figure 4-57) appears on PC-B's screen.
- ② PC-B user selects the [The online mode release demand is transmitted, and ...] radio button in the [Mode selection] group box of the [Mode selection by online] dialog box. Then, he/she checks the [Detailed message] check box and enters a user-specified message as necessary. In addition to this, he/she also specifies how long they will wait for a response to come from the ladder chart system currently running in online mode. This parameter, called the response time-out watch time, may not be omitted and is specified in the range 30 to 600 (seconds). The default value is 180 (seconds). If no response is received from that ladder chart system within the specified time period, the response watch timeout message dialog box will be displayed. For more information on the user-specified message and response watch timeout message dialog box, see the description under "Online-mode release request message sender" below. Then, click the  button in the dialog box. The ladder chart system running on PC-B then has its status of data communication changed to "online waiting" and waits for a response to the issued online-mode release request that will arrive from PC-A.

<Note>

If no response is received from PC-A within a fixed time period of 10 seconds, called the monitoring time, which starts elapsing when you have clicked the  button in the [Mode selection by online] dialog box, then the message dialog box shown in Figure 4-59 may be displayed which informs you that no response has been received.



where:

○○○○○○: The ID name of the personal computer using the single unit of the PCs exclusively (in online mode).

Figure 4-59 The “No Response” Message Dialog Box

Possible causes of the “no response received” condition are listed below. These possible causes cannot be identified by the personal computer user who has issued the online-mode release request.

- The ladder chart system running in online mode does not support “only for online monitor” mode, because its version (Ver-Rev) is 01-20 or earlier.
- The ladder chart system had changed its status of data communication from online to another state before it sent the online-mode release request to the destination (or before the user clicked  in the [Mode selection by online] dialog box).
- The ladder chart system that was running in online mode was terminated without ending the exclusive use of the particular unit of the PCs. (For details, see the description under “(2) Online mode” in this subsection.)
- The communication link between the personal computer on which the ladder chart system was running in online mode and the particular unit of the PCs is broken (due to, for example, a disconnection of the connecting cable between them). In this case, click the  button in the displayed “no response received” message dialog box (Figure 4-59), and contact the user of the ladder chart system running in online mode. (The procedure ends at this point.)

- ③ The [Online mode release demand] message dialog box (Figure 4-64) appears on PC-A's screen. Select the [The online mode is made clear at once.] radio button in the [Reply item] group box, in order to clear (release) the online mode immediately, and click the  button.
- ④ On PC-B's screen, the message dialog box shown in Figure 4-61 appears which informs you that a response has been received. Click the  button and wait for PC-A to enter into offline mode.
- ⑤ Change the status of data communication from online to offline for the ladder chart system running on PC-A.
- ⑥ The ladder chart system running on PC-B automatically changes its status of data communication from "online waiting" to online and presents a message dialog box (Figure 4-60) to that effect. Click the  button.

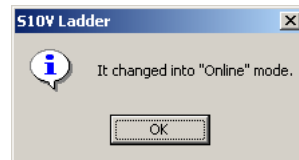


Figure 4-60 The "Communication Status Changed to Online" Message Dialog Box



In this dialog box, the user should click the  button. Then, a message dialog box as shown below appears which asks him/her whether or not to switch the operation mode to “only for online monitor”.

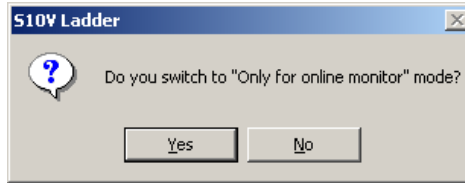


Figure 4-63 The “Switch to ‘Only for Online Monitor’ Mode” Confirmation Message Dialog Box

In this dialog box, the user clicks either the  or the  button.

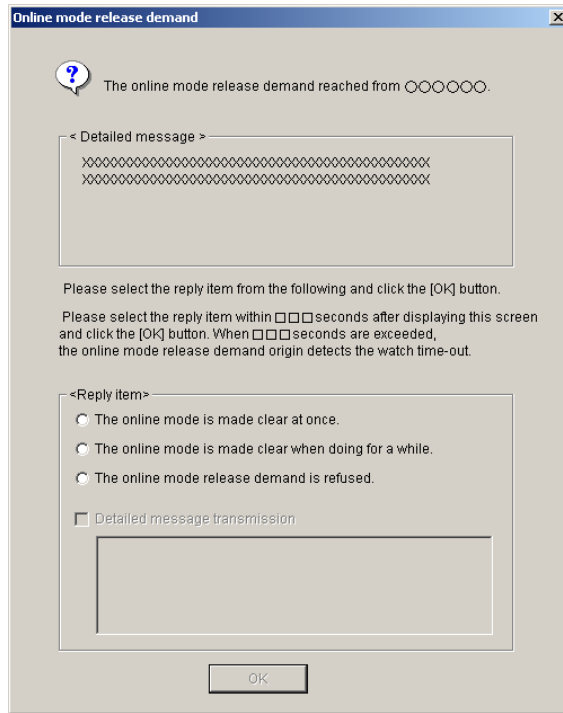
Clicking  : Switches the operation mode to “only for online monitor”.

Clicking  : Switches the operation mode to offline.



Online-mode release request message receiver:

The online-mode release request message receiver is a personal computer that, while running the ladder chart system in online mode, receives an online-mode release request from the sender. Upon its reception, the receiver displays the [Online mode release demand] message dialog box as shown below.



where:

○○○○○○: The ID name of a personal computer (sender) that issued an online-mode release request.

XX...X: Detailed message from that personal computer

□□□: A period at the end of which a timeout will be generated in that personal computer.

Figure 4-64 The [Online mode release demand] Message Dialog Box

In the above dialog box, the user should select the desired radio button from the “Reply item” radio button list and click the **OK** button. A reply message will then be sent to the sender. However, if before receiving the reply message the sender has ended its ladder chart system or has changed its operation mode either to offline or “only for online monitor”, the online mode release demand (request) cancellation message dialog box shown below is displayed on the receiver’s screen.

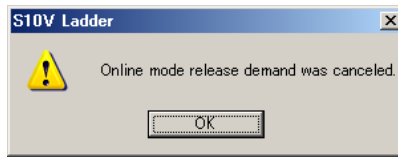


Figure 4-65 The Online Mode Release Demand Cancellation Message Dialog Box

In this dialog box, the user should click the  button.

<Detailed message transmission procedure>

- ① Check the [Detailed message transmission] check box under the [Reply item] group box so that the detailed message form will become ready for input.
- ② Enter detailed message text in the form. The detailed message may be up to 128 bytes long -- each double-byte character, if any, should be counted as two bytes.
- ③ Click the  button.

### (4) “Only for online monitor” mode

<Functional limitations>

Compared with the online mode, the “only for online monitor” mode does not support the following:

- Transmission of ladder programs
- Change of ladder program size
- Alteration of analog pulse counter registration information
- Writing to the PCs’ memory via the [Online MCS] dialog box
- Transmission by FD function
- Run-time editing

<Monitoring the ladder program for any change in content>

Ladder circuit monitoring in “only for online monitor” mode constantly checks if a change has been made to the ladder circuit. If so, the ladder program change-in-content message dialog box shown below appears.



Figure 4-66 The Ladder Program Change-in-Content Message Dialog Box

Click the  button and stop the ladder circuit monitoring according to the message as shown above. Then, receive the ladder program from the PCs by selecting [Send] from the [Build] menu, and start ladder circuit monitoring again. Without receiving the ladder program, ladder circuit monitoring will not proceed normally.

## &lt;Notification of online mode release&gt;

In “only for online monitor” mode, when the online mode in which a ladder chart system is running is released (cleared), you can receive the message (Figure 4-67) to that effect. To utilize this service, you have to check the [Online mode release message reception] check box in the [Mode selection by online] dialog box (Figure 4-57) and change the operation mode to “only for online monitor”. If you select “only for online monitor” mode directly from the [Build] menu or mode bar, this service is not available.

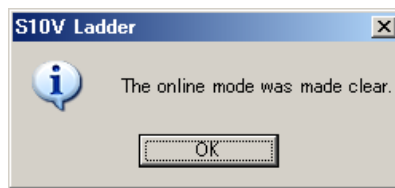


Figure 4-67 The Online Mode Release Message Dialog Box

## &lt;Maximum number of personal computers connectable&gt;

Up to four personal computers may be connected either to a CMU module or an ET.NET module (main or subordinate) if a hub is used to connect them together. This means that a maximum of 12 personal computers may be connected to one single LPU unit.

## (5) Handling of simultaneously issued online-mode release requests

Although it is rare, more than one online-mode release request may be issued simultaneously. (In normal operation, it is impossible to issue an additional online-mode release request if one such request is already issued from another personal computer in the network but has not yet been satisfied completely.) In this case, the “no response” message dialog box (Figure 4-59) may appear because the ladder chart system currently running in online mode on the other personal computer is not responding. To solve this problem, select the [The online mode release demand is transmitted, and ...] radio button again in the [Mode selection by online] dialog box and click the  button. (This action, however, cannot be taken if there is another personal computer running the ladder chart system in “online waiting” mode.)

## (6) Forcible ending of exclusive use

To forcibly end the exclusive use of any single unit of the PCs, choose [Free occupancy] from the [Utility] menu. When using this option, care must be taken because it not only forcibly ends the exclusive use of the unit but also clears (initializes) the online-mode release request information, if any.

### 4.5.3 Sending and receiving ladder programs

The ladder chart system's ladder program send/receive capability is effective only in online mode (it is not available in offline mode). To use this capability, you have to switch the mode to online if the system is running in offline mode.

#### (1) Sending edited ladder programs to the S10V

After you have edited and compiled ladder programs successfully, you can send them to the S10V by performing the procedure described below.

Note 1: Ladder programs cannot be transmitted separately for each N coil; all the existing N coils in a ladder program must be transmitted in a single batch.

Note 2: The ladder program transmitted is written to both the sequence memory and flash memory. When the power to the LPU unit is turned off, the contents of the sequence memory are cleared and the ladder program that was saved at the power-on time is transferred from the flash memory to the sequence memory.

Note 3: If system extension functions (as listed in "APPENDIX B SYSTEM EXTENSION FUNCTIONS") are used in the ladder program to be transmitted, the ladder chart system checks if they are installed. If they are not, the system will present an error message without sending it out. After installing the program of the relevant system extension arithmetic function, send the ladder program.

For details of the arithmetic functions to be installed, see "APPENDIX B SYSTEM EXTENSION FUNCTIONS."

<Procedure>

- ① Click [Send] from the [Build] menu.
- ② The [Sending setup] window will appear.

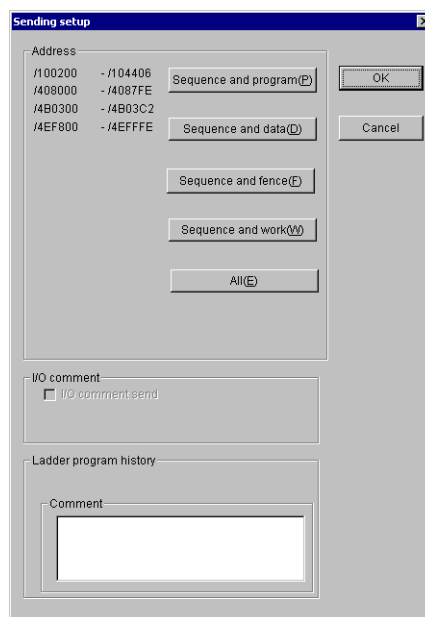


Figure 4-68 [Sending setup] Window

- ③ Click the selection button for the destination area you like in the [Sending setup] window, and click the  button. The default area is “Sequence”.

**Table 4-11 Destination and Source Areas**

Selection button	Ladder area (*1)	Analog pulse counter information	TUC set values	Registers			
				DW, LW	FW, BD	LB, LL, LF, LM, LG, LX	Work (*2)
Sequence and program	√	√	√	–	–	–	–
Sequence and data	√	√	√	√	–	–	–
Sequence and fence	√	√	√	√	–	–	–
Sequence and work	√	√	√	√	√	√	–
All areas	√	√	√	√	√	√	√

√: Subjected to both sending and receiving.

–: Not subjected to sending and receiving.

(\*1) The ladder area is used to hold ladder programs plus the following information:

- User function information (registration tables and program bodies). (Limited to cases where a user function area size is specified in the [Change capacity] window as shown in Figure 4-86.)
- I/O comment information. (Limited to cases where an I/O comment area size is specified in the [Change capacity] window as shown in Figure 4-86.)
- Sequence management table (SQET).
- PCs edition information (set or changed in the [Change capacity] window as shown in Figure 4-86).
- Ladder program history information.
- Ladder program label information.

(\*2) This is one of the registers X, J, Y, Q, G, R, M, K, T, U, C, N, P, V, E, Z, and S. Of these, T, U, and C are for contacts.

If the  or  button is clicked, the ladder program will be subjected to transmission as far as the EOP (end of ladder program) is encountered in it. If any other button is clicked instead, all the areas for the ladder program set in the [Change capacity] window (Figure 4-86) will be subjected to transmission.

Ladder program history comments are entered as required. When you enter such comments, remember that their length is limited to 128 single-byte characters (or 64 double-byte characters).

When you wish to transmit I/O comments, check the [I/O comment send] checkbox in the [I/O comment] group box.

- ④ The [Confirmed send circuit] window below will appear.

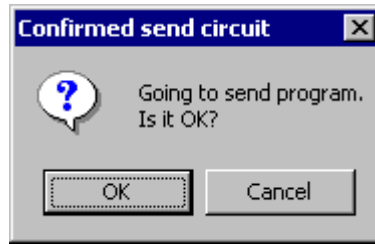


Figure 4-69 [Confirmed send circuit] Window

If you click the  button, the [Confirmed send circuit] and [Sending setup] windows will be closed and transmission of the ladder program will begin. If you click the  button instead, the [Confirmed send circuit] window will be closed without starting the transmission of the program (you will be taken back to Step ③).

- ⑤ If the ladder program to be sent contains an odd-numbered long-word register or PSHO/POPO instruction, the LPU Ver.-Rev. is checked immediately before sending. If the LPU Ver.-Rev. is 02-05 or earlier, the send inhibition window (see Figure 4-70) appears.

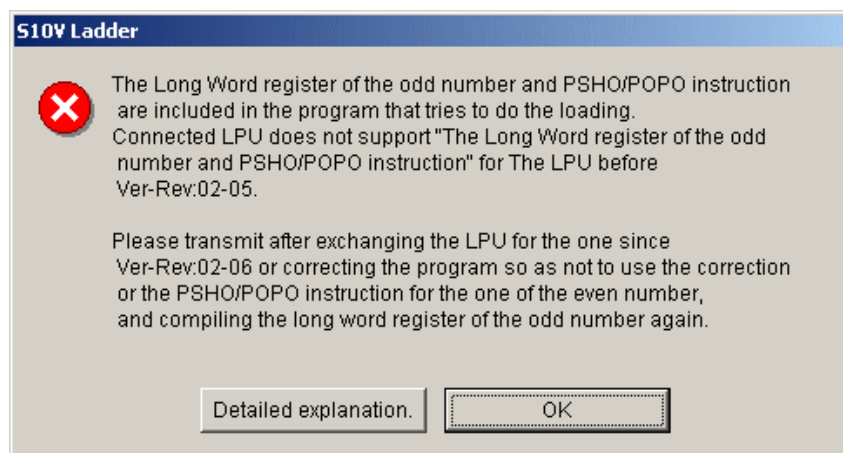


Figure 4-70 Send Inhibition Window

The LPU stops due to “Invalid instruction detected.” This occurs if a ladder program containing an odd-numbered long-word register or PSHO/POPO, which was created by the Ladder Chart System of Ver.-Rev. 01-16 or later, is sent to a Ladder Chart System of Ver.-Rev. 01-15 or earlier, or to an LPU of Ver.-Rev. 02-05 or earlier using batch loading.

- ⑥ If the ladder program to be sent uses LIW and LOW registers internally, the ladder chart system checks the Ver-Rev number of the existing LPU module before sending. If the LPU module is found to be Ver-Rev 04-00 or earlier, the sending refusal window as shown in Figure 4-71 will be displayed.

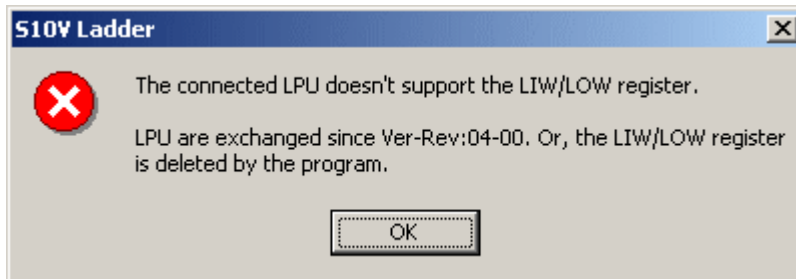


Figure 4-71 Program-with-LIW/LOW-Registers Sending Refusal Window

If a ladder program with LIW and LOW registers used in it is created using a ladder chart system of Ver-Rev 01-32 or later and an attempt is made to send the created program to the LPU module of Ver-Rev 04-00 or earlier by using either a ladder chart system of Ver-Rev 01-31 or earlier or a backup restore system, then the LPU will stop functioning due to an “Invalid instruction detected” error.

- ⑦ While the transmission is in progress, the [Now sending] window below remains displayed.

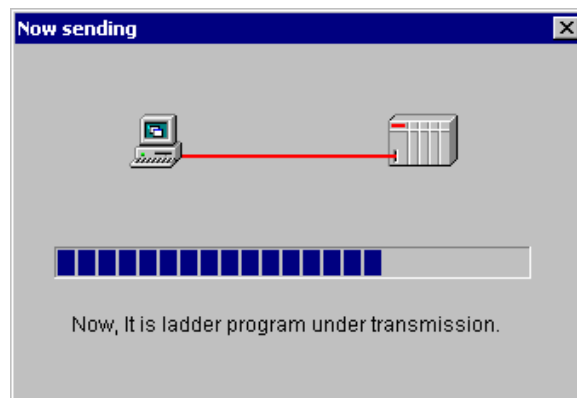


Figure 4-72 [Now sending] Window



- ⑧ When the transmission of the ladder program is completed, the [Now sending] window disappears.

### <Ladder program history>

If you have entered a ladder program history comment in the [Sending setup] window, the comment will be loaded into the S10V's memory during the transmission of the ladder program, along with the transmission date and time that is always loaded in automatically. It is recommended that, since the loaded transmission date and time is affected by the time setting of the S10V, the S10V's time should be set correctly beforehand.

Note: No ladder program history data alone can be subjected to the transmission process.

### <I/O comment transmission>

Transmission of I/O comments becomes possible when all the conditions listed below are satisfied. When one or both of these conditions are not met, the [I/O comment send] checkbox in the [I/O comment] group box is not selectable.

- The ladder sheet has an I/O comment displayed.
- An I/O comment area is secured in the S10V's memory (via the [Change capacity] window).

## (2) Receiving ladder programs from the S10V

You can receive ladder programs from the S10V's memory and store them on the disk of the personal computer, all by performing the following procedure:

<Procedure>

- ① Click [Receive] from the [Build] menu.
- ② The [Receiving setup] window below will appear.

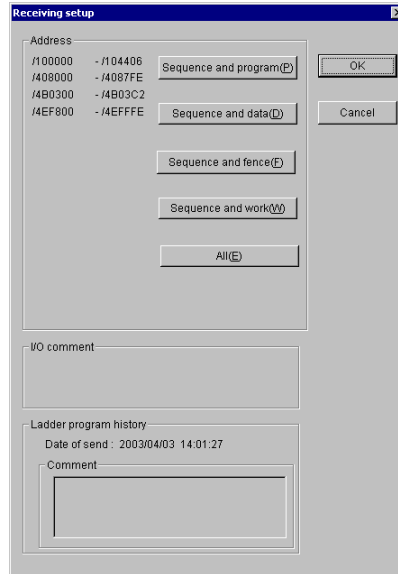


Figure 4-73 [Receiving setup] Window

When this window appears, you can see the ladder program history information presented in the window (the transmission date and time displayed in this window is the one at which the most recent transmission of a ladder program was performed). In addition to this information, if an I/O comment is held in the S10V's memory (SEQ-RAM), the location where the comment is saved is also displayed.

- ③ Select the area whose content you wish to receive (see item (1) above) in the [Receiving setup] window and click the  button. The default area is "Sequence and program". If the  button is clicked in place of  button, the [Receiving setup] window will disappear (no ladder program will be received).

- ④ The [Confirmed receive circuit] window below will appear.

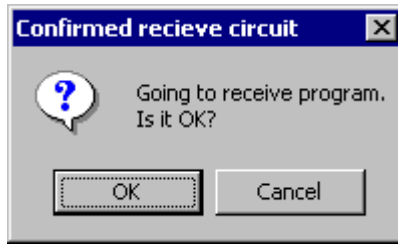


Figure 4-74 [Confirmed receive circuit] Window

If you click the  button, the [Confirmed receive circuit] and [Receiving setup] windows will be closed and reception of the ladder program will begin. If you click the  button instead, the [Confirmed receive circuit] window will be closed without starting the reception of the program (you will be taken back to Step ③).

- ⑤ While the reception is in progress, the [Now receiving] window below remains displayed.

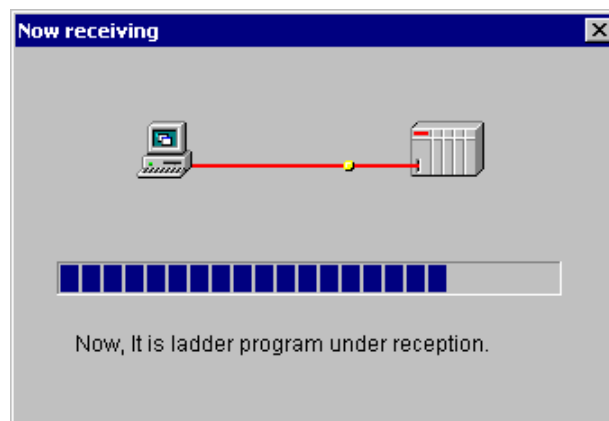


Figure 4-75 [Now receiving] Window

- ⑥ When the reception of the ladder program is completed, the [Now receiving] window disappears.

#### 4.5.4 Monitoring ladder circuits

You can monitor the status of ladder programs running in the S10V's memory (SEQ-RAM).

The types of ladder symbols you can monitor are listed below. No other types can be subjected to monitoring. These other types include the A/B contacts used with the system registers S000 through S00F. Even if any of such contacts (conditions) is true, its display remains unchanged (i.e., the display color does not change to red).

This monitoring capability of the ladder chart system supports input/output settings for certain types of ladder symbols.

- A-contact: The display color of this symbol changes to red when the contact turns on (= 1).
- B-contact: The display color of this symbol changes to red when the contact turns off (= 0).
- Rising-edge contact: The display color of this symbol changes to red when the contact turns on (= 1).
- Falling-edge contact: The display color of this symbol changes to red when the contact turns on (= 1).
- Normal coil: The display color of this symbol changes to red when the coil turns on (= 1).  
For timers, counters, and one-shots, their current count values are also displayed at that time.
- Set coil: The display color of this symbol changes to red when the coil turns on (= 1).
- Reset coil: The display color of this symbol changes to red when the coil turns on (= 1).
- Function: The result of this symbol is displayed in decimal or hexadecimal format.

The display color settings for symbols can be changed in the [Setup environment] window.

#### <Procedure>

- ① Click [Start monitoring] from the [Build] menu (the [Start monitoring] option in the menu will change to [Stop monitoring]). Alternatively, click [Start monitoring] from the tool bar.
- ② The ladder sheet will enter a monitoring state (this can be recognized from the background color that has changed to the one set in the environment setting window).
- ③ The monitoring in progress can be stopped by clicking [Stop monitoring] from the [Build] menu (the [Stop monitoring] option in the menu will change to [Start monitoring]). Alternatively, click [Stop monitoring] from the tool bar.

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### <Switching between display formats>

You can change the display format for the result of functions from decimal to hexadecimal or back. This switching can be accomplished via the [Display] menu or tool bar. If the [Display] menu is used, the current display format used is checked to see if it is “Monitor of decimal” or “Monitor of Hexadecimal.” If the tool bar is used, the new display format is offered in the tool bar (i.e., if the decimal format is being used, the tool bar button offers hexadecimal as the new display format, or vice versa).

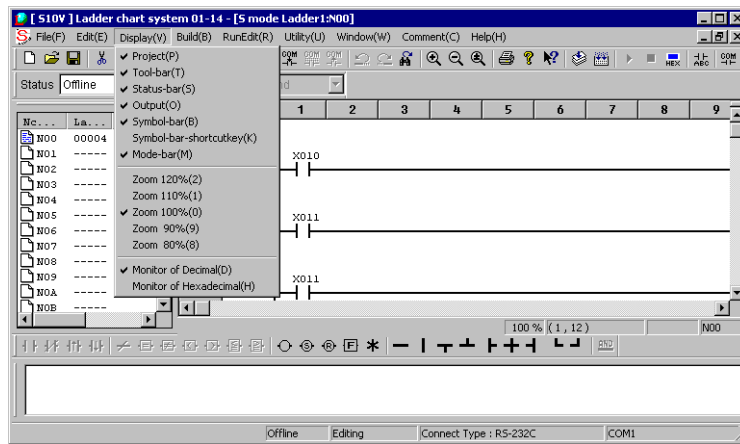


Figure 4-76 Switching between Monitoring Display Formats via the [Display] Menu

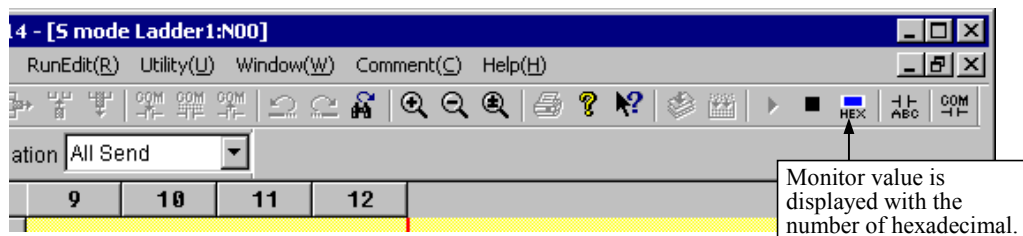


Figure 4-77 Switching between Monitoring Display Formats via the Tool Bar

The display format is defaulted to decimal.

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The figures below show an example of monitoring a function.

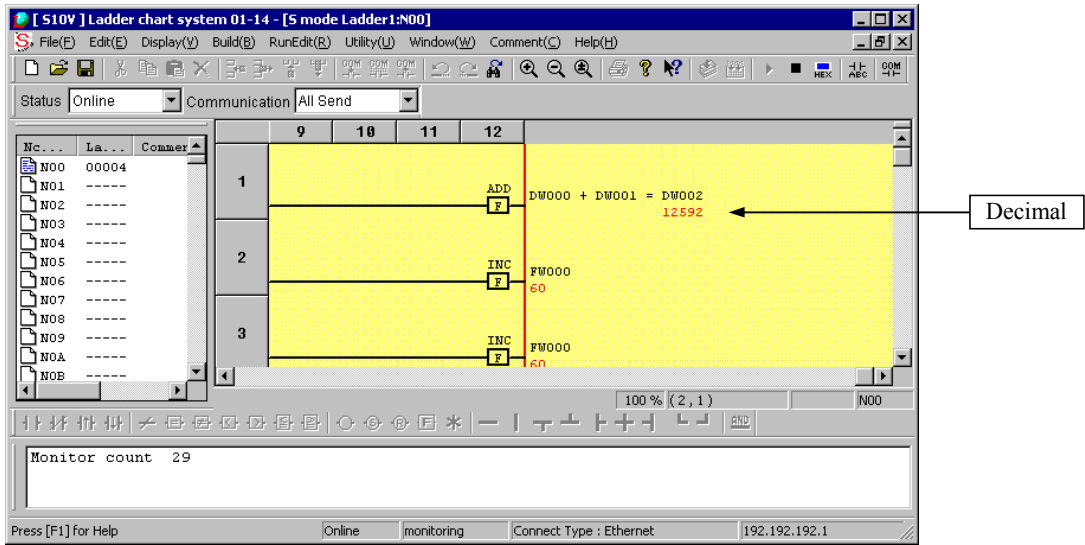


Figure 4-78 Monitoring of a Ladder Circuit Using Decimal Format

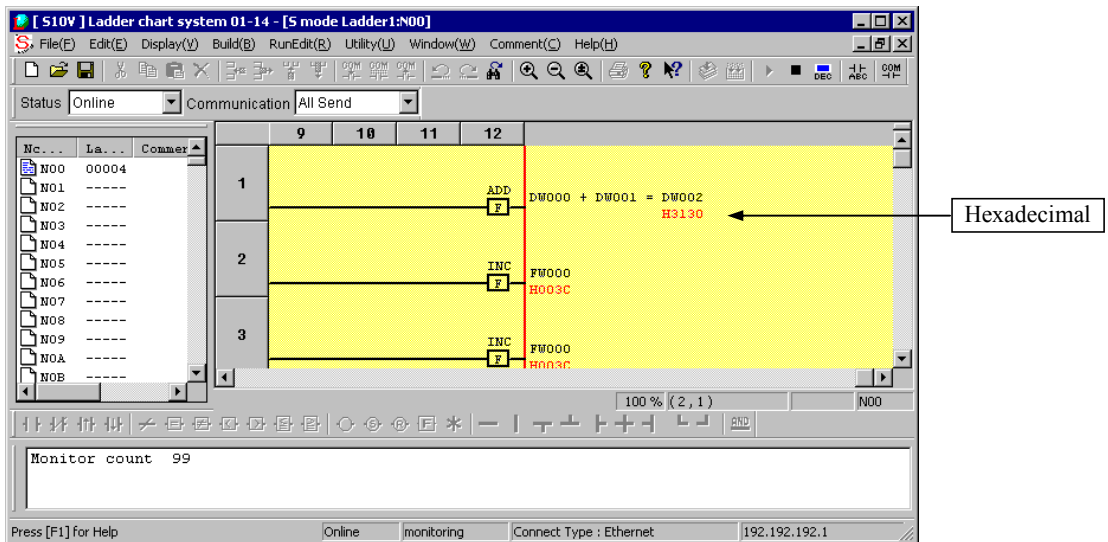


Figure 4-79 Monitoring of a Ladder Circuit Using Hexadecimal Format

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### <Input/output settings>

While a ladder sheet is subjected to monitoring, you can provide input/output settings for ladder symbols, except comparison symbols and other symbols using index registers. How to provide an input/output setting is exemplified below.

- (1) Move the mouse cursor to a ladder symbol for which you wish to provide an input/output setting, and then double-click the symbol. (In the window below, the mouse cursor has been moved to the A contact X000 before double-clicking.)

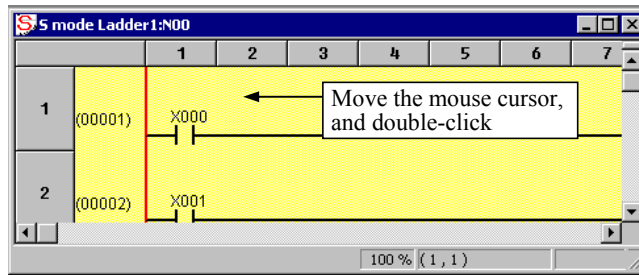


Figure 4-80 Selecting a Ladder Symbol

- (2) The [IO Set] window will be displayed as shown below.

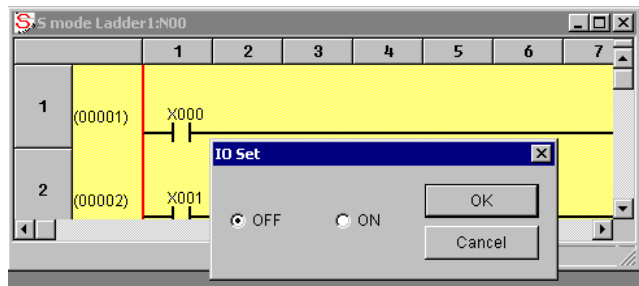


Figure 4-81 [IO Set] Window

- (3) Click the [ON] radio button in the [IO Set] window. Then, if you click the **OK** button, the [IO Set] window will disappear and the contact will turn on, as shown below. If you click the **Cancel** button instead, the [IO Set] window will disappear, but the contact remains unchanged.

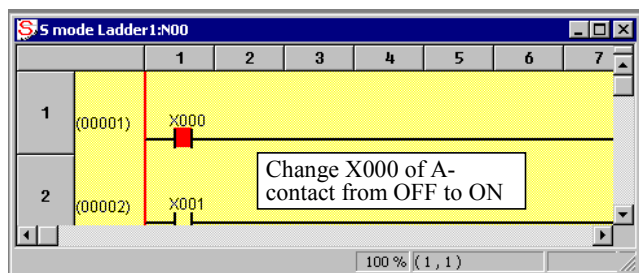


Figure 4-82 Changed Display Color of the Symbol under Monitoring

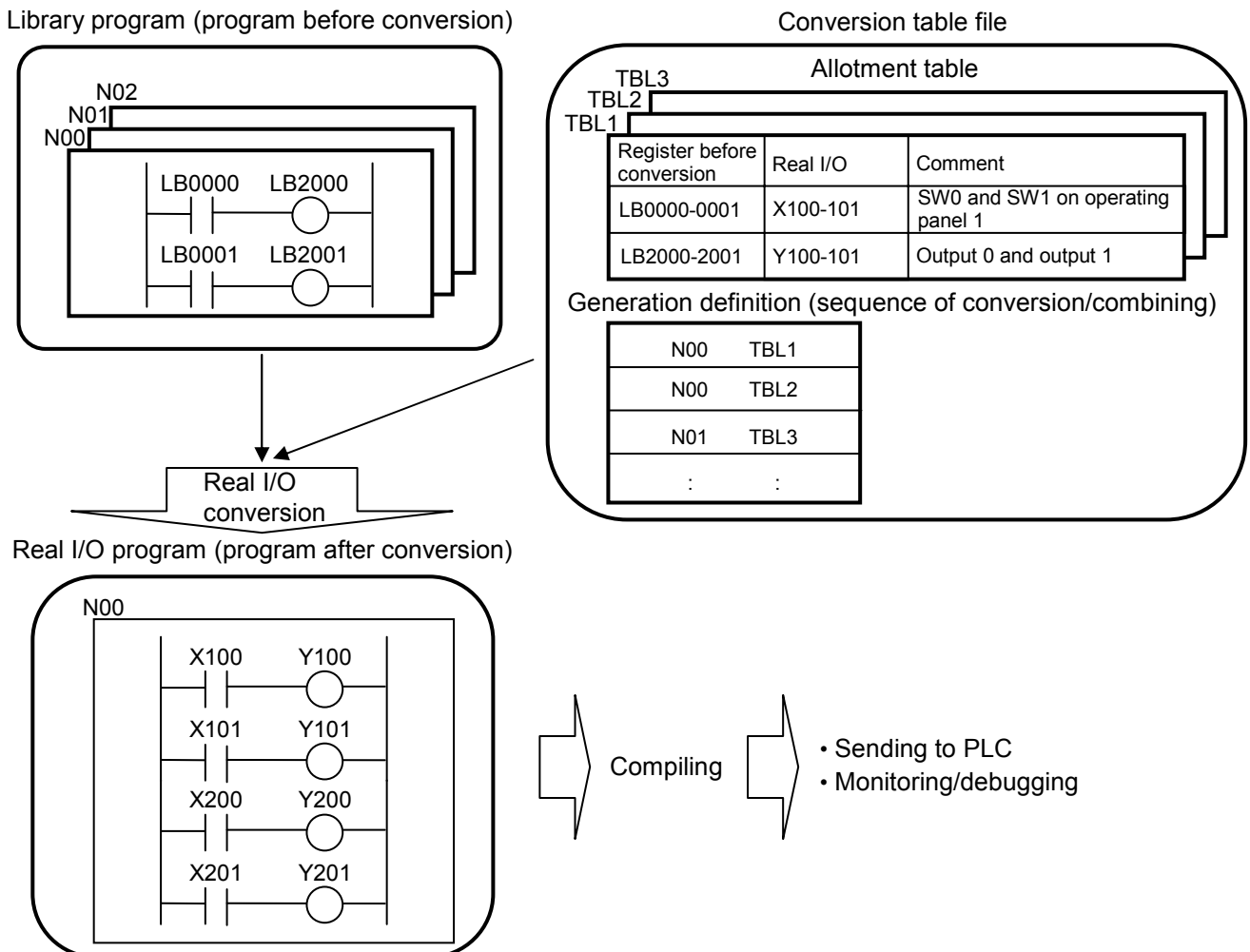
4.5.5 Real I/O conversion function

The real I/O conversion function handles multiple ladder circuits (N coils) as common programs, replaces contacts and coils with specified registers, and combines multiple ladder circuits (common programs) into one ladder circuit.

When controlling multiple robots by using a single PLC, the ladder circuits used to control the robots have the same logic (circuit) but may differ only in terms of contacts and coil addresses. In such a case, you can create common ladder circuits beforehand, define the method of converting contacts and contact addresses, and the sequence of combining the circuits, and then execute the real I/O conversion function to automatically generate a combined program in which the actual addresses of contacts and coils are assigned.

In the terminology used for the real I/O conversion function, a common program before conversion is called a “library program,” and a program after conversion (or converted program) is called a “real I/O program.” The method of converting contact and coil addresses, and the sequence of combining circuits are defined in different files. These definition files are called “conversion table files.” The definition of the method of converting contact and coil addresses is called an “allotment table.” The definition of the sequence of converting or combining circuits is called a generation definition.

The generated real I/O program is compiled, sent to the PLC, and then monitored and debugged.





## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

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### (1) Creating library programs (programs before conversion)

A program created as an N coil corresponds to a library program (a common program before conversion). Therefore, since the maximum number of N coils is 256, you can create up to 256 library programs.

Use library registers to describe library programs. If a register other than a library register is used in a library program, the register will not be converted. Library registers are converted according to the definition in the conversion table file.

#### <Library registers>

The registers listed below can be used as library registers. Other registers will not be converted. The library registers can also be used as registers after conversion.

- Bit register: LB0000 to LBFFFF
- Word register: LBW0000 to LBWFFF0  
LWW0000 to LWWFFFF  
LVW0000 to LVW0FF0
- Long word register: LBL0000 to LBLFFE0  
LWL0000 to LWLFFFE  
LVL0000 to LVL0FE0
- Bit register for edge contact: LV0000 to LV0FFF
- Special coils listed below
- T: On-delay timer coil: T000 to T7FF (contact, coil)
- U: One-shot coil: U000 to U0FF (contact, coil)
- C: Counter coil: C000 to C0FF (contact)  
CU00 to CUFF (coil)  
CD00 to CDFE (coil)  
CR00 to CRFF (coil)
- N: Nesting coil: N001 to N0FF (contact)  
NM01 to NMFF (coil)  
NZ01 to NZFF (coil)
- P: Process coil: P001 to P080 (contact, coil)
- K: Keep relay coil: K000 to KFFF (contact, coil)

To convert an edge contact or special coil, the registers before and after conversion must be the same types.

(2) Creating a conversion table file

A conversion table file consists of allotment tables and a generation definition. An allotment table must define the register conversion method for one library program (one N coil). The generation definition must define the allotment table to be used to convert registers in a specific library program (a specific N coil) and the sequence in which library programs are to be combined to generate a real I/O program.

The conversion table file must be created as a CSV-format file. You can use Microsoft Excel to create the conversion table file or use a text editor to directly create the file.

The following gives an example of using Microsoft Excel to create the conversion table file [defining the registers before conversion and registers after conversion (real I/O registers)] by, and describes the conversion table file format in detail:

	A	B	C
1	# Allotment table 1 — ①		
2	— ②		
3	<<TBL1>> — ③		
4	# Register before conversion	Register after conversion	Comment
5	LB0001	X100	Input 1
6	LB0010-001F	Y100-10F	Output 1 to output 15
7	LBW0020 — ④	DW002 — ⑤	Data 1 — ⑥
8			
9	# Allotment table 2		
10	<<TBL2>>		
11	# Register before conversion	Register after conversion	Comment
12	LB0001	X200	Input 1
13	LB0010-001F	Y200-20F	Output 1 to output 15
14	LBW0020	DW102	Data 1
15			
16	# Generation definition		
17	[LIB] — ⑦		
18	# Library No.	Allotment table	
19	L00	TBL1	
20	L01	TBL2	

① A line beginning with “#” is handled as a comment line. All characters other than those in comments must be en-size uppercase letters.

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- ② Null lines are ignored.
- ③ Enclose the name of an allotment table as “<<TBLx>>”, and describe the name in the first cell (column A).  
Note that “x” in “<<TBLx>>” must be the relevant table number represented by a zero-suppressed hexadecimal number.  
The valid range of table number is from 0 to 0x7FFFFFFF.
- ④ Describe the name of a register before conversion in the first cell (column A).  
Specify registers individually or by using a range specification. Describing “LB0010-001F” specifies 16 registers (i.e., LB0010, LB0011,... to LB001F).  
You cannot use a range specification that specifies different types of registers.
- ⑤ Describe the register after conversion corresponding to a register before conversion in the second cell (column B).
- ⑥ The descriptions in the third and subsequent cells (column C and subsequent columns) are handled as comments.  
The comments described here are irrelevant to those to be assigned to registers when editing the ladder program.
- ⑦ In the lines following the line on which “[LIB]” is described, describe the generation definitions for generating the real I/O program in the sequence of combining library programs.
- ⑧ Describe the library number (L00 to LFF) in the first cell (column A). Library numbers L00 to LFF correspond to the N coil numbers (N00 to NFF) of library programs.
- ⑨ Describe the name of an allotment table in the second cell (column B).  
You can assign multiple allotment tables to a library number.

<When converting a real I/O program to library programs>

Create allotment tables by replacing the descriptions of registers before and after conversion with one another as shown below. At conversion, specify “The register before conversion is not limited.” [See Item (3), “Conversion to a real I/O program,” below.]

# Register before conversion	Register after conversion
X100	LB0001
Y100-10F	LB0010-001F
DW002	LBW0020

<CSV file>

The following shows the content of the CSV file corresponding to the example of descriptions using Microsoft Excel above.

```
# Allotment table 1, ,
',
<<TBL1>>, ,
# Register before conversion, register after conversion,
comment
LB0001, X100, input 1
LB0010-001F, Y100-10F, output 1 to output 15
LBW0020, DW002, data 1
',
# Allotment table 2, ,
<<TBL2>>, ,
# Register before conversion, register after conversion,
comment
LB0001, X200, input 1
LB0010-001F, Y200-20F, output 1 to output 15
LBW0020, DW102, data 1
',
# Generation definition, ,
[LIB], ,
# Library No., allotment table,
L00, TBL1,
L01, TBL2
```

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### <Descriptions of special coils>

A special coil is converted to a contact or another coil of the same kind. The registers before and after conversion described in the allotment table must conform to the description formats shown in the table below. Be sure to describe the on-delay timer coil, one-shot coil, and process coil as TI, UI, and PI, respectively (instead of T, U, and P).

Register type	Contact description	Coil description	Use
T	T000 to T7FF	TI000 to TI7FF	On-delay timer
U	U000 to U0FF	UI000 to UI0FF	One-shot timer
CU	C000 to C0FF	CU00 to CUFF	Up counter
CD		CD00 to CDFF	Down counter
CR		CR00 to CRFF	Reset counter
NM	N001 to N0FF	NM01 to NMFF	Master control
NZ		NZ01 to NZFF	Zone control
P	P001 to P080	PI001 to PI080	Process
K	K000 to KFFF	K000 to KFFF	Keep relay

To convert both the contact and coil of a special coil whose contact and coil are described differently, specify the conversion of both contact and coil in the allotment table as shown below.

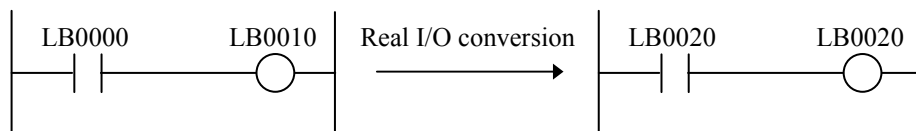
# Register before conversion	Register after conversion	
T100-10F	T200-20F	..... [Contact]
TI100-10F	TI200-20F	..... [Coil]

### <Precautions for conversion>

- Jump commands (JT, JMP, and JSE) cannot be used in a library program. Any attempt to execute real I/O conversion for a library program that includes a jump command displays a dialog box showing the error message below.  
“A jump command (JT, JMP, JSE) cannot be used for a library program.”
- An index register using the format below will not be converted.  
PIO register (index register)
- All allotment tables described after the generation definition are ignored.  
Describe all allotment tables before the generation definition.
- You can describe up to 512 lines of library number-allotment table combinations in the generation definition.  
The 513th and subsequent lines of descriptions are ignored.
- If the data type of the register before conversion does not match that of the register after conversion, conversion will not be performed.

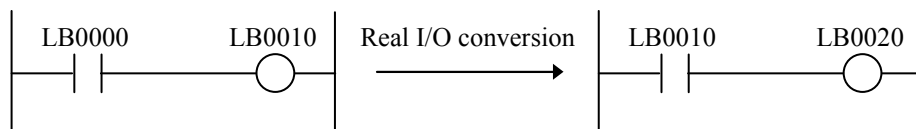
- When the registers before or after conversion are range-specified, the register number of the first register in the range must be smaller than that of the last register in the range.
- If the number of range-specified registers before conversion does not match the number of range-specified registers after conversion, only registers up to the matching number will be converted. The other registers will not be converted.
- If the registers before conversion are specified individually (e.g., LB0000) and the registers after conversion are range-specified (e.g., X100-110), or vice versa, the registers will not be converted.
  - If any of the registers below are specified as the registers before and after conversion, the registers will not be converted.
  - Floating-point registers: LF and LG
  - Count-value registers: TC, UC, and CC
  - Preset-value registers: TS, US, and CS
  - Indirect registers: BD, BW, and BL
- To convert a special coil, the type of the register before conversion must be the same as the type of the register after conversion. If different types of registers are specified, the registers will not be converted. Also, a normal coil (e.g., LB) cannot be converted to a special coil.
- An edge contact can only be converted to the register for edge contact.
- A set or reset coil can only be converted between K registers (keep relays).
- Conversions are performed in the sequence of descriptions in the allotment table. For example, when definitions are described in the allotment table as shown below, LB0000 will be converted to LB0010 first, and then LB0010 will be converted to LB0020.

# Register before conversion	Register after conversion
LB0000	LB0010
LB0010	LB0020



When changing the sequence of definitions as shown below, LB0010 will be converted to LB0020 first, and then LB0000 will be converted to LB0010. As a result, LB0000 will be converted to LB0010 and LB0010 will be converted to LB0020.

# Register before conversion	Register after conversion
LB0010	LB0020
LB0000	LB0010



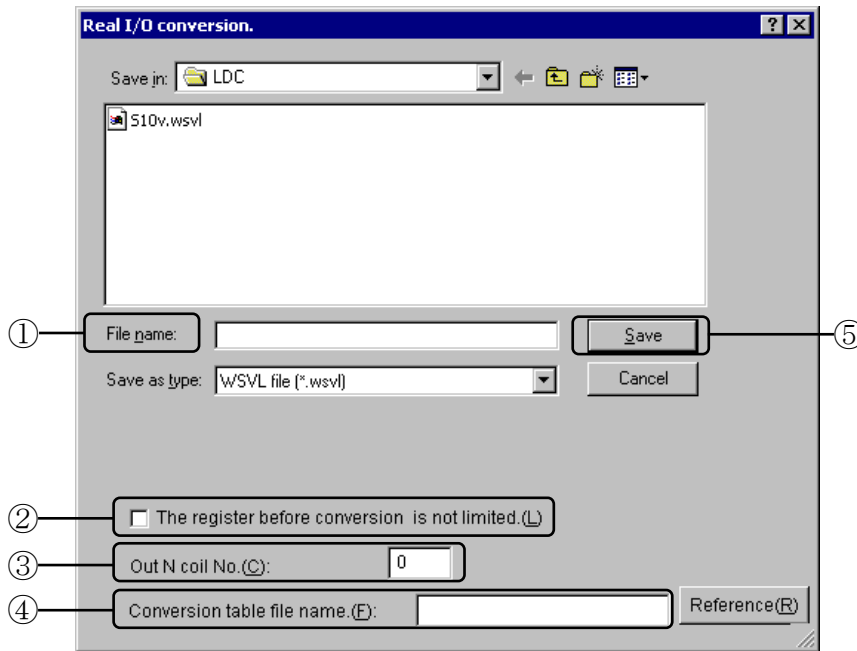
- No HS.RI/O registers, namely LIW/LOW registers, can be converted to the usual registers of symbols other than operation functions.

(3) Conversion to a real I/O program

Selecting “Real I/O conversion” from the [Build] menu in the main window displays the [Real I/O conversion] window.

The real I/O conversion function handles the currently open program as a library program, converts the library program according to the definitions in the conversion table file, and then saves the conversion result as a real I/O program in the specified file.

Real I/O conversion can only be performed in offline mode. In online mode, “Real I/O conversion” cannot be selected from the [Build] menu.



- ① Specify the name of the file in which to save the real I/O program (program after conversion). This box shows the name of library program (program before conversion) with “\_CHG” added as the default file name.
- ② Specify whether to limit the library registers (registers before conversion). Selecting the check box converts all registers described in the library program. Deselecting the check box only converts the library registers described in the library program (default setting).
- ③ Enter the N coil number [0 to FF (without entering “0x” at the top)] of the real I/O program to be obtained after converting (combining) the library program(s). The default N coil number is 0.
- ④ Enter the name of the conversion table file to be used to convert the library program to the real I/O program. This box is initially blank when the [Real I/O conversion] window appears.  
Note that clicking the **Save** button without any file name entered or with a nonexistent file name entered displays a dialog box showing the error message, “A conversion table file name is inaccurate.”
- ⑤ Click the **Save** button. The library program is then converted to the real I/O program, and saved with the specified file name.

(4) Lists of contact and coil conversions

The tables below list the conversions of contacts and coils.

Conversions of Contacts and Coils (When the Registers before Conversion are Limited)

Register type	Name	Contact		Coil	
		Circuit description	Possible conversion destination	Circuit description	Possible conversion destination
External input	X	X000 to FFF	No conversion	Undefinable	
External output	Y	Y000 to FFF		Y000 to FFF	No conversion
Internal register	R	R000 to FFF		R000 to FFF	
	M	M000 to FFF		M000 to FFF	
	A	A000 to FFF	A000 to FFF		
Keep relay	K	K000 to FFF		K000 to FFF	
On-delay timer	T	T000 to 7FF		T000 to 7FF (with preset value)	TI000 to 7FF
One-shot timer	U	U000 to 0FF		U000 to 0FF (with preset value)	UI000 to 0FF
Up/down counter	C	C000 to 0FF		CU00 to FF (with preset value)	CU00 to FF
				CD00 to FF (with preset value)	CD00 to FF
				CR00 to FF	
Global link register	G	G000 to FFF	No conversion	G000 to FFF	No conversion
Nesting coil	N	N000 to 0FF		NM00 to FF	
				NZ00 to FF	
Process register	P	P001 to 080		P001 to 080	PI01 to 80
Event register	E	E000 to FFF	No conversion	E000 to FFF	No conversion
Edge contact	V	V000 to FFF		Undefinable	
Set register	Z	Z000 to 3FF		Z000 to 3FF	No conversion
System register	S	S000 to BFF		Undefinable	
Shared-data register	J	J000 to FFF		Undefinable	
	Q	Q000 to FFF			
Internal extended register	LB	LB0000 to FFFF	(*1)	LB0000 to FFFF	(*2)
Register for converter (work register)	LR	LR0000 to 0FFF	No conversion	LR0000 to 0FFF	No conversion
Register for converter (edge contact)	LV	LV0000 to 0FFF	V000 to FFF LV0000 to 0FFF	Undefinable	

(\*1) This contact can be converted to any of the following contacts other than V, LV, and K:

X, Y, R, M, A, G, E, Z, S, J, Q, LB, LR, T, U, C, N, and P

(\*2) This coil can be converted to any of the following coils:

Y, R, M, A, G, E, Z, Q, LB, and LR



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### Conversions of Contacts and Coils (When the Registers before Conversion are Not Limited)

Register type	Name	Contact		Coil	
		Circuit description	Possible conversion destination	Circuit description	Possible conversion destination
External input	X	X000 to FFF	(*1)	Undefinable	
External output	Y	Y000 to FFF		Y000 to FFF	(*2)
Internal register	R	R000 to FFF		R000 to FFF	
	M	M000 to FFF		M000 to FFF	
	A	A000 to FFF	A000 to FFF		
Keep relay	K	K000 to FFF		K000 to FFF	
On-delay timer	T	T000 to 7FF	(*1)	T000 to 7FF (with preset value)	TI000 to 7FF
One-shot timer	U	U000 to 0FF		U000 to 0FF (with preset value)	UI000 to 0FF
Up/down counter	C	C000 to 0FF		CU00 to FF (with preset value)	CU00 to FF
				CD00 to FF (with preset value)	CD00 to FF
		CR00 to FF			
Global link register	G	G000 to FFF		G000 to FFF	(*2)
Nesting coil	N	N000 to 0FF		NM00 to FF	
				NZ00 to FF	
Process register	P	P001 to 080		P001 to 080	PI01 to 80
Event register	E	E000 to FFF		E000 to FFF	(*2)
Edge contact	V	V000 to FFF	V000 to FFF LV0000 to 0FFF	Undefinable	
Set register	Z	Z000 to 3FF	(*1)	Z000 to 3FF	(*2)
System register	S	S000 to BFF		Undefinable	
Shared-data register	J	J000 to FFF		Q000 to FFF	(*2)
	Q	Q000 to FFF			
Internal extended register	LB	LB0000 to FFFF		LB0000 to FFFF	
Register for converter (work register)	LR	LR0000 to 0FFF		LR0000 to 0FFF	
Register for converter (edge contact)	LV	LV0000 to 0FFF	V000 to FFF LV0000 to 0FFF	Undefinable	

(\*1) Convertible to any of the following contacts other than V, LV, and K:

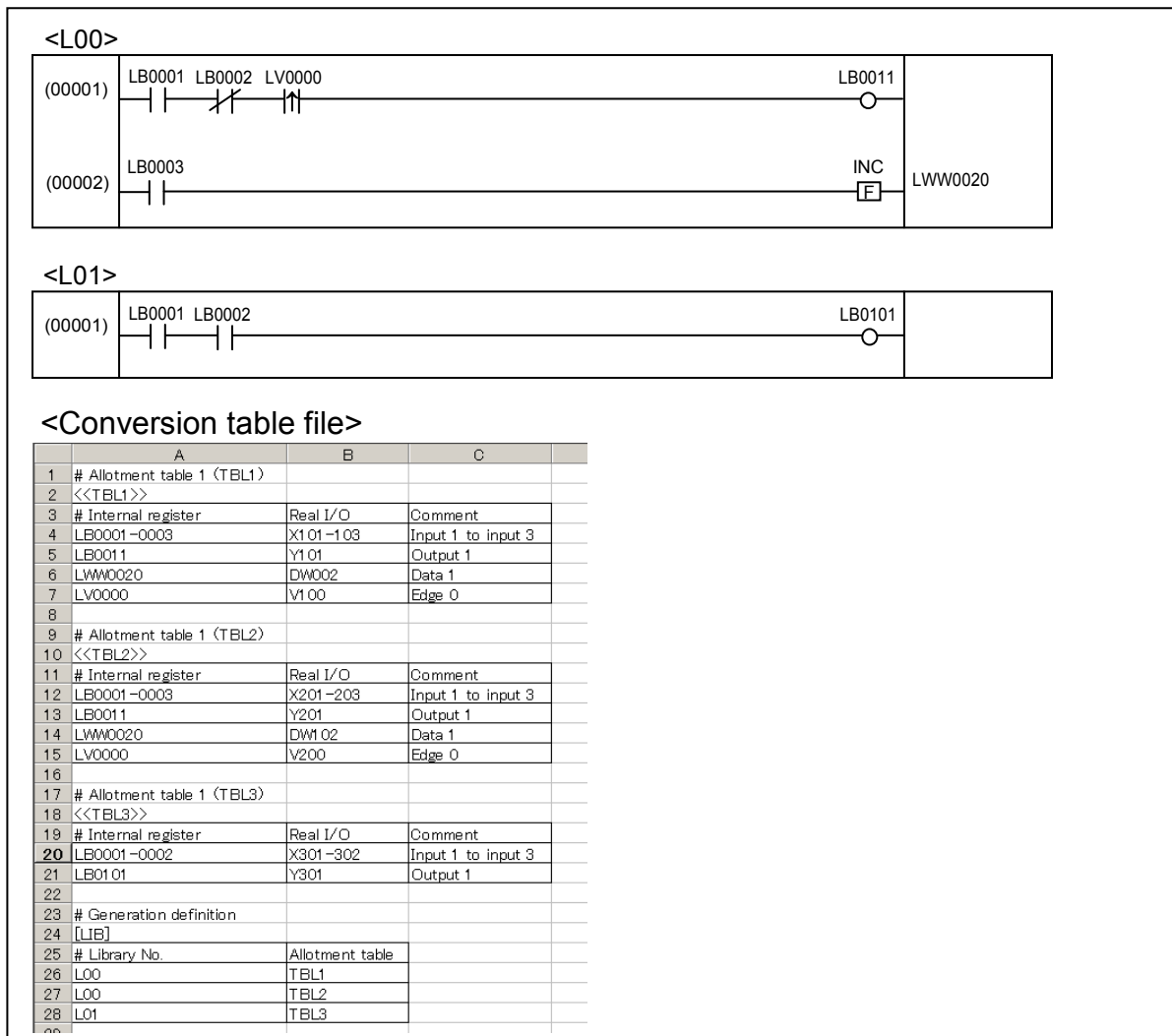
X, Y, R, M, A, G, E, Z, S, J, Q, LB, LR, T, U, C, N, and P

(\*2) Convertible to any of the following coils:

Y, R, M, A, G, E, Z, Q, LB, and LR

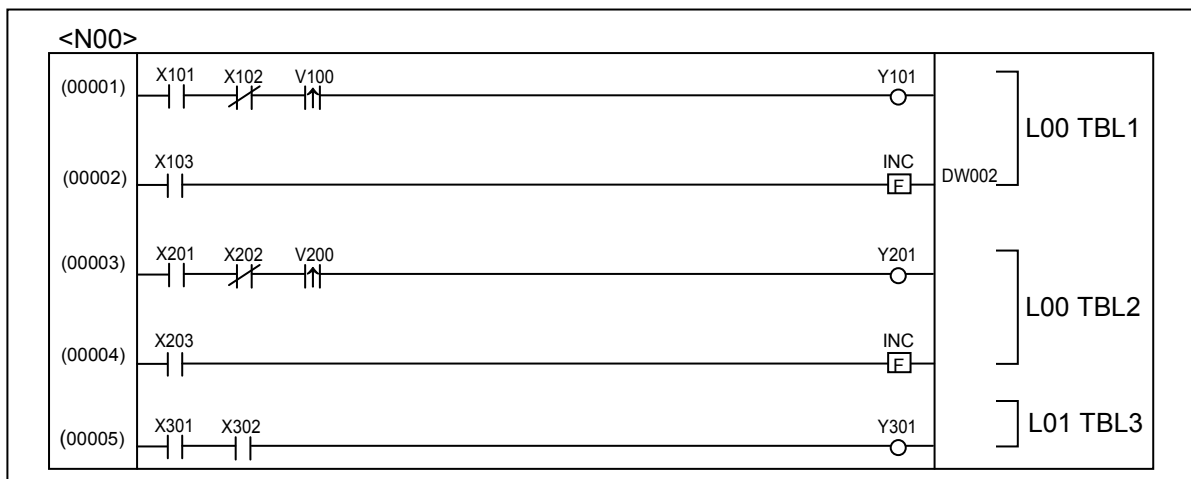
(5) Example of real I/O conversion

<Before real I/O conversion>



<After real I/O conversion>

Execution of real I/O conversion (with N00 specified as N coil No.)



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### (6) Messages related to real I/O conversion

(1/2)

No.	Message	Category	Code	Corrective action
1	Conversion table file open error.	E	650	Review the specified name of the conversion table file.
2	Conversion table file read error.	E	651	Confirm that the conversion table file is not currently opened by another program.
3	The definition of an allotment table was detected after the generation definition. (line XX)	E	652	Correct the definition of allotment table so that it is described before the generation definition.
4	A format of a definition is unusual. (line XX)	E	653	Review the description of the generation definition.
5	There is no generation definition.	E	654	Describe a generation definition.
6	The definition of library No. is mistaken. (line XX)	E	655	Review the definition of library No.
7	The definition of an allotment table is mistaken. (line XX)	E	656	Review the definition of the allotment table.
8	A definition of a specification allotment table is not found. (TBLyy)	E	657	Review the specification of the allotment table described in the generation definition.
9	The numbers of registers differ by range specification of a register. Only a convertible thing is changed. (line XX)	E	658	Make the number of registers before conversion match the number of registers after conversion.
10	An internal register (LF, LG, TC, UC, CC, TS, US, CS, BD, BW, BL) is the outside for conversion. (line XX)	E	659	Delete the register indicated by the message from the allotment table because conversion of said register is not supported.
11	Specification of a register is mistaken. (line XX)	E	660	Review the specification of the register before or after conversion.
12	The data type of a register is inharmonious. (line XX)	E	661	Match the data type between the registers before and after conversion.
13	It is not the register which can change register before conversion. (line XX)	E	662	Review the specification of the register before conversion.
14	The end register is specified by range specification of a register smaller than a start register. (line XX)	E	663	Review the range specification of registers.
15	TI, UI, CU, CD, CR, NM, NZ, PI should specify the register conversion before and after, by the same register. (line XX)	E	664	Specify the same registers as those before and after conversion for TI, UI, CU, CD, CR, NM, NZ, and PI.
16	The generation definition exceeded the number of the maximum registration cases.	E	665	Correct the generation definition so that its descriptions do not exceed the maximum limit of 512 lines.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

(2/2)

No.	Message	Category	Code	Corrective action
17	It's different in register classification in the change before and after. (line XX)	E	666	Correct the specifications of registers before and after conversion so that the registers are the same type.
18	It isn't possible to change a usual coil to a special coil.	E	667	Correct the definitions so that a special coil will be converted to the same type of special coil.
19	Function type "X", "J", "S" cannot be used for a coil.	E	913	Correct the definitions so that function type X, J, or S will not be allotted to a coil after conversion.
20	A jump command (JT, JMP, JSE) cannot be used for a library program.	E	-	Avoid using a jump command (JT, JMP, or JSE) in a library program.
21	It failed in conversion of real I/O.	I	-	Real I/O program could not be generated because of an error. Remove the cause of error, and then retry conversion.
22	It succeeded in conversion of real I/O. Please open and compile changed real I/O program.	I	-	Conversion to real I/O program succeeded. Open and compile the real I/O program.
23	There is I/O which has not been changed by the error of a definition of conversion. Please correct the conversion table file. Please open and compile changed real I/O program.	I	-	Remove the cause of the error in conversion definitions, and then retry conversion.
24	The definition of a change was wrong, so a real I/O change wasn't performed. A circuit was combined. Please open and compile changed real I/O program.	I	-	Remove the cause of the error in conversion definitions, and then retry conversion.
25	The LIW/LOW register cannot be converted excluding the operation function.			Neither LIW registers nor LOW registers can be converted to the usual registers of symbols other than operation functions. Correct the conversion definition file's content containing this error.
26	An indirect register of the float type cannot be converted into the LIW/LOW register.			No float-type indirect register can be converted to an LIW or LOW register. Correct the conversion definition file's content containing this error.

[Categories]

E: Error message

I: Informational message

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.6 Ladder Sheet Run-Time Editing Functions

The ladder sheet run-time editing functions are contained in the [RunEdit] pull-down menu, as shown below.

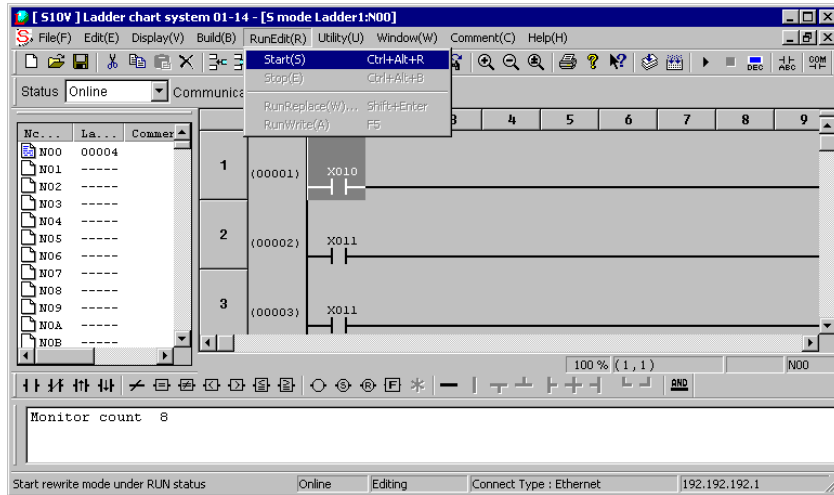


Figure 4-83 Clicking the [RunEdit] Option

The run-time editing functions provided in the [RunEdit] menu are listed below along with their descriptions.

Table 4-12 [RunEdit] Menu Options

No.	Level 1	Level 2	Level 3	Description
1	RunEdit	Start		Enters the run-time editing mode.
2		Stop		Exits the run-time editing mode.
3		RunReplace		Starts the run-time rewriting process.
4		RunWrite		Performs the run-time writing process.

Additional information on the [RunReplace] and [RunWrite] options of the [RunEdit] menu is given below.

**RunReplace:** Provides a means of changing existing symbols (contacts and coils) without stopping the PCs. This option does not support changing of branch instructions and deletion and addition of circuits. When you wish to change a branch instruction or to delete or add a circuit, use the RunWrite option set forth below. To change an existing symbol, move the cursor to that symbol and click the [RunReplace] option. The [Rewrite] window below will then appear which offers a function for changing an existing symbol. Specify the type of a new symbol by clicking the symbol button representing that symbol, and click the **Rewrite** button. The new symbol data will then be transmitted to the PCs.

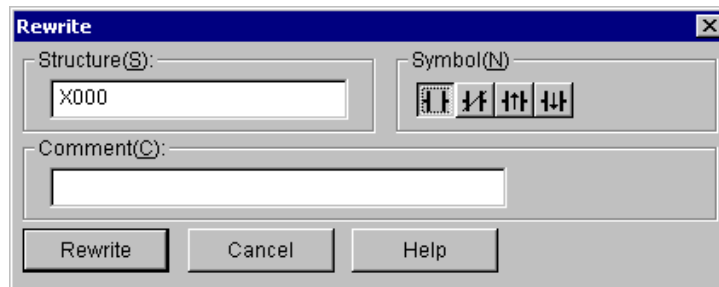


Figure 4-84 [Rewrite] Window

**RunWrite:** Changes branch instructions in an existing circuit, or deletes or add circuits. After altering the circuit, click [RunWrite] from the [RunEdit] menu. The new data will then be transmitted to the PCs (without stopping the PCs).

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.7 Ladder Sheet Utility Functions

The ladder sheet utility functions are contained in the [Utility] pull-down menu, as shown below.

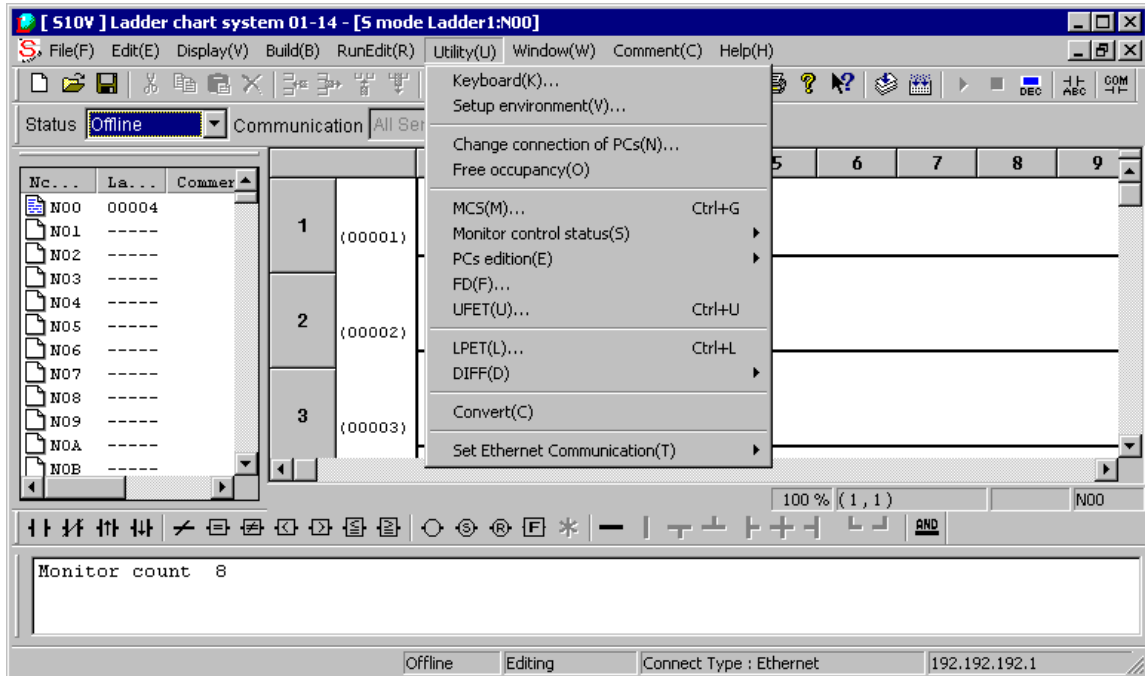


Figure 4-85 Clicking the [Utility] Option

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

The utility functions provided in the [Utility] menu are listed below along with their descriptions.

**Table 4-13 [Utility] Menu Options**

No.	Level 1	Level 2	Level 3	Description	
1	Utility	Keyboard		Sets shortcuts to symbol key inputs.	
2		Setup environment		Sets display colors for operation states.	
3		Change connection of PCs		Sets types of communication with the PCs.	
4		Free occupancy		Forcibly terminates the current exclusive use of the PCs.	
5		MCS		Reads from or writes to the PCs' memory.	
6		Monitor control status	Time chart monitor		Displays a time chart monitor.
7			Matrix monitor		Displays a matrix monitor.
8			Register monitor		Displays a register monitor.
9			Sequence cycle monitor		Displays a sequence cycle monitor.
10		PCs edition	Change capacity		Sets operating conditions and environments for operation in the PCs.
11			Analog counter		Registers control data for analog and pulse counters with the S10V, or deletes it from the S10V.
12		FD		Reads files from or writes files to floppy disks.	
13		UFET		Registers UFETs with the S10V or deletes them from the S10V.	
14		LPET		Displays contents of LPETs.	
15		DIFF	Circuit		Compares ladder charts.
16			Data		Compares memory data.
17		Convert		Converts downward-sloping-rung ladders to normal-rung ladders.	
18		Set Ethernet Communication	Set Parameter		Displays [Ethernet Communication Setting List] window to show the list of parameter information in Ethernet communication system extension functions.
19			Send System Program		Sends the system program in Ethernet communication system extension functions to PCs.



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.7.1 Setting PCs edition information

PCs edition information can be set in the [Change capacity] window by performing the procedure described below. When you wish to create a new ladder program, first display the [Change capacity] window on screen and then set sizes in the “Ladder program”, “I/O comment”, and “User function” boxes in the [Area size] group box. If none of I/O comments and user functions need to be loaded into the S10V, you can use the default values for their areas.

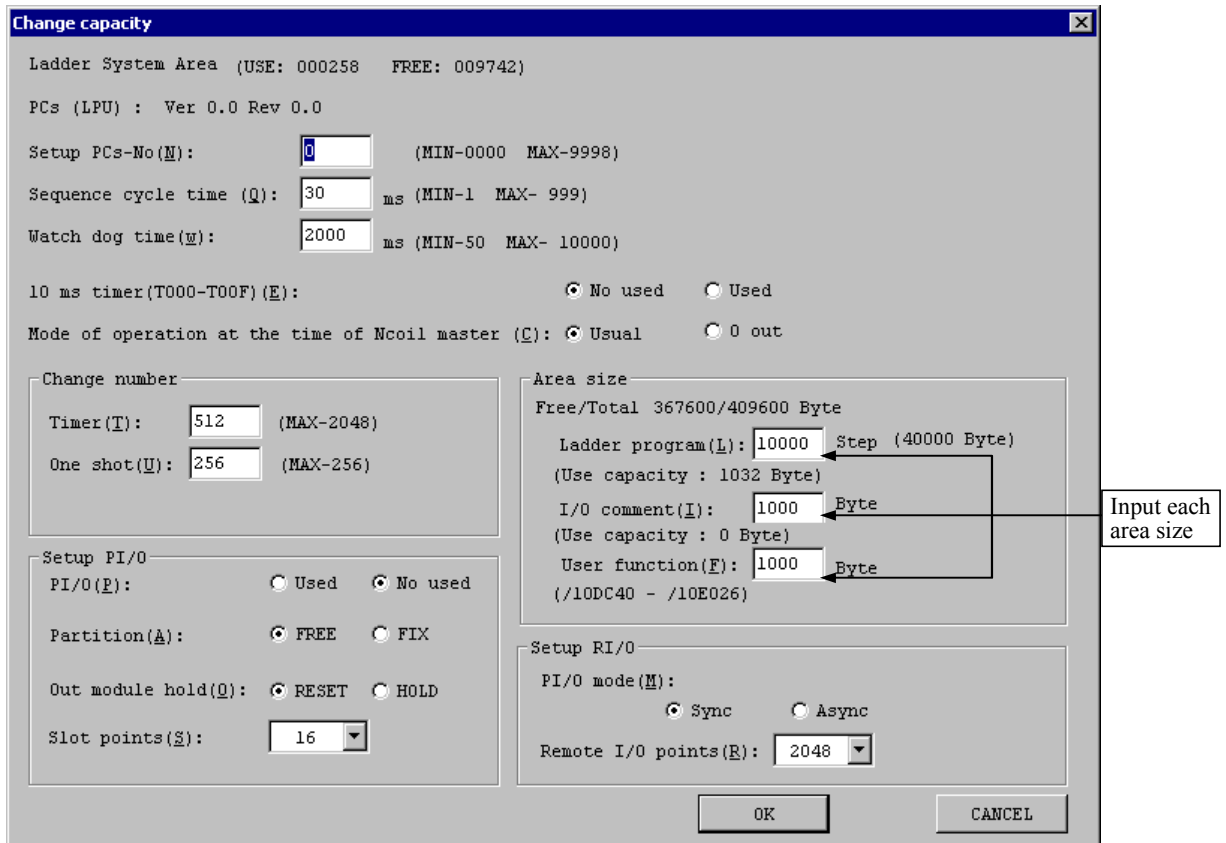
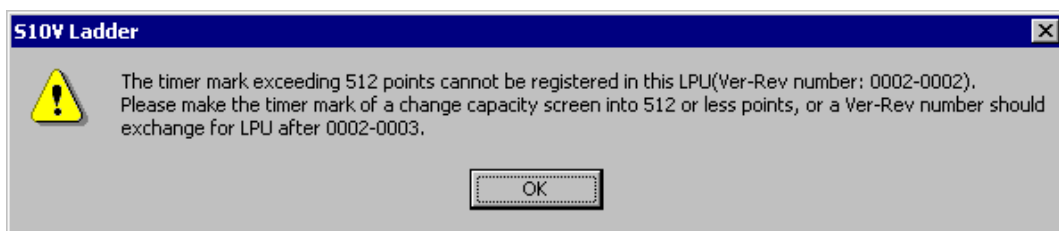


Figure 4-86 [Change capacity] Window

#### <Procedure>

- ① Click [PCs edition] - [Change capacity] from the [Utility] menu.
- ② The [Change capacity] window will appear. If this window is displayed in offline mode, the values of the individual items presented in the window are their default values. If the window is displayed in online mode, they are the PCs edition information set for the items in the S10V.

- ③ Set each individual item in the window and click the  button. Then, the set values will be loaded in immediately if the ladder chart system is running in online mode. If it is running in offline mode, they will not be loaded into the S10V until the ladder program is transmitted to it. If you enter a number larger than 512 in the “Timer” box in the “Change number” group box and click the  button in online mode, the system checks the Ver-Rev number of the connection-destination PC (LPU). If the Ver-Rev number of the connection-destination PC (LPU) is 0002-0002 or earlier, the error message dialog box below then appears, and the settings changed in the [Change capacity] window are not reflected on the PC.



Replace the connection-destination LPU module with the one that has Ver-Rev number 0002-0003 or later, or specify up to 512 points as the number of timer points in the “Change number” group box in the [Change capacity] window.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

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<Items>

Ladder System Area:

Size in steps of the space used in the ladder program storage area and the size in steps of the unused space in that area.

PCs (LPU):

Version number (Ver) and revision number (Rev) of the operating system (OS) running on the LPU module. These numbers are significant only in online mode.

Setup PCs-No:

PCs No to be set in the S10V; expressed in decimal form. This item may be set to a value in the range 0 to 9998 and is defaulted to 0.

Sequence cycle time:

Execution time in milliseconds of the ladder program. This item may be set to a value in the range 1 to 999 and is defaulted to 30.

Watchdog timer:

Monitoring duration in milliseconds until one sequence cycle of the ladder program is completed. If the ladder program does not end within the specified duration, an “LPU DOWN” error will result. This item may be set to a value in the range 50 to 10000 and is defaulted to 2000.

10 ms timer:

Specification of whether the 16 points T000 through T00F (registers) need to be used as 10-ms on-delay timers or not:

Used: The 16 points T000 through T00F will operate as 10-ms on-delay timers. The points T010 through T7FF will operate as 100-ms on-delay timers.

No used: The points T000 through T7FF will operate as 100-ms on-delay timers.

Note: The above information is the case when the timer setting in the [Change number] group box is 2048 (maximum).

Mode of operation at the time of N coil master:

Specification of an operation mode of the master control that turns off coils in use when the N coil turns off:

Usual: Turns off all coils in use in the N coil, except the set and reset coils, when that N coil turns off.

0 out: Turns off all coils in use in the N coil when that N coil turns off.

### Change number (Timer):

Specification of the number of T registers (points) that the OS will process as timers. This item may be set to a value in the range 0 to 512 and is defaulted to 2048.

Example: If this item is set to 16, then:

- The points T000 through T00F will operate as on-delay timers.
- The points T010 through T7FF will not operate as on-delay timers.

Example: If this item is set to 0, then:

- None of the T registers will operate as timers.

Note: The points above are processed in units of 16 points. Thus, if the set number of points is in the range 1 to 15, the 16 points T000 through T00F will operate as timers, and if it is 17, the 32 points T000 through T01F will operate as timers.

### Change number (One shot):

Specification of the number of U registers (points) that the OS will process as one-shots. This item may be set to a value in the range 0 to 256 and is defaulted to 256.

Example: If this item is set to 16, then:

- The points U000 through U00F will operate as one-shots.
- The points U010 through U0FF will not operate as one-shots.

Example: If this item is set to 0, then:

- None of the U registers will operate as one-shots.

Note: The points above are processed in units of 16 points. Thus, if the set number of points is in the range 1 to 15, the 16 points U000 through U00F will operate as one-shots, and if it is 17, the 32 points U000 through U01F will operate as one-shots.

### Setup PI/O (PI/O):

Specification of whether one or more I/O modules are mounted in the LPU unit or not. Defaulted to “No used”.

Used: Indicates that one or more I/O modules are mounted in the LPU unit. The LPU unit is assigned to the station number 0, and slot 0 onwards are assigned to the corresponding I/O number 000 onwards. The I/O unit (station) must not be assigned to the station number 0.

No used: Indicates that no I/O modules are mounted in the LPU unit.

Note: If this item is set to “No used”, the other items in the “Setup PI/O” group have no effect (i.e., they cannot be set).

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

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### Setup PI/O (Partition):

Usually set to “Free” and defaulted to that value.

**FREE:** Removes the I/O limitations placed on all I/O slots in the LPU mount base or I/O mount base. Each slot will be assigned to two I/O numbers dedicated to input or output (X $\Delta\Delta\Delta$  and Y $\Delta\Delta\Delta$ ). This allows specification of the I/O number matching an I/O module to be mounted.

**FIX:** Defines the left half of the I/O slots in the LPU mount base or I/O mount base as slots dedicated to input modules and the right half as slots dedicated to output modules. Each input slot and each output slot thus defined will be assigned to an I/O number dedicated to input (X $\Delta\Delta\Delta$ ) and an I/O number dedicated to output (Y $\Delta\Delta\Delta$ ), respectively. In the above description, each  $\Delta\Delta\Delta$  is an I/O number.

### Setup PI/O (Out module hold):

Specification of whether the output capabilities of the DO (digital output) modules mounted in each unit should be reset or held in the event of a breakage of the RI/O circuit. Defaulted to “RESET”.

**RESET:** Turns off the output capabilities of the individual DO modules.

**HOLD:** Holds the output values from the individual DO modules that occurred immediately before the circuit failure.

**Note:** This output hold setting is effective only for DO modules. It is ineffective for AO (analog output) modules, which always operate as if this item were set to “HOLD”.

### Setup PI/O (Slot points):

I/O point count setting for each mounted I/O module. If modules with difference I/O point counts are mounted in the same unit, set this item to the largest among those I/O point counts. For example, if 16-point modules and 32-point modules are mounted in the same unit, set this item to 32. In this case, each module will be assigned to as many I/O numbers as the specified 32 points, and each 16-point module will use only the first 16 I/O numbers corresponding to its 16 points, the remaining 16 I/O numbers being regarded as unused. In contrast, if this item is set to 16, each 32-point module will have only its first 16 points assigned to I/O numbers.

The I/O slot point counts that can be specified for this item are 16, 32, 64, and 128. The default is 16.

### Area size (Free/Total):

Total capacity of the ladder area (i.e., an area in SEQ-RAM that holds ladder programs, user functions' program bodies, and I/O comments) and free space size in that area.

### Area size (Ladder program):

Specification of the size in steps (and bytes) of the ladder program storage area. Defaulted to 102,400 (steps).

### Area size (Actual size):

Size in bytes of the storage space actually used for the ladder program.

### Area size (I/O comment):

Specification of the size in bytes of the I/O comment storage area. Set this item to an integer multiple of 2. Defaulted to 0.

### Area size (Actual size):

Size in bytes of the storage space actually used for the I/O comments (in the I/O comment storage area).

### Area size (User function):

Specification of the size in bytes of the user function program bodies storage area. Set this item to an integer multiple of 2. Defaulted to 0.

### Area size (User function loading area address range):

Starting and ending addresses of the storage space into which the user functions' program bodies can be loaded.

### Setup RI/O (PI/O mode):

Specification of whether RI/O processing should be synchronized with ladder processing. Defaulted to "Async".

Async: Updates PI/O-RAM without regard to execution of the ladder program.

Sync: Updates PI/O-RAM on the completion of one sequence cycle of the ladder program.

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Setup RI/O (RI/O points):

Specification of a RI/O point count. As a value of this item, select one from among 64, 128, 256, 512, 1024, and 2048 (points). Defaulted to 2048.

The table below shows the relationships between specifiable RI/O point counts and I/O numbers exclusively used.

Table 4-14 Specifiable RI/O Point Counts and Their Related I/O Numbers Exclusively Used

RI/O point count	Their related I/O numbers exclusively used	
	Input	Output
64	X000 to X03F	Y000 to Y03F
128	X000 to X07F	Y000 to Y07F
256	X000 to X0FF	Y000 to Y0FF
512	X000 to X1FF	Y000 to Y1FF
1024	X000 to X3FF	Y000 to Y3FF
2048	X000 to X7FF	Y000 to Y7FF

<About area sizes>

No area size settings for ladder programs, I/O comments, and user functions are allowed whose total exceeds 409,600 bytes. Ladder programs require a storage area of at least 258 steps (1032 bytes).

Note: The area sizes for ladder programs are specified in steps and one step is equivalent to 4 bytes.

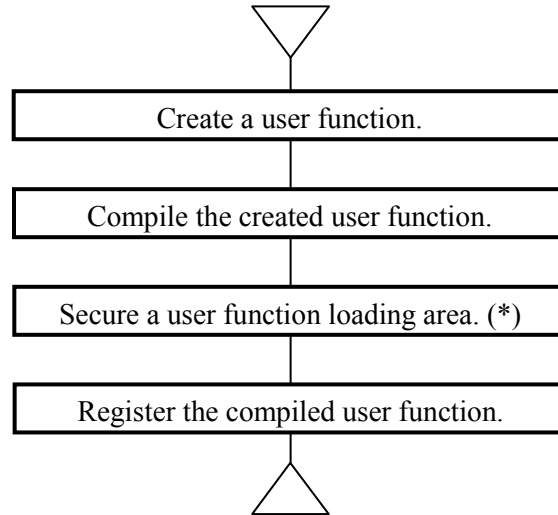
<Notes>

- If the existing PCs edition information is modified in online mode, receive the ladder program from the S10V before you alter the ladder program at hand. If the altered (and compiled) ladder program is transmitted to the S10V without receiving the ladder program from it, the new PCs edition information after the online modification will be replaced by the old PCs edition information before the online modification. For information on the transmission and reception of ladder programs, see Subsection 4.5.3, “Sending and receiving ladder programs.”
- If you have changed the area size for the ladder program, re-register the user functions’ program bodies with the S10V, except when the “Area size (User function)” item is set to 0 or when no user functions are registered. For details, see Subsection 4.7.2, “Registering user functions.”
- If you have reduced the area size for the I/O comments below their actual size, the I/O comments in their storage area will be cleared (they will remain intact as long as the changed area size is larger than or equal to the actual size). For this reason, care should be taken when you change the area size for the I/O comments.

### 4.7.2 Registering user functions

#### (1) Procedure overview

An outline of the procedure for registering user functions is given below.



(\*) This step is skipped when a user function loading area is already secured.

#### (2) Creating user function programs

User function programs can be created in C. When you create a user function, observe the following rules:

- Only long-type pointers are allowed as parameters of user functions.
- Only one parameter may be specified for any user function.
- The parameter of a user function should be extracted separately from the upper and lower words by using the mask pattern 0x0000FFFF.
- To access the PI/O-RAM, use internal addresses of the LPU module (i.e., addresses used in the SH7055 processor).



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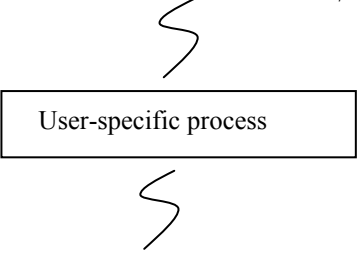
An example of coding a user function is given below.

Source name: testFunc.c

```
void testFunc( long *para )
{
    long paraTmp;          /* Parameter extraction */
    /* Parameter extraction process */
    paraTmp = ( *para++ & 0x0000ffff ) << 16 ; /* Extracting the upper word */
    paraTmp |= ( *para & 0x0000ffff ); /* Extracting the lower word */
    /******  

    }

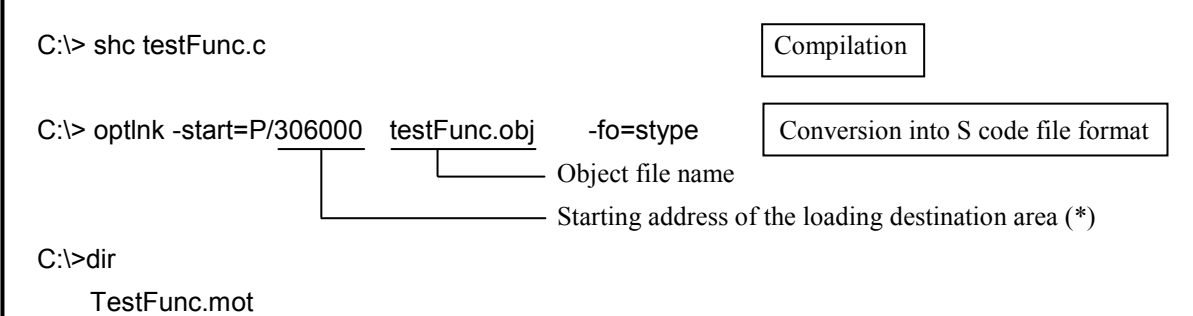
```



### (3) Compiling the created user function

Compilation of the coded user function requires the SuperH RISC engineC/C++ compiler, V7.0. By using this compiler, you can compile the coded user function, convert the generated object into S code file format, and output the result. The procedure shown below is a simple command-line-based compilation procedure.

```
C:\> shc testFunc.c
C:\> optlnk -start=P/306000 testFunc.obj -fo=stype
C:\> dir
TestFunc.mot
```



Object file name

Starting address of the loading destination area (\*)

For more information on how to use the compiler, refer to the SuperH RISC engineC/C++ Compiler V7.0 manual.

(\*) This starting address must be specified by an LPU internal address value, which can be calculated by adding the value 0x200000 to the starting address found as described in item (6), “Finding a user function loading address range.”

(4) Securing a user function loading area

Before you register the created user function, be sure to secure a user function loading area. For information on how to secure the loading area, see Subsection 4.7.1, “Setting PCs edition information.” Unless a user function loading area is secured, the error message dialog box below will appear when you attempt to get the [User operation function registration] window on the screen.

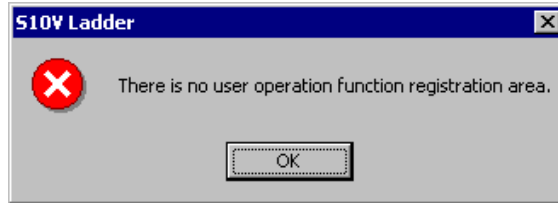


Figure 4-87 Possible Error Message Where No User Function Loading Area Is Secured

(5) Registering the compiled user function

The compiled user function can be registered via the [User function setup] window as shown below.

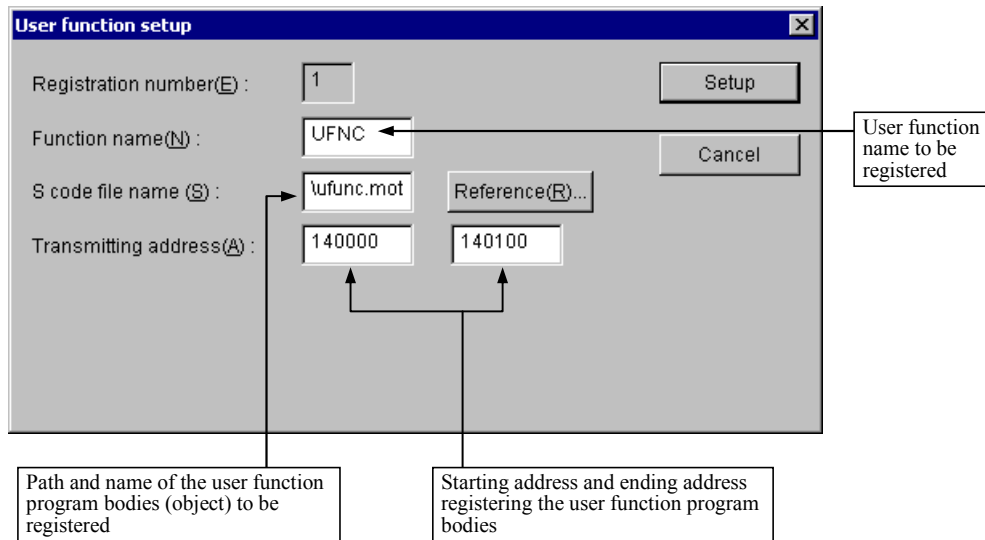


Figure 4-88 [User function setup] Window

Up to 128 user functions can be registered with the S10V (provided you have secured 128 user function areas via the [Change capacity] window). Whether it is a system function, system extension function, or a user function, each function to be registered must be assigned a unique function name. No duplicate function name may be used for function registration. Any user function program, when registered, will be loaded into an SEQ-RAM area in the LPU module.

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<Registration procedure>

- ① Click [UFET] from the [Utility] menu.
- ② The [User operation function registration] window will be shown below.

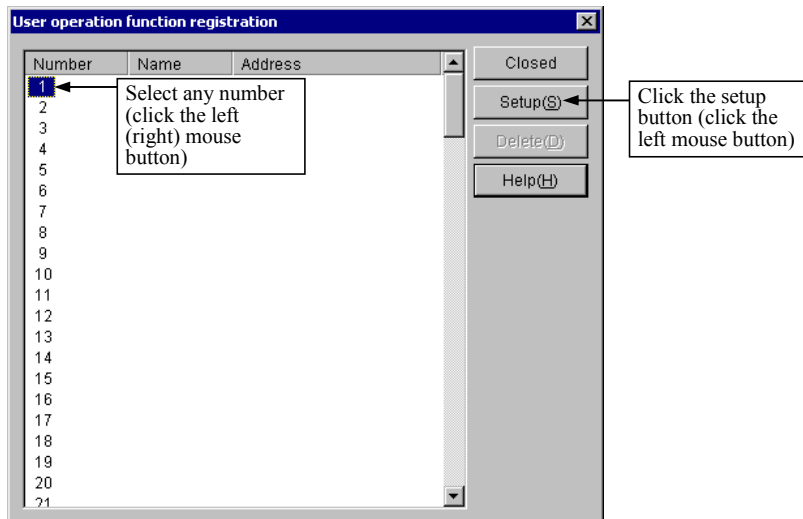


Figure 4-89 [User operation function registration] Window

- ③ Select the number you like, and click the **Setup** button. If the ladder chart system is operating in online mode, you cannot click the button (the system allows the registration of user functions only when it is running in offline mode).
- ④ The [User function setup] window will appear. Enter the function name of the user function to be registered. If the user function's program body is already loaded in, and you only wish to change its registered function name, then only change the function name. If you wish to register a new user function, specify its function name and the path to its program stored. When this specification is made, the starting and ending addresses of the transmission destination area will be automatically displayed. Click the **Setup** button, and then the user function will be registered. When the registration succeeds, the [User function setup] window will be closed. If it fails, an error message dialog box will appear.

<Possible causes of registration failures>

The table below is a list of error messages presented in the event of registration failures and remedial actions to be taken.

Error message	Remedial action
An operation function name overlaps.	Assign a unique function name to the user function.
Operation function registration address range excess.	The storage area having been secured via the [Change capacity] window is not large enough. Review and correct the loading area addresses.
An operation function address overlaps.	Change the specified loading area addresses so that the given loading area for the user function will not overlap with the loading area for an existing user function.

(6) Finding a user function loading address range

The information supplied below is concerned with how to find the starting and ending addresses of a user function loading area. Any user function should fit into its secured loading area. If it does not, increase the size of the area via the [Change capacity] window.

<Starting address of user function loading area>

$$0x00104000 + \text{ladder program area size (steps)}$$

<Ending address of user function loading area>

$$\text{user function loading area starting address} + \text{user function area size} - 2$$

Example: If the size of the ladder program area is 10000 steps, and the size of the user function area is 3000 bytes, then:

$$\begin{aligned} \text{Starting address} &= 0x00104000 + 10000 \times 4 \\ &= 0x0010DC40 \end{aligned}$$

$$\begin{aligned} \text{Ending address} &= 0x0010DC40 + 3000 - 2 \\ &= 0x0010E7F6 \end{aligned}$$

$$\begin{aligned} \text{Address range of user function loading area:} \\ &= 0x0010DC40 \text{ to } 0x0010E7F6 \end{aligned}$$

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (7) Deleting registered user functions

Registered user functions can be deleted by performing the procedure described below. Deleting a registered user function only removes its name and other items from the user function registration table; it does not remove the program itself.

<Procedure>

- ① Click [UFET] from the [Utility] menu.
- ② The [User operation function registration] window will be shown below.

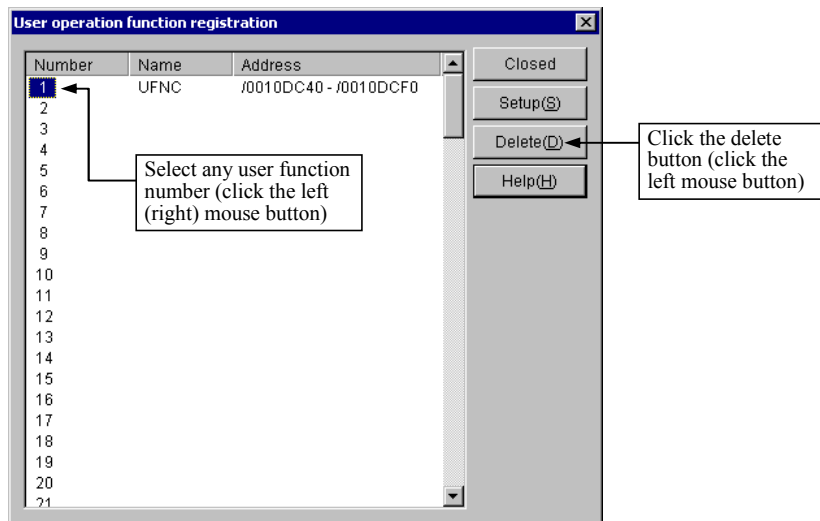


Figure 4-90 Deleting a User Function

- ③ Select the user function number you wish to delete, and then click the **Delete** button. If the ladder chart system is operating in online mode, you cannot click the **Delete** button (the system allows the deletion of user functions only when it is running in offline mode).

### 4.7.3 Monitoring the sequence cycle of ladder programs

The sequence cycle of a ladder program can be monitored via the sequence cycle monitoring function of the ladder chart system. This monitoring function allows you to specify log collection intervals and log collection repeat counts for monitoring. According to these specifications, the function collects sequence cycle times for the ladder program and displays them in a graph. The function also allows you to save the collected cycle times in a file on the personal computer.

<Procedure>

- ① Click [Monitor control status] - [Sequence cycle monitor] from the [Utility] menu.
- ② The [Sequence cycle monitor] window will be shown below.

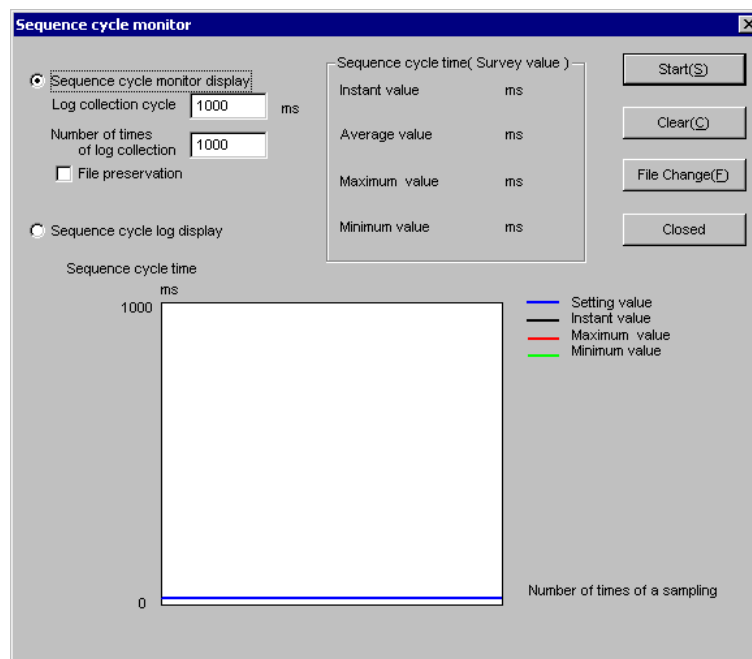


Figure 4-91 [Sequence cycle monitor] Window

- ③ Enter a log collection interval in milliseconds (in the range 100 to 30000) and a log collection repeat count (in the range 0 to 30000). These two items are both defaulted to 1000. If a log collection repeat count of 0 is entered, the monitoring function will not perform cycle time collection.

If you wish to save the collected cycle times in a file, check the [File preservation] checkbox before you start collecting cycle times (no collected cycle times will be saved in a file if you check the checkbox after completion of a cycle time collection).

If no file name for saving the collected cycle times has been specified, the [Open] dialog box will be shown below. Enter the file name you like.

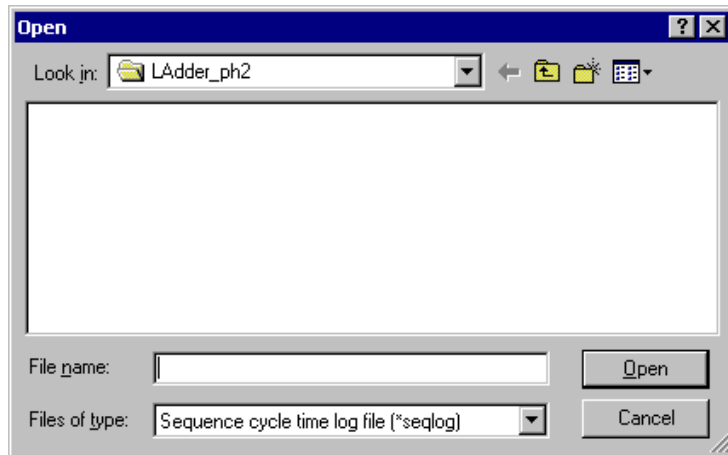


Figure 4-92 [Open] Dialog Box

If no file name is given, the collected cycle times will not be saved.

- ④ Click the **Start** button. Cycle time collection will start. Once cycle time collection starts, the **Start** button will be replaced by the **Stop** button. If you wish to discontinue the cycle time collection in process, click the **Stop** button (the cycle times thus far collected will not be saved even if the [File preservation] checkbox has been checked).
- ⑤ When the collection is completed, the “Collection of a sequence cycle time was completed normally” message dialog box will appear.

<Changing the specified file name for saving>

If you wish to change the file name specified for saving the collected cycle times, click the **File Change** button. The [Open] dialog box will then be displayed. Enter the new file name you like.

The specified file name cannot be changed after cycle time collection has started. Thus, be sure to change it before it starts.

<Displaying the sequence cycle times saved in a file>

You can display the sequence cycle times saved in a file on the screen. To accomplish this, click the [Sequence cycle log display] radio button in the [Sequence cycle monitor] window. The [Open] dialog box will then appear. Select the file in which the collected cycle times have been saved. Then, the contents of the selected file will be displayed.

<Clearing the graph being displayed>

You can clear the sequence cycle time graph currently presented on the screen. This can be done by clicking the  button. However, this clearing does not clear the set values for the graph and the values (instantaneous, average, maximum, and minimum values) in the [Sequence cycle time] group box.

<Notes>

- The average, maximum, and minimum values presented in the [Sequence cycle time] group box of the [Sequence cycle monitor] window are found after the ladder program has been executed, not the values which are found after the collection of sequence cycle times has started.
- No sequence cycle times can be collected when the ladder system is running in offline mode (however, the collected cycle times saved in a file can be displayed in offline mode). When you wish to start collecting sequence cycle times, be sure to enter the system in online mode.
- Sequence cycle monitoring can be started even when ladder processing is in a stopped state. However, there is not much point in such monitoring. Thus, you are advised to conduct it when the ladder program is running.



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### 4.7.4 Converting downward-sloping-rung ladders to normal-rung ladder format

The ladder chart system's function that converts conventional downward-sloping-rung ladder programs to normal-rung ladder format is called the converter. By using this converter, you can fully utilize downward-sloping-rung ladder program assets that were created on conventional S10/2 $\alpha$  Series and S10mini Series machines.

#### (1) Procedure for operating the converter

- ① Click [Convert] from the [Utility] menu.
- ② The converter source file selection window as shown below will appear.

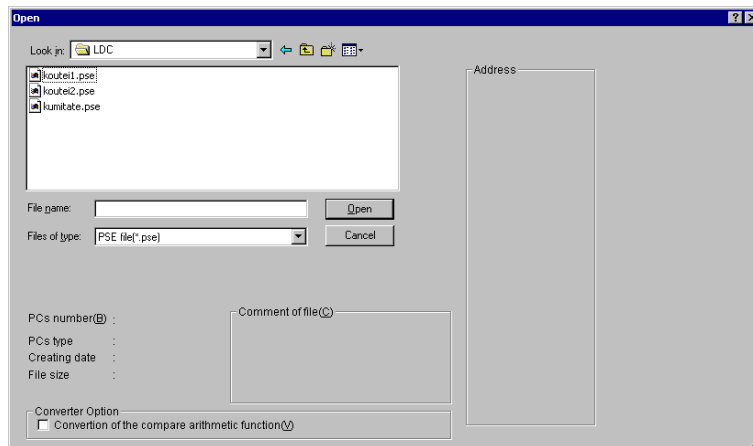


Figure 4-93 Converter Source File Selection Window

- ③ Select the desired downward-sloping-rung ladder program file (with the file extension “PSE” or “WLD”) in the converter source file selection window.

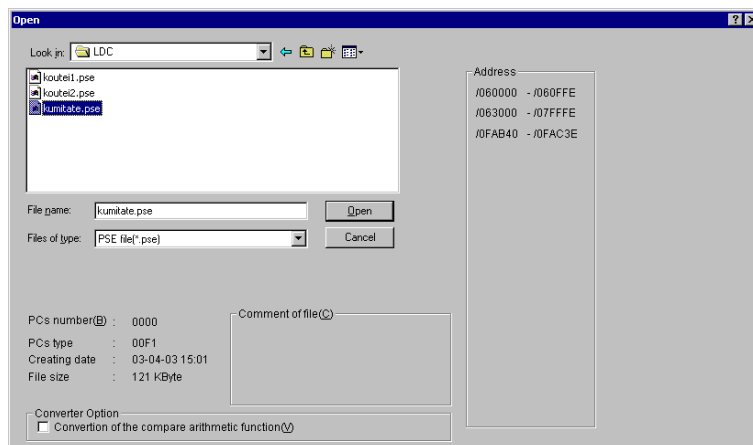


Figure 4-94 Selecting a Downward-Sloping-Rung Ladder Program File

- ④ Click the  or  button. If you click the  button, the converter source file selection window will disappear and the selected program file will be converted into normal-rung ladder format, the resulting normal-rung ladder program being displayed in the ladder sheet.  
If you click the  button instead, the converter source file selection window will disappear and no conversion will take place.
- ⑤ Compile the resulting normal-rung ladder program. To accomplish this, click [All N coil Compile] from the [Build] menu.
- ⑥ If the compilation ends up with an error(s), correct the errors according to the messages presented in the output window.

### (2) Notes on operations

- Any conversion error information (error counts and error messages) is displayed in the output window.
- If an error is reported, double-clicking the error message displayed in the output window will jump to the location of the detected error in the circuit.
- In addition to performing circuit conversion (right downward -> horizontal), the converter function reflects the following information common to existing systems in the memory: PCs edition information, user arithmetic function information, inter-CPU link module information, analog counter information, TUC (T, U, and C coils) set values, and PIO-RAM area.

The following information is not reflected by the converter function of the Ladder Chart System Ver.-Rev. 01-15 or earlier:

- CPU link transmission areas
  - CPU link operation mode
  - Analog counter information
- After you have compiled the resulting normal-rung ladder program, be sure to check the [Change capacity] settings (see Subsection 4.7.1, “Setting PCs edition information”) and the [UFET] settings (see Subsection 4.7.2, “Registering user functions”) to see if they are normal. In addition, since the starting and ending addresses of the transmission destination area will not be reflected in the memory, set them through registration operations.

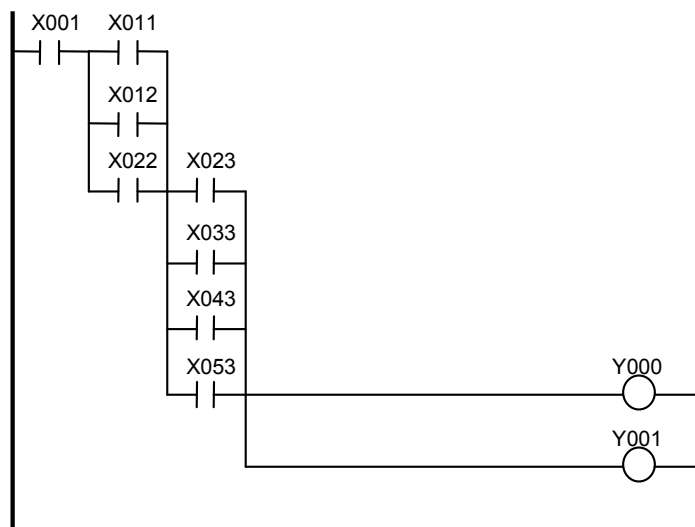
## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (3) Basic conversion method

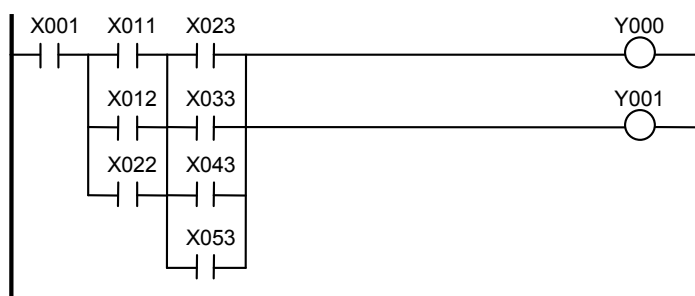
Where parallel paths (branches) are connected to the next branch in a rung, the next branch is generally placed in the lowest parallel-path line in that rung if the ladder containing them is a downward-sloping-rung ladder and in the highest parallel-path line in that rung if it is a normal-rung ladder. Thus, the converter places each next branch in the highest parallel-path line in the same rung as far as possible. In addition, if sets of parallel paths appear successively, the converter arranges them horizontally, i.e. in normal-rung ladder format.

Sample conversion:

<Downward-sloping-rung ladder program>



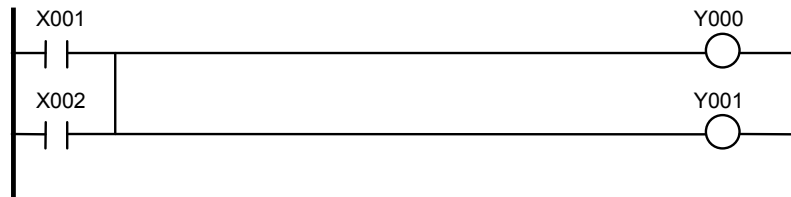
<Normal-rung ladder program>



(4) Split of rungs

In a downward-sloping-rung ladder program, if as shown below, a set of two parallel paths is shared by two coils, the condition for each coil's turning on differs from that for each other coil's.

<Downward-sloping-rung ladder program>

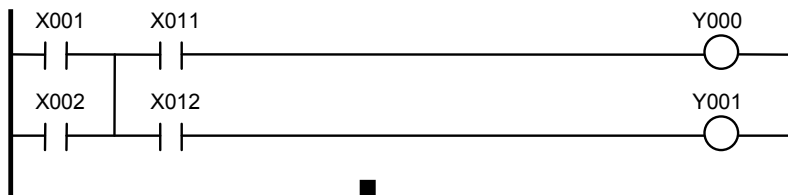


Coil	Condition for each coil's turning on
Y000	The X001 for the A contact is ON.
Y001	One of the X001 and X002 for the A contacts is ON.

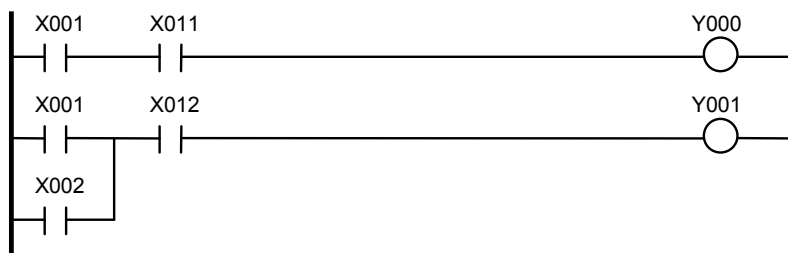
In this case, since the parallel paths cannot be converted to a single rung of a normal-rung ladder program, the converter splits the rung as exemplified below.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (5) Duplication of symbols

In a downward-sloping-rung ladder program, two or more sets of parallel paths can be arranged horizontally as shown below. The conditions for the coil's turning on in this rung differ from the conditions for the corresponding coil's turning on in another downward-sloping rung with a simple series of two sets of parallel paths, because the order of evaluation of the contacts in the former rung differs from that in the latter rung.

<A downward-sloping rung ladder program whose symbol needs to be duplicated>



In this rung, when both X002 and X001 become ON, Y000 seems to become ON. In reality, however, the conditions and their evaluation performed are as follows:

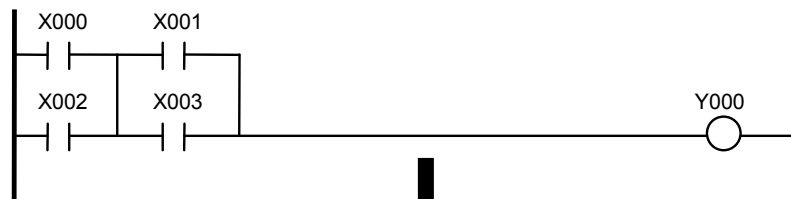
- ① Condition 1: X000 and X001 are both ON.
- ② Condition 2: X000 or X002 is ON, and X003 is ON.
- ③ If condition 1 or 2 above is met, Y000 becomes ON.

So, the Y000 in the above example does not become ON at that time.

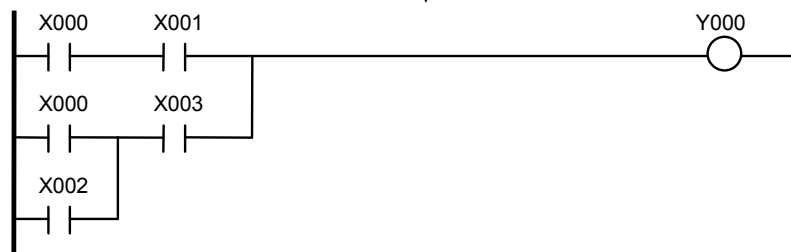
Thus, when the converter converts the above rung into normal-rung ladder format, it duplicates the symbol evaluated more than once so that the conditions and their evaluation performed may become the same as in the downward-sloping ladder program.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



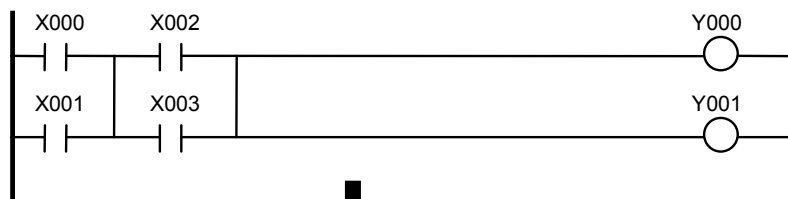
This sample conversion adds an additional parallel path to the rung.

(6) Use of converter-dedicated work registers

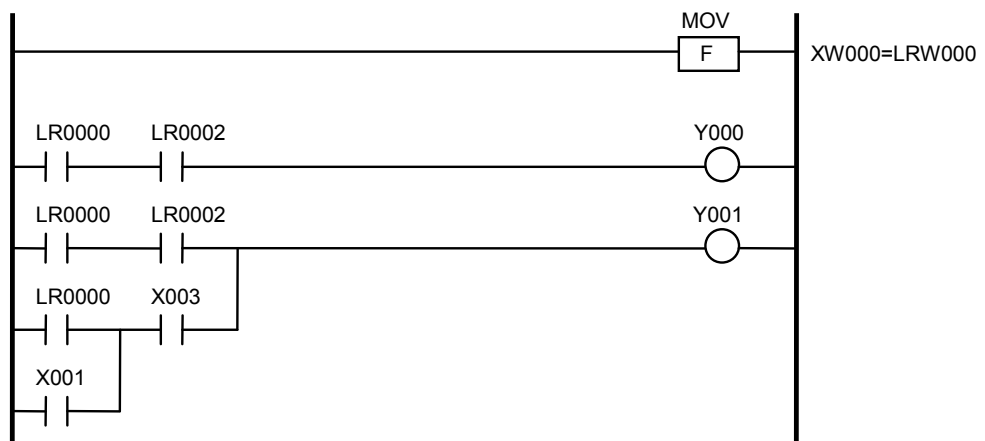
When a downward-sloping rung ladder program is converted into normal-rung ladder format, the split of rungs described in Subsection 4.7.4 (4), “Splits of rungs,” and the duplication of symbols described in Subsection 4.7.4 (5), “Duplication of symbols,” may occur. In such a case, a contact originally used in one place is used in more than one place in the normal-rung ladder program, and the status of this contact may change in any of these places during execution of the ladder program. To handle this situation, the converter saves the values of duplicated contacts in its dedicated work registers (in the range LR0000 to LR0FFF) in units of words and uses these work registers as the contacts, provided they are not edge contacts. Since edge contacts are “renumbered” during the conversion, their values are not saved in converter-dedicated work registers.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



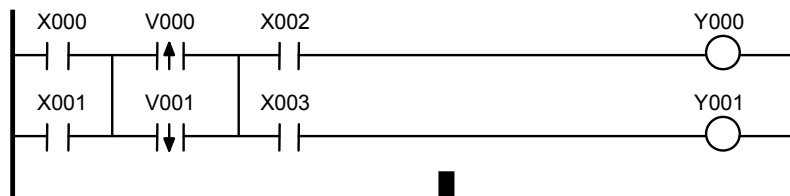
## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (7) Renumbering of edge contacts

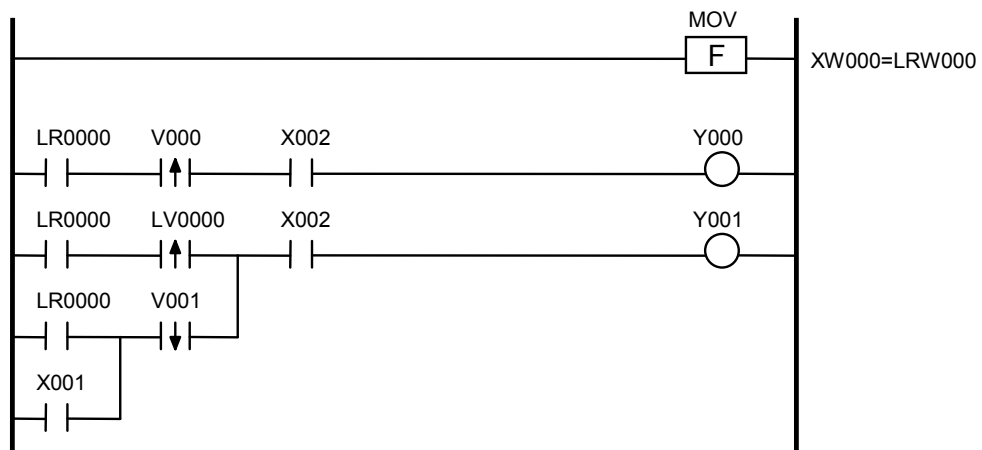
When a downward-sloping rung ladder program is converted into normal-rung ladder format, the split of rungs described in Subsection 4.7.4 (4), “Split of rungs,” and the duplication of symbols described in Subsection 4.7.4 (5), “Duplication of symbols,” may occur. In such a case, an edge contact originally used in one place is used in more than one place in the normal-rung ladder program. As a rule, any edge contact may not have its number duplicated in the same N coil, so the converter reviews all the existing edge contacts in the ladder program after the split of rungs and duplication of symbols and renumbers any duplicated edge contacts (i.e., those with the same number) with converter-dedicated edge contact numbers (in the range LV0000 to LV0FFF).

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



(8) Conversion of functions

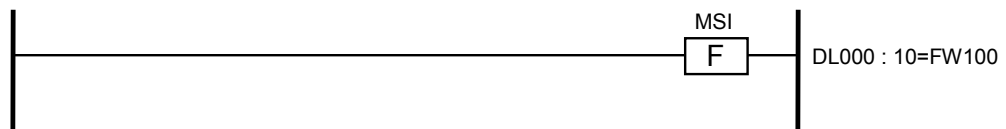
Some functions used on S10mini machines are made obsolete or renamed for use on the S10V machine. The information supplied below is concerned with those functions.

● Source indirect transfer (MSI or Move Multi Source Indirect) – made obsolete

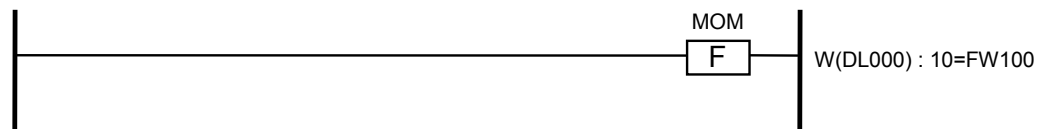
Added support for index specifications in function instructions has made the MSI function obsolete. The MSI function is now covered by the batch transfer (MOM) function, so the converter replaces the MSI function with the MOM function.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



● Destination indirect transfer (MDI or Move Multi Destination Indirect) – made obsolete

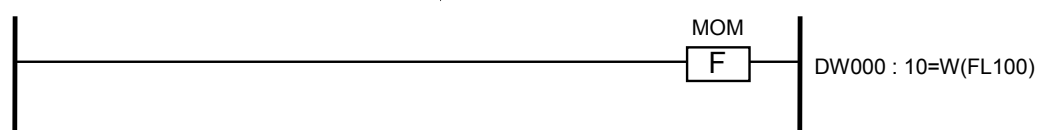
Added support for index specifications in function instructions has made the MDI function obsolete. The MDI function is now covered by the batch transfer (MOM) function, so the converter replaces the MDI function with the MOM function.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>





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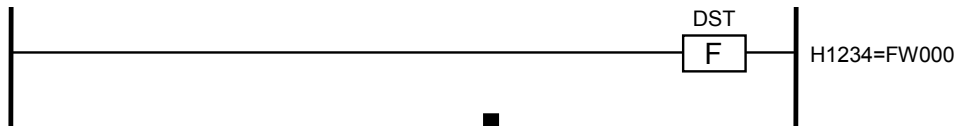
---

- Data set (DST) – made obsolete

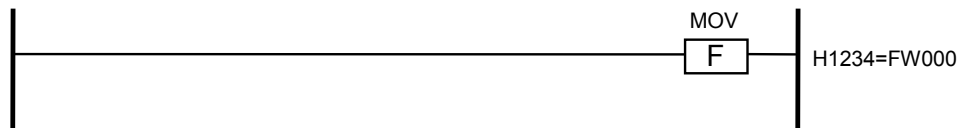
The upgraded MOV (transfer) function has made the DST function obsolete. The MOV function now supports the transfer of constants, so the converter replaces the DST function with the MOV function.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



- Square root (ROT) – renamed

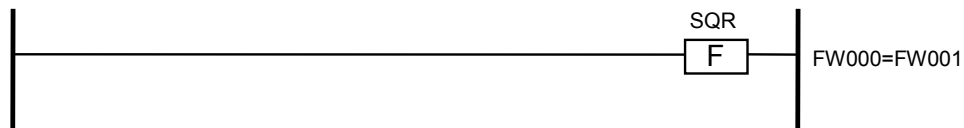
The name of the ROT function has been changed to SQR.

Sample conversion:

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>

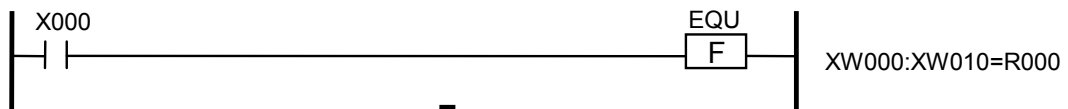


(9) Conversion of comparison functions

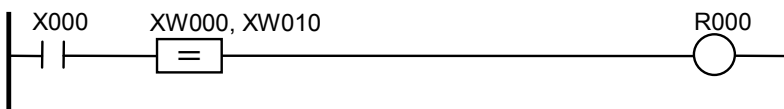
S10V supports comparison symbols equivalent to the comparison instructions (EQU, NEQ, GT, GE, LT, and LE) of comparison functions. These comparison symbols realize faster processing speeds than the comparison function instructions. Thus, if any downward-sloping-rung ladder program requires an improvement in processing speed, the comparison function instructions used in the program should be replaced with the equivalent comparison symbols through conversion (this can be done by selection from a menu). This replacement is made by two steps: the comparing portion of each comparison function instruction is changed to the equivalent comparison symbol and the result of the comparison instruction is changed (assigned) to an output coil.

Sample conversion:

<Downward-sloping-rung ladder program>

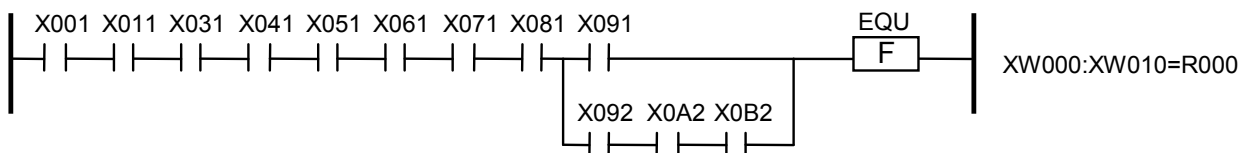


<Normal-rung ladder program>



Notes: Conversion of comparison functions to comparison symbols does not take place in the following cases:

- The parameter-comparing portion of a comparison function uses a register other than word-type registers.
- The parameter-assigning portion of a comparison function uses a register other than bit-type registers.
- The parameter-assigning portion of a comparison function uses a letter other than Y, R, K, G, E, Z, M, A, and Q as the symbol of a bit-type register.
- An I/O register is used as a parameter to a comparison function.
- There is no free space available in a cell which is large enough to hold a comparison symbol (adding a comparison symbol to a cell always increases the number of existing contacts in the cell to more than 11).
- A comparison symbol is placed in a parallel path (in other words, there is a non-horizontal connecting line to the position of a function; see the figure below).



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### (10) Converting FIFO write (PSH) and FIFO read (POP) arithmetic functions

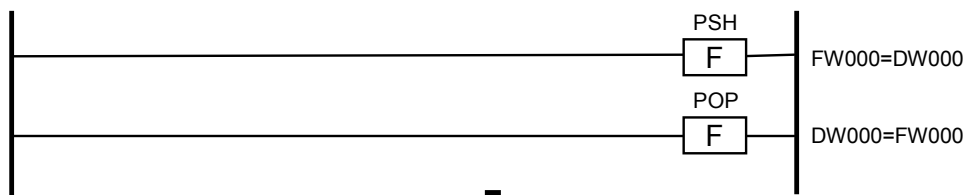
- If the LPU module Ver.-Rev. is 02-05 or earlier and the Ladder Chart System Ver.-Rev. is 01-15 or earlier:

The S10/ $\alpha$  and S10mini FIFO tables are not supported.

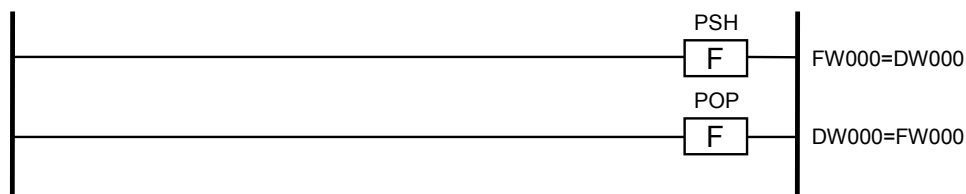
The PSH/POP instruction is converted as is. However, correct the ladder program according to the differences in the FIFO table configuration.

#### Sample conversion

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



The S10V and the S10/2 $\alpha$  and S10mini Series differ in the configuration of the FIFO table used by the PSH/POP instruction.

[S10/2 $\alpha$  and S10mini compatibility PSHO/POPO]

FIFO data table configuration

FIFO top	n (data size)	
+2	ZERO flag address	
+4	FULL flag address	
+6	Pointer	
+8	Data #1 to data #n	Data area specified with the data size
n×2+10		

[S10V PSH/POP]

FIFO data table configuration

FIFO top	n (data size)	
+2	Reserved	← Added for S10V. Subsequent addresses are changed.
+4	ZERO flag address	
+6	FULL flag address	
+8	Pointer	
+10	Data #1 to data #n	Data area specified with the data size
+12		
n×2+12		

- If the LPU module Ver.-Rev. is 02-06 or later and Ladder Chart System Ver.-Rev. is 01-16 or later:

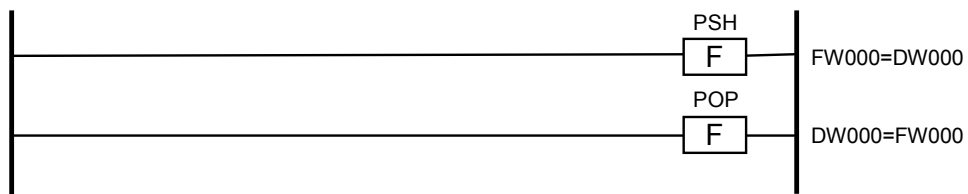
The PSH/POP instruction is converted to the PSHO/POPO instruction.

The PSHO/POPO instruction is the S10V-compatible instruction of the S10/2 $\alpha$  and S10mini version PSH/POP instructions that support the S10/2 $\alpha$  and S10mini FIFO tables.

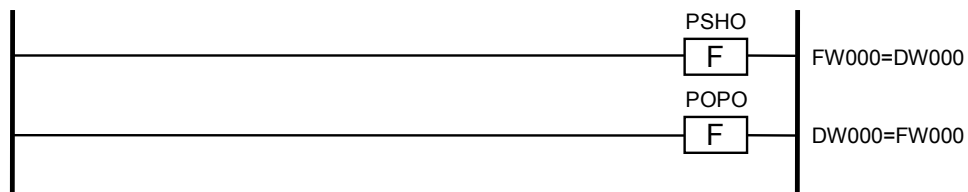
To use the PSHO/POPO instruction, you need not correct the ladder programs.

### Sample conversion

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



### (11) Converting NX arithmetic functions

- Initializing NX (SAT) (changing instruction names and parameters)

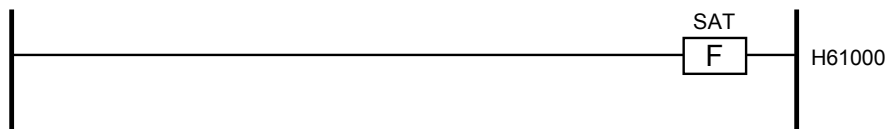
For NX, the interface specifications are changed from NX/Ladder-S10 Ver.-Rev. 02-00 and later. So, if the SAT instruction parameter has the address format beginning with “H,” Ver.-Rev. of the specification used is determined to be earlier than NX/Ladder-S10 Ver.-Rev. 02-00. SAT is converted to SATO and the parameter is converted to “0.”

However, the following cases are not subjected to the automatic conversion:

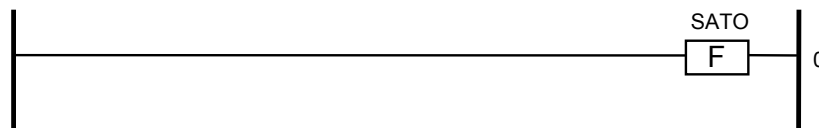
- The specified parameter conforms to the specification of the NX/Ladder-S10 version 02-00 or later (the parameter does not have the address format beginning with “H”).
- The address destination specified by the parameter is not saved in the ladder program.
- Data is not correctly registered in the parameter information of the destination specified by the parameter.

#### Sample conversion

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



● Sending NX data (ACP) (changing instruction names and parameters)

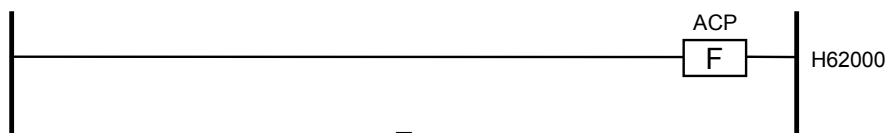
For NX, the interface specifications are changed from NX/Ladder-S10 Ver.-Rev. 02-00 and later. So, if the ACP instruction parameter has the address format beginning with “H,” Ver.-Rev. of the specification used is determined to be earlier than NX/Ladder-S10 Ver.-Rev. 02-00. ACP is converted to ACPO and the parameter is converted to “DF number + TCD number.”

However, the following cases are not subjected to the automatic conversion:

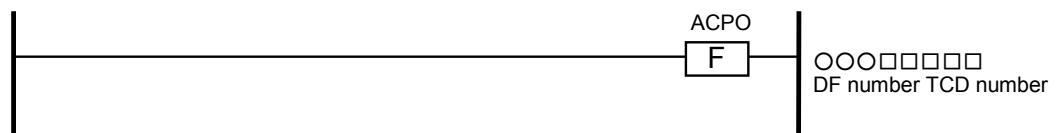
- The specified parameter conforms to the specification of the NX/Ladder-S10 version 02-00 or later (the parameter does not have the address format beginning with “H”).
- The address destination specified by the parameter is not saved in the ladder program.
- Data is not correctly registered in the parameter information of the destination specified by the parameter.

Sample conversion

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



Note: If an NX arithmetic function is detected during conversion, the window for specifying the location in which old NX table information has been saved appears. The parameter specification destination information (TCD information) of the SAT/ACP instruction not yet converted is output to the user-specified save destination file.

After conversion, set the TCD information for NX/Tools-S10V while referring to the file which was output.

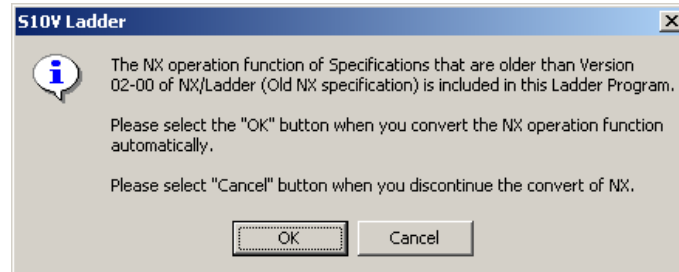
However, the user needs to obtain the following setting information:

- Logical node number
- Alive message timeout period (second) and alive message sending interval (second)
- Alive message destination port number
- Send local-port number
- Send MCG Number and Send Port Number
- Receive byte count

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

- Starting NX conversion

The following message appears if the ladder program being converted contains the NX arithmetic function of NX/Ladder-S10 version 02-00 or earlier (the SAT/ACP instruction whose parameter has the address format beginning with “H”):

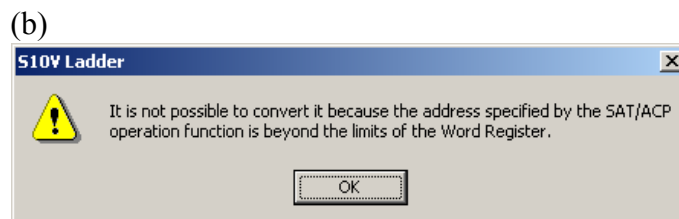
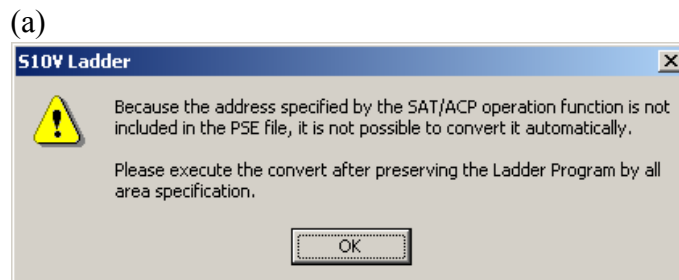


To start converting the NX arithmetic function, click the  button. To cancel that conversion, click the  button (clicking the  button does not perform NX conversion).

- Checking NX arithmetic function parameters

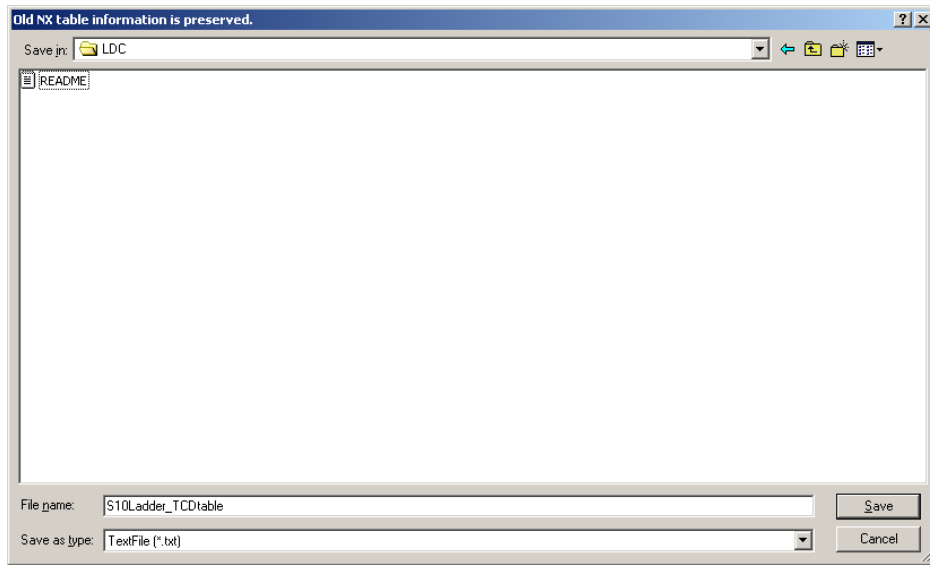
When the NX arithmetic function is started to be converted, a check is made to the arithmetic function parameters (having the address format beginning with “H”) and to the parameter specification destination (table address).

If the ladder program file (pse) does not contain the address specified by the arithmetic function parameter, message (a) appears to indicate that the relevant NX arithmetic function is not converted. If that specified address does not specify the word register, message (b) appears to indicate that the relevant NX arithmetic function is not converted.



- Saving the old NX table information (TCD setting table)

When the NX arithmetic function parameter is normal, the dialog box shown below appears to save the old NX table information. Specify the save destination and file name and click the  button. (As the save file name, the default name “S10VLadder\_TCDtable.txt” appears. Change the file name as required.) Clicking the  button saves the old NX table information in the specified file.



Note: Make settings using NX/Tools-S10V, by referring to the old NX TCD table information saved in the file here.



### (12) Converting HS.RI/O start instructions and registers

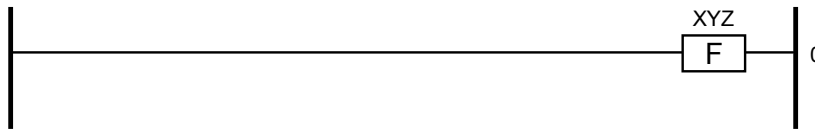
- Converting HS.RI/O start instructions -- changing their names

The HS.RI/O start instruction's default name (“HIO”) that can conventionally be changed by users is now made unchangeable. Therefore, any user-specified name of the HS.RI/O start instruction will be converted to “HIO” if detected.

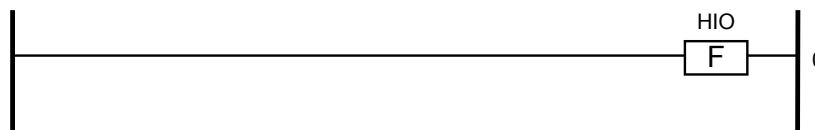
#### Sample conversion

In the example shown below, the user-specified name of the HS.RI/O start instruction is assumed to be “XYZ”.

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>

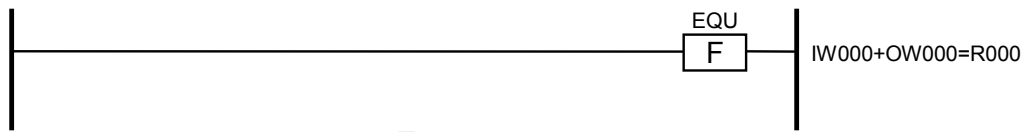


- Converting HS.RI/O registers

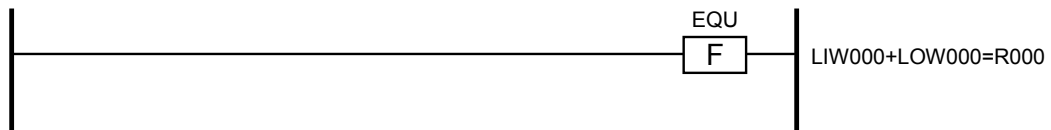
The HS.RI/O registers used on S10/2α controllers, namely IW/OW registers (or IL/OL registers, which are used in long-word accesses), are identified by different symbol names on S10V controllers, namely LIW or LOW (or LIL or LOL, each of which identifies long-word data). Therefore, the symbol names of IW and OW registers will be converted to the symbol names of LIW and LOW registers.

Sample conversion

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



As a rule, LIW and LOW registers cannot be used by any system extension arithmetic function. Therefore, if a system extension arithmetic function (as an optional user arithmetic function) is used in a downward-sloping-rung ladder program, the ladder program will be converted to a normal-rung ladder program, with the system extension arithmetic function's register treated as described below.

Case 1: The system extension arithmetic function used is a function dedicated to data transmission:

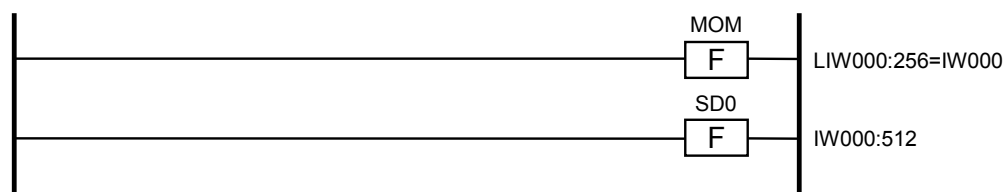
If the system extension arithmetic function used is one of JSND and SD0 through SD3 each dedicated to data transmission, a given LIW/LOW register's content to be sent will be saved into a given work register (IW or OW) and the work register will then be used as the send data register of that function.

Sample conversion

<Downward-sloping-rung ladder program>



<Normal-rung ladder program>



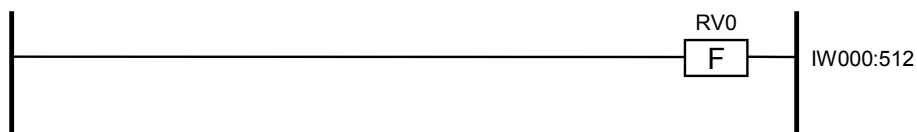
## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

Case 2: The system extension arithmetic function used is a function dedicated to data reception:

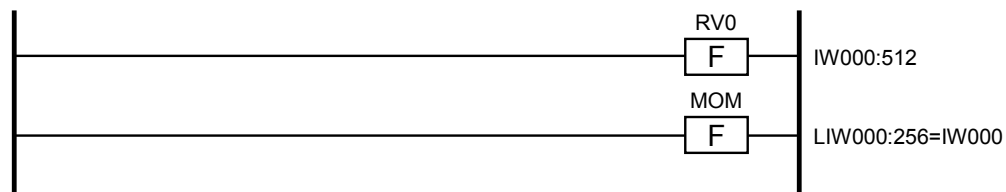
If the system extension arithmetic function used is one of JRSP, JRCV, and RV0 through RV3 each dedicated to data reception, a given work register (IW or OW) will be used as the receive data register of that function and the received data from the receive data register will then be set in a given LIW or LOW register.

Sample conversion

<Downward-sloping-rung ladder program>

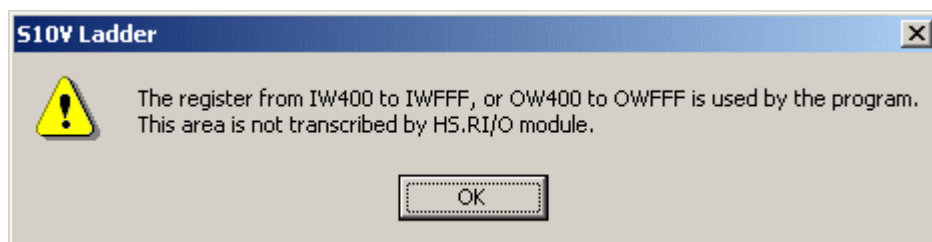


<Normal-rung ladder program>



Note 1: The converter does not convert a system extension arithmetic function named JCMD. If JCMD is used in a downward-sloping-rung ladder program, it will be detected as an error during compilation. To prevent this, the incorrect usage needs to be corrected.

Note 2: None of the following two memory areas can be used in a downward-sloping-rung ladder program for HS.RI/O operation: one from address IW400 to IWFFF and the other from address OW400 to OWFFF. If an attempt is made to use any of the two memory areas for such a purpose, a warning message will be displayed as shown below. In this case, check that, after conversion, no problem will arise even if no remote I/O communication is performed by the HS.RI/O module.



### (13) Notes on convert usage

- S10V has been improved in performance, compared with the conventional S10/2α Series and S10mini Series. Thus, pay attention to timing as the sequence time of converted ladder programs may become shorter on the S10V.
- If addresses are specified as immediate values in functions, they will not be converted. These addresses need to be corrected after the conversion into normal-rung ladder format. Special care should be taken where extension memory is used, because all extension memory locations are unconditionally processed as immediate values, not as addresses.
- In S10V of LPU module Ver.-Rev. 02-05 and earlier, register numbers (such as XL000 and FL004) used for accesses in long-word boundaries need to be specified for the long-word register according to the hardware restrictions. So, the word boundary specification (such as XL010 and FL003) is impossible. The converter function does not convert these values. If an odd-numbered long-word register is detected as an at compilation, correct it to be an even-numbered long-word register. (The following modifications are unnecessary for LPU module Ver.-Rev. 02-06 and later:)

Examples of corrections:

Before correction		After correction
XL010	→	XL000
FL003	→	FL004

The table below shows register numbers that can be specified as long word-type registers.

Register numbers specifiable as long word-type registers:  
(excluding the LPU whose Ver.-Rev. 02-06 and later)

Register type	Register symbol	Specifiable register number
I/O registers (long-word)	XL, JL, YL, QL, GL, AL, RL, ML, KL, TL, UL, CL, NL, PL, VL, EL, ZL, SL, LBL	The specifiable register numbers are those which contains an even digit in the digit position enclosed in a small rectangle (□): XL0□0, LBL00□0, etc.
Work registers (long-word)	DL, FL, LWL, LXL, IL, OL	The specifiable register numbers are those which contains an even digit in the digit position enclosed in a small rectangle (□): DL00□, LWL000□, etc.

The LPU module stops due to “Invalid instruction detected.” This occurs if a ladder program containing an odd-numbered long-word register or PSHO/POPO, which was created by the Ladder Chart System of Ver.-Rev. 01-16 or later, is sent to a Ladder Chart System of Ver.-Rev. 01-15 or earlier, or to an LPU of Ver.-Rev. 02-05 or earlier using batch loading.

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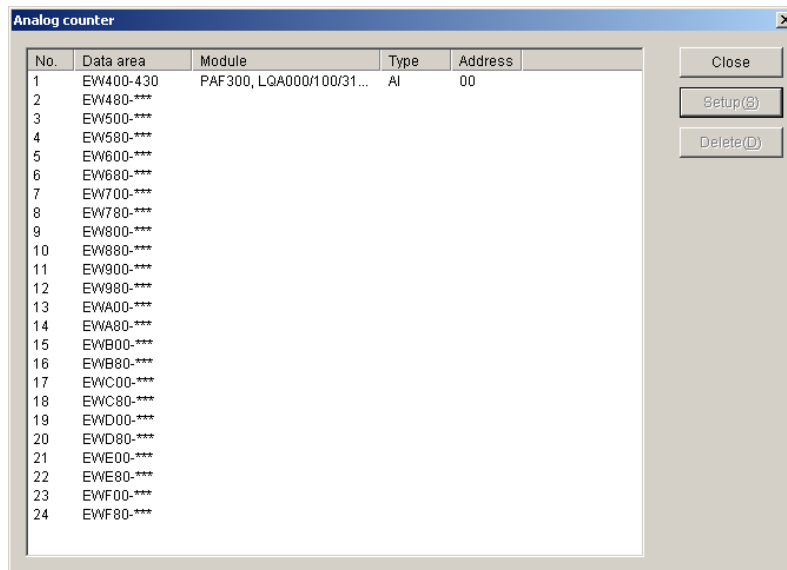
- The setting information is converted if the ladder program contains analog counter and inter-CPU link module settings.

You can check the converted settings as follows:

① Analog counter setting

Click [PCs edition] - [Analog counter] from the [Utility] menu to display the [Analog counter] window.

Check whether the post-conversion settings differ from the pre-conversion settings.



② Inter-CPU link module setting

After sending the ladder program according to the procedure in Subsection 4.5.3, start the inter-CPU link system to check whether the post-conversion settings differ from the pre-conversion settings.

## (14) Preconversion check of ladder programs

The following is the background of why a support of preconversion check of ladder programs is newly added: In Ver-Rev 01-10 or earlier of the S10V Ladder Chart System, the conversion by the converter of downward-sloping-rung ladder program files (with “.pse” or “.wld” as their file extension) into normal-rung ladder format (with “.wsvl” as their file extension) may suffer the loss of contacts extracted from the original file, resulting in non-equivalent ladder logic in the converted ladder program, although that is limited to special cases (where no error report to that effect is generated). For information on these special cases, see “(15) Circuit patterns causing a conversion error.”

This problem has been solved in Ver-Rev 01-11, along with the addition of the support to check downward-sloping-rung ladder program files for any circuits that will cause a conversion error. By applying this support to ladder programs already converted by an old converter, the user can make a decision as to whether those ladder programs are special cases. If any circuits leading to a conversion error are detected by checking a ladder program file, the user can resolve them by reconversion of that file using the converter of Ver-Rev 01-11 or later of the S10V Ladder Chart System.

The following step-by-step description deals with how to perform a preconversion check:

<Procedure for preconversion check>

- ① Click [Convert] from the [Utility] menu.
- ② The file-to-convert selection window as shown below appears.

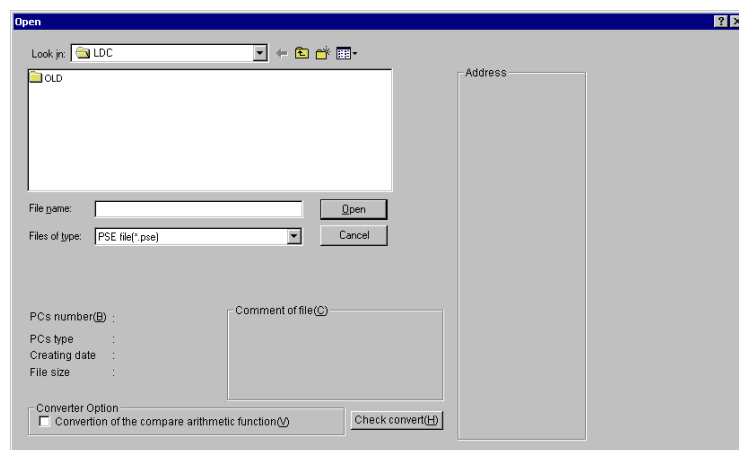


Figure 4-95 The File-to-Convert Selection Window

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- ③ In this window, specify in the “Look in” box the folder that contains downward-sloping-rung ladder program files (with “.pse” or “.wld” as their file extension) to be checked by preconversion check.
- ④ Click the  button.
- ⑤ The file save confirmation dialog box shown below appears to ask you whether to save the S10V ladder file currently open -- this dialog box appears only when any changes made to that file have not been saved.

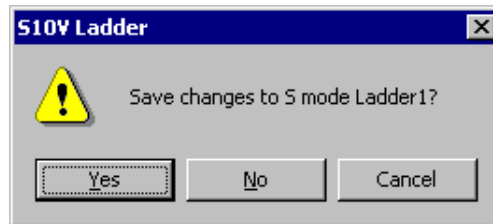


Figure 4-96 The File Save Confirmation Dialog Box

where:

button: If clicked, saves all the changes made to the file and starts a preconversion check.

button: If click, immediately starts a preconversion check, ignoring all the changes made to the file. Upon completion of the check, the ladder chart returns to its former condition.

button: If clicked, immediately goes back to the file-to-convert selection window without performing anything.

- ⑥ During the requested preconversion check, its progress is shown in the following dialog box:

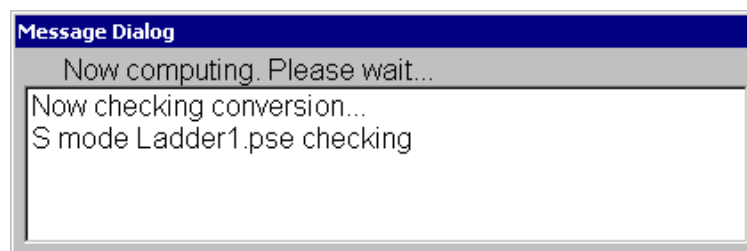


Figure 4-97 The Dialog Box Indicating the Progress of a Preconversion Check

- ⑦ Upon completion of the preconversion check, the [Conversion check result] window as shown below appears.

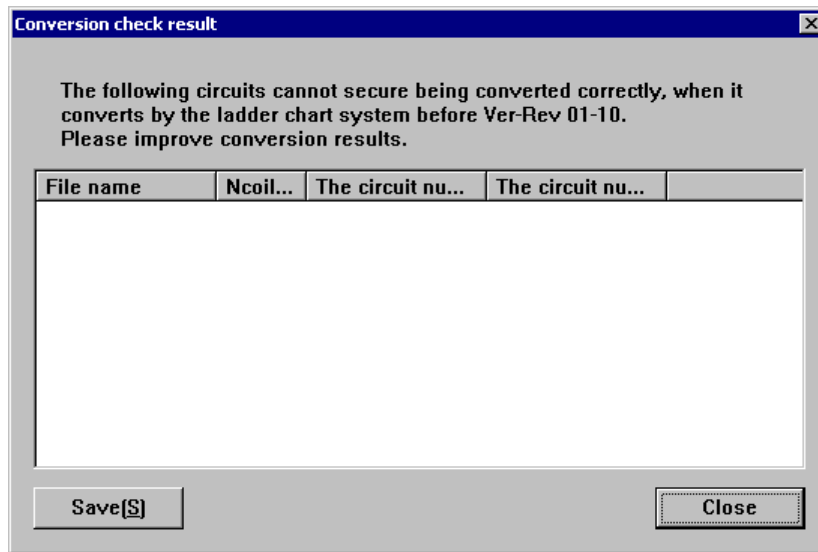


Figure 4-98 The [Conversion check result] Window

- ⑧ If you want to save the displayed check result to a file, click the  button. The [Save file as...] window will then appear. Specify a file to which to save the check result, and then click the  button. The check result will be saved to the specified file in text format.

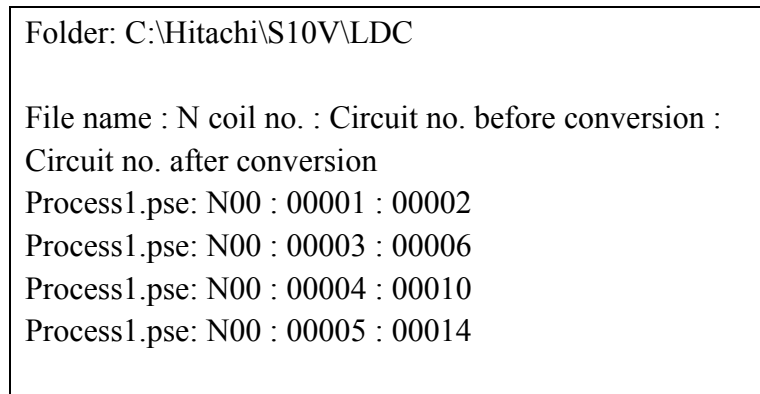


Figure 4-99 Conversion Check Result Save File Format

- ⑨ Click the  button. Then, the file-to-convert selection window becomes active again.

Note: The result of a preconversion check includes cases not causing a conversion error. These cases are called exceptional cases. (Exceptional cases can be resolved by automatic correction logic.)



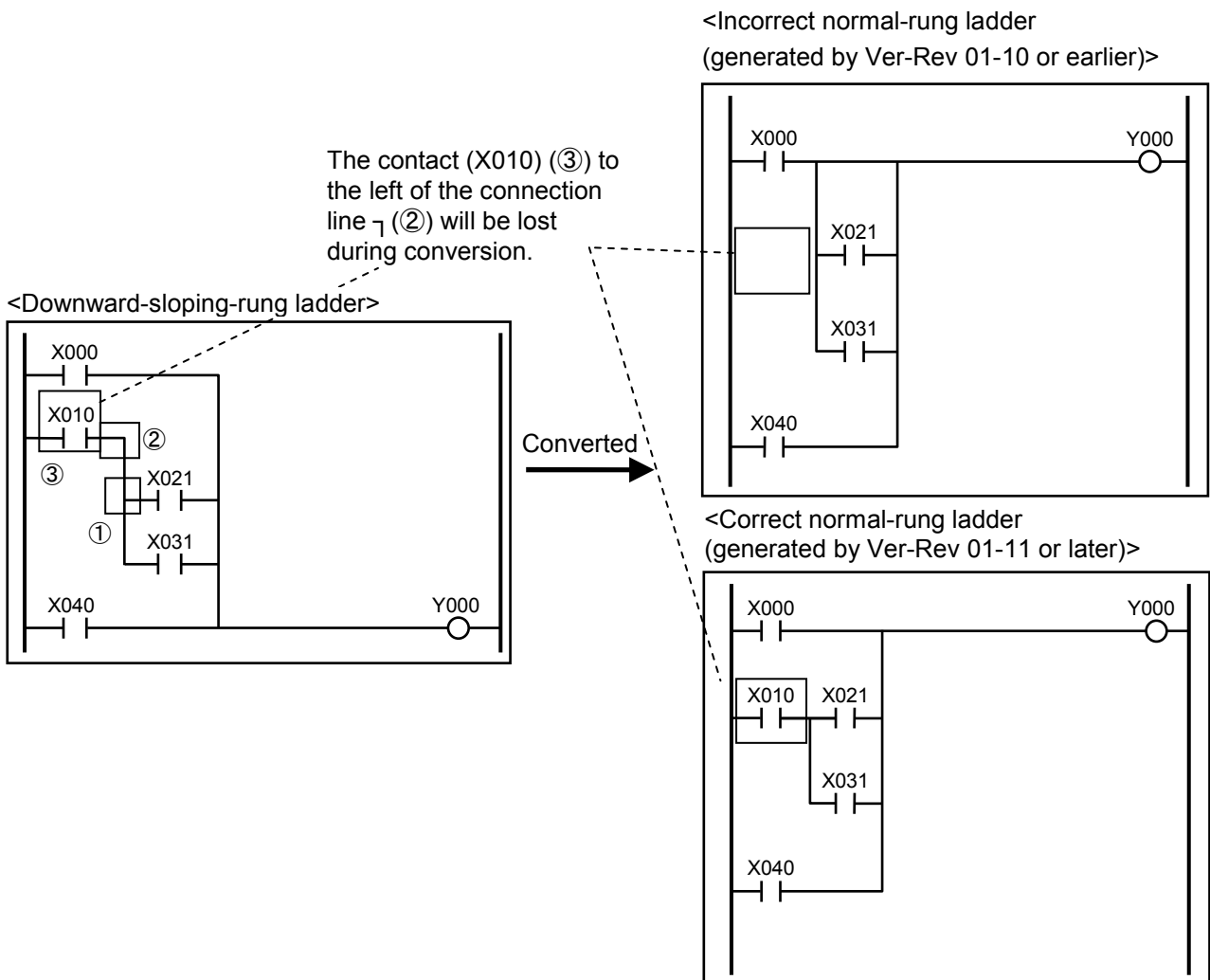
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### (15) Circuit patterns causing a conversion error

As discussed above, the converter of Ver-Rev 01-10 or earlier of the S10V Ladder Chart System may suffer the loss of contacts during conversion, due to certain circuits in which an abnormality is detected by a preconversion check. These circuits are special cases and may be classified into four patterns. The discussions (a) through (d) below describe these four circuit patterns.

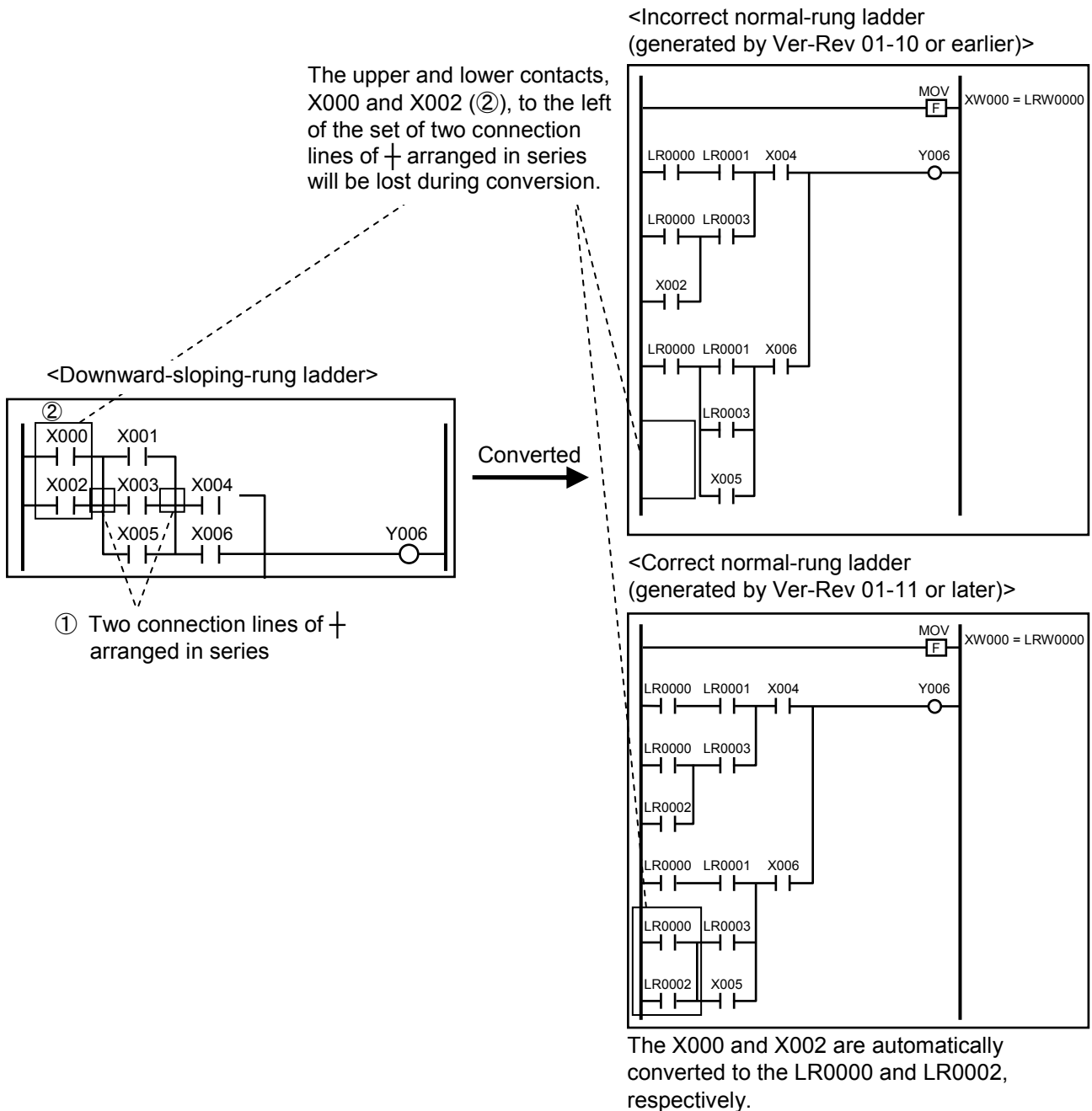
- (a) Loss of a contact at a given position connected with a connection line  $\vdash$  at the next lower position in the same circuit

If either of the connection lines  $\neg$  and  $\vdash$  (as in (2) below) placed at a given position in a circuit connects to the connection line  $\vdash$  (as in (1) below) placed at the next lower position in the same circuit but not placed anywhere in the outermost vertical/horizontal lines of that circuit, the contact (as in (3) below) to the left of, or at the position next higher than, the connection line  $\neg$  or  $\vdash$  will be lost during conversion. An example of this is shown in the figure below.



- (b) Loss of contacts to the left of a set of connection lines of + arranged in series in the same circuit

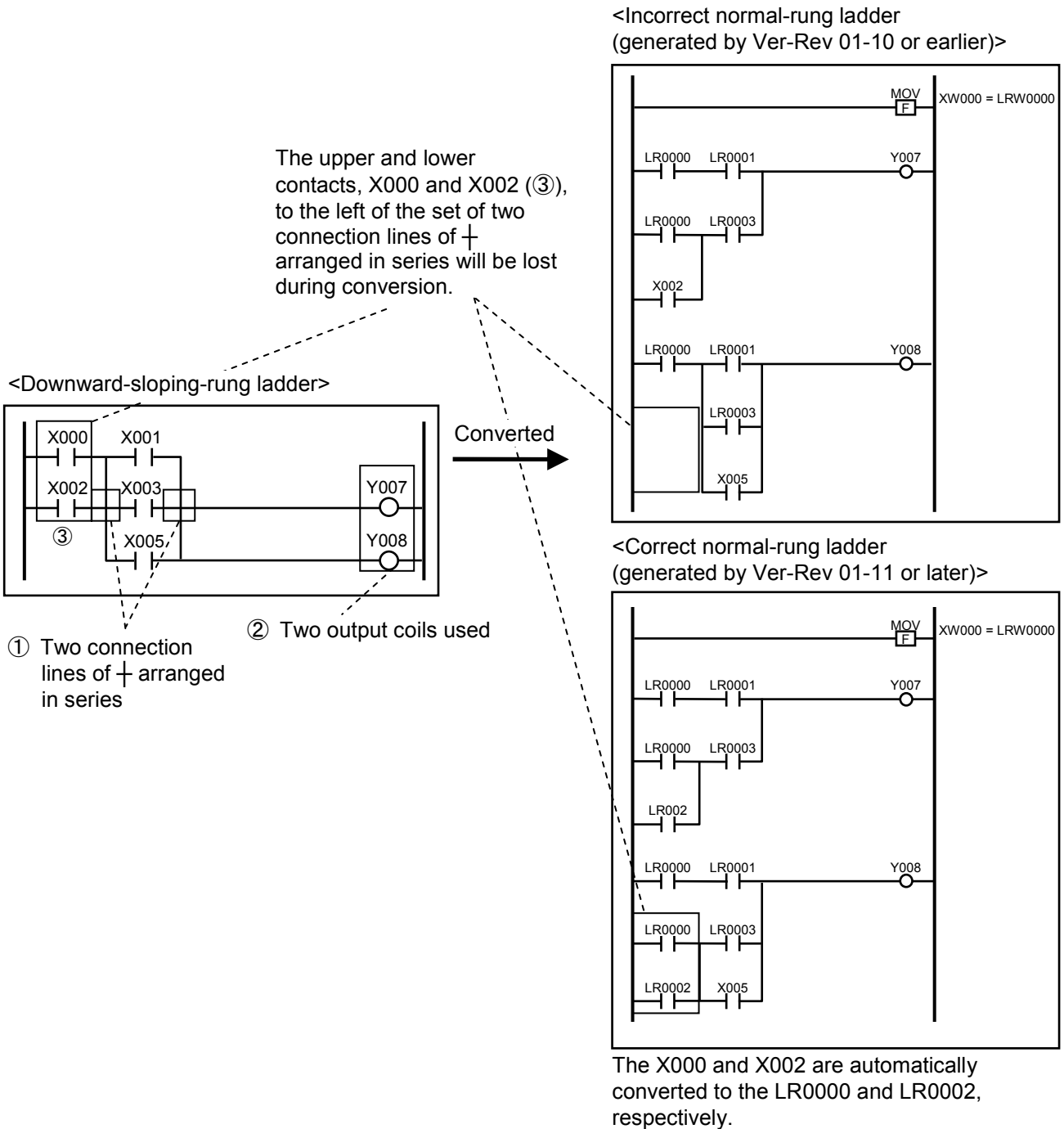
If a set of two or more connection lines of + (as in (1) below) is arranged in series in a circuit, the upper and lower contacts (as in (2) below) to the left of that set will be lost during conversion. An example of this is shown in the figure below.



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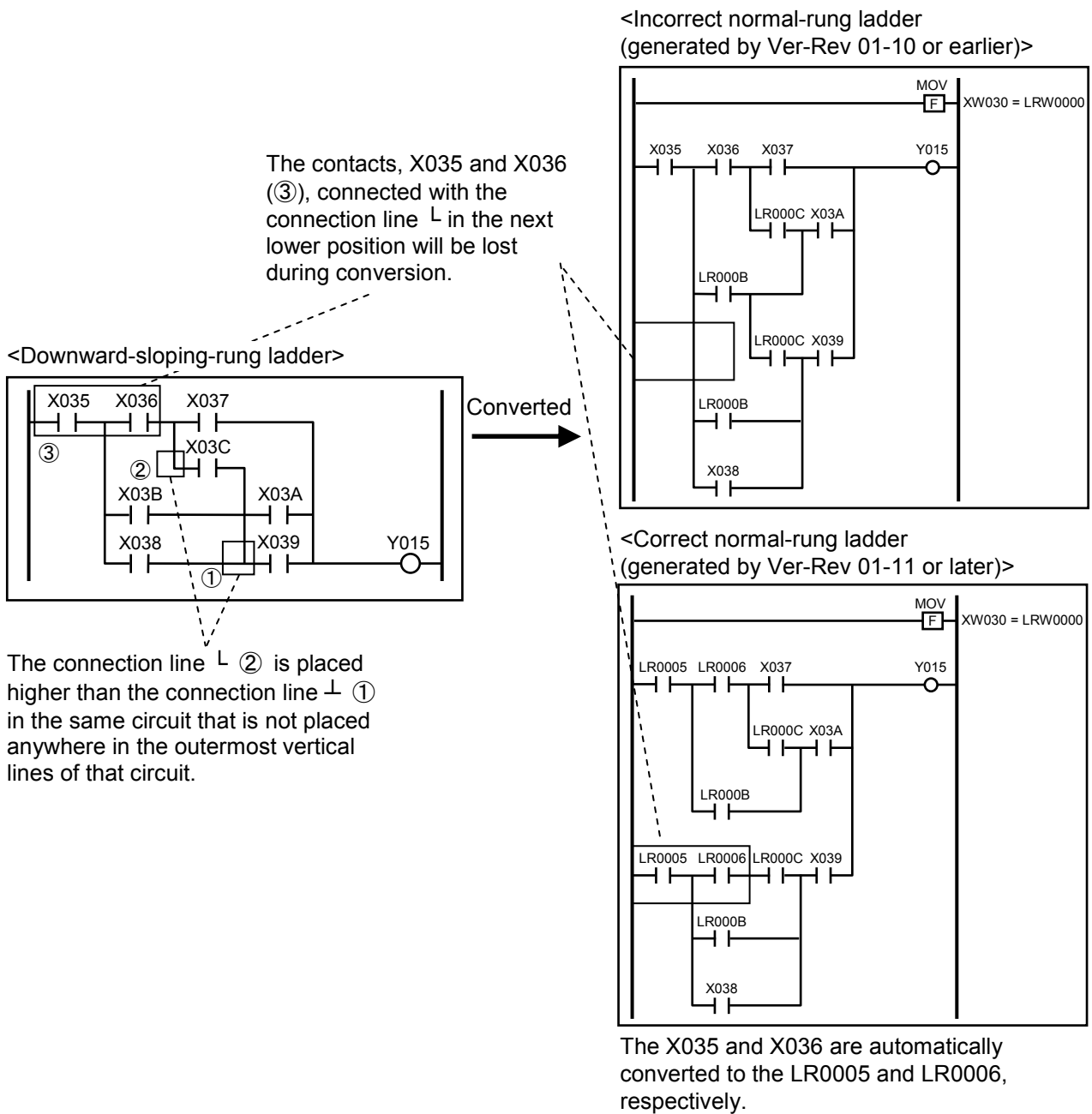
- (c) Loss of contacts to the left of a set of connection lines of  $\perp$  arranged in series in the same circuit where output coils are used

If a set of two or more connection lines of  $\perp$  (as in (①) below) is arranged in series in a circuit, and two or more output coils (as in (②) below) are used along with that set, then the upper and lower contacts (as in (③) below) to the left to that set will be lost during conversion. An example of this is shown in the figure below.



- (d) Loss of contacts at given mutually-adjacent positions connected with the connection line  $\perp$  at a lower position in the same circuit

If the connection line  $\perp$  (as in ② below) is placed higher than one of the connection lines  $\vdash$ ,  $\dashv$ , and  $\perp$  (as in ① below) in the same circuit that are not placed anywhere in the outermost vertical/horizontal lines of that circuit, any contacts (as in ③ below) connected with the connection line  $\perp$  (as in ② below) at the next lower position in that circuit will be lost during conversion. An example of this is shown in the figure below.



### 4.7.5 Forcibly terminating the exclusive use of PCs

Should an established connection with the PCs be terminated abruptly while your ladder chart system exclusively use it, the condition of the exclusive use may continue. In such a case, none of the PCs on the network can establish a connection with that PCs. To solve this problem, the ladder chart system offers a function for forcibly terminating the exclusive use of the PCs.

- This forcible termination function can also be applied to the PCs being exclusively used by some other user. If it is applied to such a PCs, the user of that PCs will not be informed that the exclusive use of that PCs has been forcibly terminated. In this situation, it is conceivable that multiple accesses may be made to the PCs, depending on network and PCs operations. To prevent multiple accesses to the PCs, you are advised to ensure from presented warning messages that no other users are using the PCs when using the forcible termination function.
- When your ladder chart system is operating online with the PCs, you might alter the [Utility] - [PCs edition] - [Change capacity] settings or [Analog counter] settings and then transmit a ladder program already created offline to the PCs. In such a case, the altered [Change capacity] or [Analog counter] settings will be overwritten with the settings that were supplied during the offline operation. This is because the PCs edition settings are contained in the transmitted ladder program. When such overwriting happens, you have to supply the settings again while the system is running online with the PCs.

## 4.7.6 Setting Ethernet communication (parameter information setting)

## (1) [Ethernet Communication Setting List] window

This window shown below provides functions to display and edit the list of parameter information in Ethernet communication system extension functions. [Management No.] displays the fixed number from 1 to 80 corresponding to the usable socket. In addition, a fixed name is displayed for the [Module name], from a communication module available to its management number. The other items will be displayed “\*” in case of unsetting.

<Operation>

- ① Click [Set Ethernet Communication] - [Set parameter] from the [Utility] menu.
- ② The [Ethernet Communication Setting List] window will be shown below.

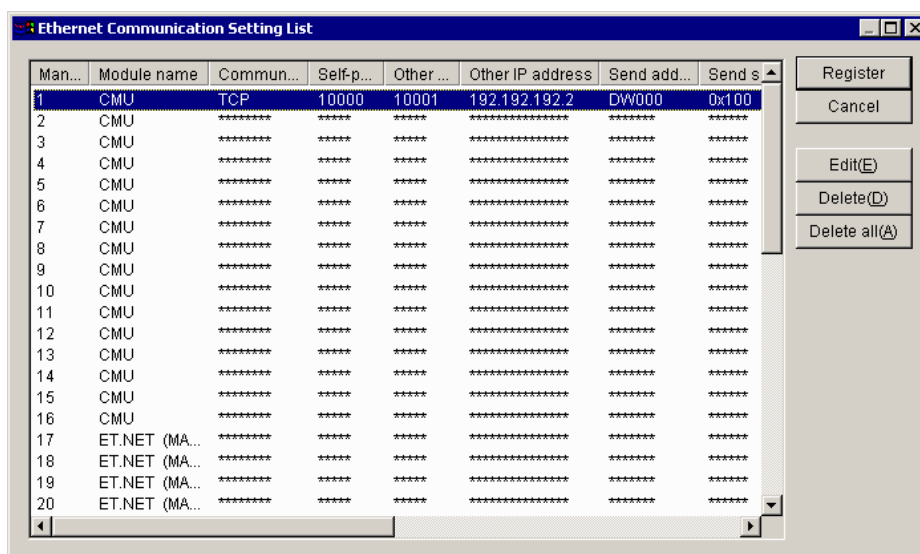


Figure 4-100 [Ethernet Communication Setting List] Window

- ③ When you save the parameter information of Ethernet communication setting into PCs (when the ladder chart system is operating in offline mode, save into the internal memory of the ladder chart system), and terminate [Ethernet Communication Setting List] window, click the  button.
- ④ When terminating [Ethernet Communication Setting List] window without saving the parameter information of Ethernet communication setting into PCs, click the  button.
- ⑤ Select a line of the parameter information of Ethernet communication setting to be edited, and then click the  button. When clicking the  button, [Set Ethernet Communication] window (see Figure 4-101) will be displayed. You cannot set information shown in the [Set Ethernet Communication] window if you do not select the line. When double clicking on the line of the parameter information of Ethernet communication setting, [Set Ethernet Communication] window will be displayed.

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- ⑥ When deleting one parameter information of Ethernet communication setting, select a line of the parameter information of Ethernet communication setting to be deleted, and then click the  button.
- ⑦ When deleting all parameter information of Ethernet communication setting, click the  button. You cannot delete the information shown in the [Ethernet Communication Setting List] window if there is no registered parameter information in Ethernet communication setting list.

### <Notes>

- The display of parameter information of Ethernet communication setting of the selected line is only turned into the unsetting state by operating just the  button or the  button. Ethernet communication setting information is really reflected in PCs or the internal memory when you click the  button.
- Check LPU module, CMU module, and ET.NET module version whether Ethernet communication instructions are enable, and display a warning message shown below to display the [Set Ethernet Communication] window. This window is not displayed at the time of line failure occurring.

Condition		Warning message	Remarks
Offline		In order to use an Ethernet communication instruction, please mount ET.NET module or CMU module after Ver-Rev 04-00.	Parameter setting is enable
Online	LPU module version earlier than 02-02	LPU module is ET.NET module that doesn't support Ethernet communication.	Parameter setting is enable
	CMU module unmounted	CMU module is unmounted.	Parameter setting is enable
	CMU module version earlier than 03-01	CMU module is a version that doesn't support Ethernet communication.	Parameter setting is enable
	CMU module version earlier than 04-00	CMU module is a version that doesn't support ET.NET module.	Parameter setting is enable
	ET.NET module (main) unmounted	The ET.NET module (main) is unmounted.	Parameter setting is enable
	ET.NET module (sub) unmounted	The ET.NET module (sub) is unmounted.	Parameter setting is enable
	OPTET module unmounted	Module of OPTET has not been mounted.	Parameter setting is enable
	Other than the above	No display	

## (2) [Set Ethernet Communication] Window

[Set Ethernet Communication] window will appear on the screen when clicking the **Edit** button or double-clicking on the management number of Ethernet communication setting list box on the [Ethernet Communication Setting List] window. The parameter information of Ethernet communication of the specified management number is set at the window as shown below.

The screenshot shows the 'Set Ethernet Communication' dialog box with the following fields and values:

- Management No.: 1
- Module name: CMU
- Communication mode: TCP
- Connection information:
  - Self-port No.: 10000
  - Other port No.: 10001
  - Other IP address: 192 . 192 . 192 . 2
- Send/Receive area:
  - Send address: DW000 ~ DW07F
  - Send size: 100 Byte
  - Receive address: FW000 ~ FW07F
  - Receive size: 200 Byte
  - Receive timeout: 20 (\*100ms)
- Result storing area:
  - Execution flag: R000
  - Details result code: LWL0000
- Socket disconnection mode: Waiting for non-sent data sending

Figure 4-101 [Set Ethernet Communication] Window

## &lt;Operation&gt;

- ① Set each item and click the **OK** button to reflect the value displayed on the [Ethernet Communication Setting List] window (see Figure 4-100).
- ② Terminate [Set Ethernet Communication] window without reflecting the displayed value when clicking the **Cancel** button.



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<Item>

Management No.:

Displays management numbers specified on [Ethernet Communication Setting List] window (see Figure 4-100).

Module name:

Displays the module for communication specified on [Ethernet Communication Setting List] window (see Figure 4-100).

The module name is fixed according to the management number and the module shown below will be displayed.

If you want to use an OPTET module whose management number is in the range 49 to 80, specify its module number in place of its management number.

Management No.	Module name
1 to 16	CMU
17 to 32	ET.NET (main)
33 to 48	ET.NET (sub)
49 to 80	OPTET (modules 0 thru 3)

Communication mode:

While in the combo box, select “TCP” or “UDP.” It is “TCP” by default. This selected item corresponds to the open command of the Ethernet communication.

Self-port No.:

Specify a port number for communication as a decimal number. (The specification range is from 1 to 65535.) It is blank by default. (Using a number between 10000 and 59999 is recommended. The system reserves numbers for 60000 and above.)

Other port No.:

Specify the port number of the interlocutor as a decimal number. (The specification range is between 1 and 65535.) It is blank by default. (Using a number between 10000 and 59999 is recommended. The system reserves a number for 60000 and above.)

Other IP address:

Specify the IP address of the interlocutor. It is blank by default. To broadcast data by UDP transmission, specify the node address as 255, as in 255.255.255.255.

### Send address:

Specify the top address of sent data in word form (registers for long and float only are in long and float forms) of PI/O. The system does not allow you to specify a bit-type register, specify an area unassigned as a PI/O, or span two or more registers. It is blank by default. The send address and send size are used to calculate the final address of sent data and display it.

### Send size:

Specify a send size for data in a hexadecimal number. It is blank by default. The unit is the byte. For each communication type, the system allows you to specify either of the following sizes:

TCP: 0x0 to 0x1000 (0 to 4096)

UDP: 0x0 to 0x5C0 (0 to 1472)

### Receive address:

Specify the top address of the area for storing received data in word form (registers for long and float only are in long and float forms) of PI/O. The system does not allow you to specify a bit-type register, specify an area unassigned as PI/O, or span two or more registers. The receive address and the receive size are used to calculate the final address of received data and display it.

### Receive size:

Specify a receive size for data in a hexadecimal number. It is blank by default and the units are bytes. For each communication type, the system allows you to specify either of the following sizes:

TCP: 0x0 to 0x1000 (0 to 4096)

UDP: 0x0 to 0x5C0 (0 to 1472)

### Receive timeout:

Set a wait time for received data to arrive in case data cannot be received when a reception instruction is issued. Specify a range between 0 and 100 (0 and 10 seconds) at increments of 100 ms. (0 means no timeout.) It is set to 10 (1 second) by default. Set a timeout setting. If a reception instruction causes a reception timeout, the reception instruction will cause an error with no reception data (EWOULDBLOCK).

### Execution flag:

Specify with a bit-type register that specifies whether an applied instruction for Ethernet communication is being processed. It is blank by default.

### Details result code:

Specify with a long-type register an area for storing a detailed result code for the execution result of an applied instruction for Ethernet communication. It is blank by default.

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Socket disconnection mode:

Can only be specified when the communication mode is “TCP.” Select “Waiting for non-sent data sending” or “Non-sent data destruction” from the combo box. It is “Waiting for non-sent data sending” by default. Here are the options and their meanings:

Waiting for non-sent data sending:

If data has not yet been sent, the system will wait until the data flows. Any unread data will be discarded.

Non-sent data destruction:

If data has not yet been sent, the system will disconnect the channel and relieve the socket without waiting for the data to flow. In that case, the TCP of the interlocutor host will receive an RST. Since the disconnection takes place differently from the way it usually occurs, be careful as to how the system functions (the method of reporting when an RST is received by the UP) when the interlocutor host receives an RST. Any unread received data will be discarded.

The following list shows the registers, which can be specified on the Ethernet communication setting.

Table 4-15 Setting Register List (1/2)

No.	Item	Symbol	Send address	Receive address	Running flag	Detailed result code
1	External input	X	√	√	√	√
2	External output	Y	√	√	√	√
3	Internal register	R	√	√	√	√
4	Keep relay	K	√	√	√	√
5	On delay timer	T	√	√	√	√
6	One-shot timer	U	√	√	√	√
7	Up/down counter	C	√	√	√	√
8	Global link register	G	√	√	√	√
9	Nesting coil	N	√	√	√	√
10	Process register	P	√	√	√	√
11	Event register	E	√	√	√	√
12	Edge contact	V	√	√	√	√
13	Z-register	Z	√	√	√	√
14	System register	S	√	√	√	√
15	Data register	DW	√	√	—	√

√: Enable to be specified

—: Disable to be specified

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Table 4-15 Setting Register List (2/2)

No.	Item	Symbol	Send address	Receive address	Running flag	Detailed result code
16	Work register	FW	√	√	–	√
17	Internal register	M	√	√	√	√
18	Internal register (Longword)	BD	–	–	–	–
19	For high speed RI/O input	I	√	√	–	√
20	For high speed RI/O output	O	√	√	–	√
21	Register for which HI-FLOW and Ladder share data.	J	√	√	√	√
22		Q	√	√	√	√
23	Work register	LB	√	√	√	√
24	Work register for word only	LW	√	√	–	√
25	Work register for longword only	LL	√	√	–	√
26	Work register for single-precision floating point only	LF	√	√	–	√
27	Work register for word only (Power failure retention)	LX	√	√	–	√
28	Work register for longword only (Power failure retention)	LM	√	√	–	√
29	Work register for single-precision floating point only (Power failure retention)	LG	√	√	–	√
30	Work register for ladder converter only	LR	√	√	√	√
31	Work register for ladder converter only (Edge contact)	LV	√	√	√	√
32	Register for HS.RI/O input	LI	–	–	–	–
33	Register for HS.RI/O output	LO	–	–	–	–

√: Enable to be specified

–: Disable to be specified

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### 4.7.7 Setting Ethernet communication (system program sending)

Send the system program of Ethernet communication functions (Ethernet communication system extension functions) to LPU. The first thing you should do is to send the system program when using Ethernet communication functions, which are provided in the ladder chart system. This operation is available only when it is online.

<Operation>

- ① Click [Set Ethernet Communication] - [Send System Program] from the [Utility] menu.
- ② The System program send confirmation window will be shown below.

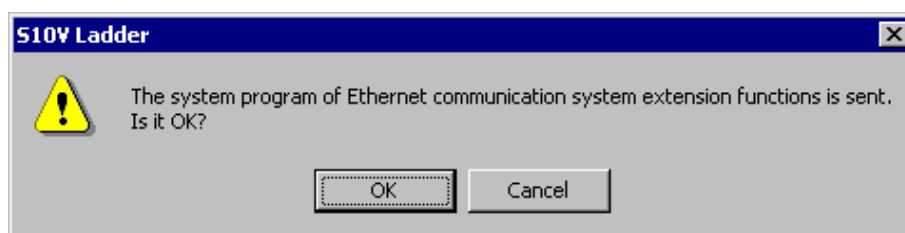


Figure 4-102 System Program Send Confirmation Window

- ③ Click the  button to send the system program. Click the  button if not sending it.
- ④ [Now sending] window will be displayed in transit as shown below.

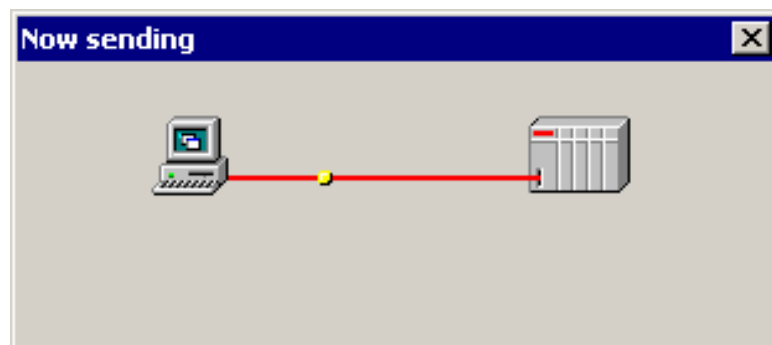


Figure 4-103 [Now sending] Window

- ⑤ [Now sending] window will be terminated after sending is completed.

- A ladder program is enable to be created even if you do not send a system program (Equal to mount Ethernet communication system extension functions). Ethernet communication system extension functions are used in the ladder program, provided, however, that checking whether Ethernet communication system extension functions are mounted during in ladder program transit. If not, the error message dialog box will be displayed and ladder program will not be sent.

Error message: XXXX of a system extension operation function is not mounted.

(XXXX is the function name of Ethernet communication system extension functions.)

- When initializing the LPU memory, the system program sent to LPU memory will be cleared. Therefore, initializing the LPU memory is required to resend the system program.

### 4.7.8 Setting analog and pulse counter modules

Ladder programs can use both a 4-/8-channel analog input module and a 4-channel analog output module for analog input/output operations, and can control a pulse counter module by exchanging data with it. To accomplish this, you first have to set the installation address of each such module in the data area (\*1), which is a PI/O register area ranging from EW400 to EWFF0. The setting of installation addresses in the data area can be done by using the ladder chart system's analog counter function. For details, see Subsection 4.7.8 (1), "Setting installation addresses in the data area." The analog input/output and pulse counter modules whose installation addresses are set in the data area can exchange data with the ladder program via that data area. For details on the data area's format, refer to the manual on each I/O module. (\*2)

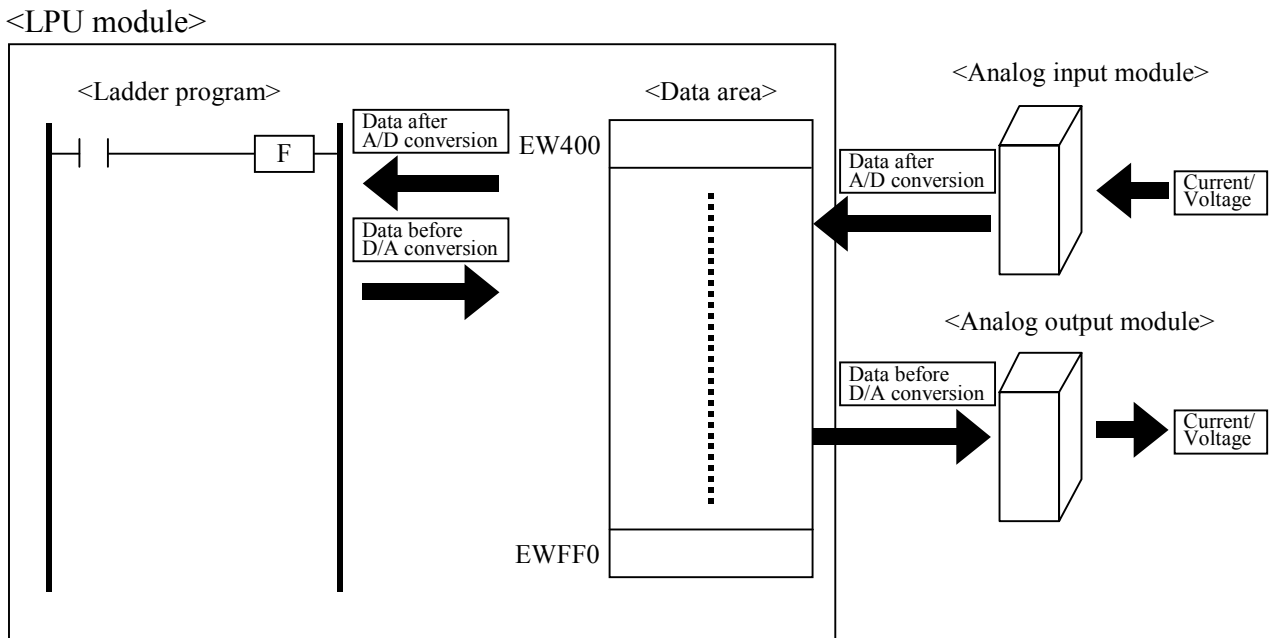
The following clarifies the relationships between the data area and the analog input/output modules and between the data area and the pulse counter module.

**Analog input module**

The analog input module takes analog input signals (current or voltage) from the external source and then converts them into digital data by A/D conversion. The converted digital data is then transferred by the LPU to the data area, where it is stored in the location allocated for the channel used for the data input. The ladder program can then obtain the data from the analog input module in digital form by accessing the data area.

**Analog output module**

The ladder program writes digital data to the allocated location in the data area. Then, the LPU further transfers the data to the analog output module, which, in turn, converts it to analog output format and then outputs the resulting current or voltage signal to the external destination.





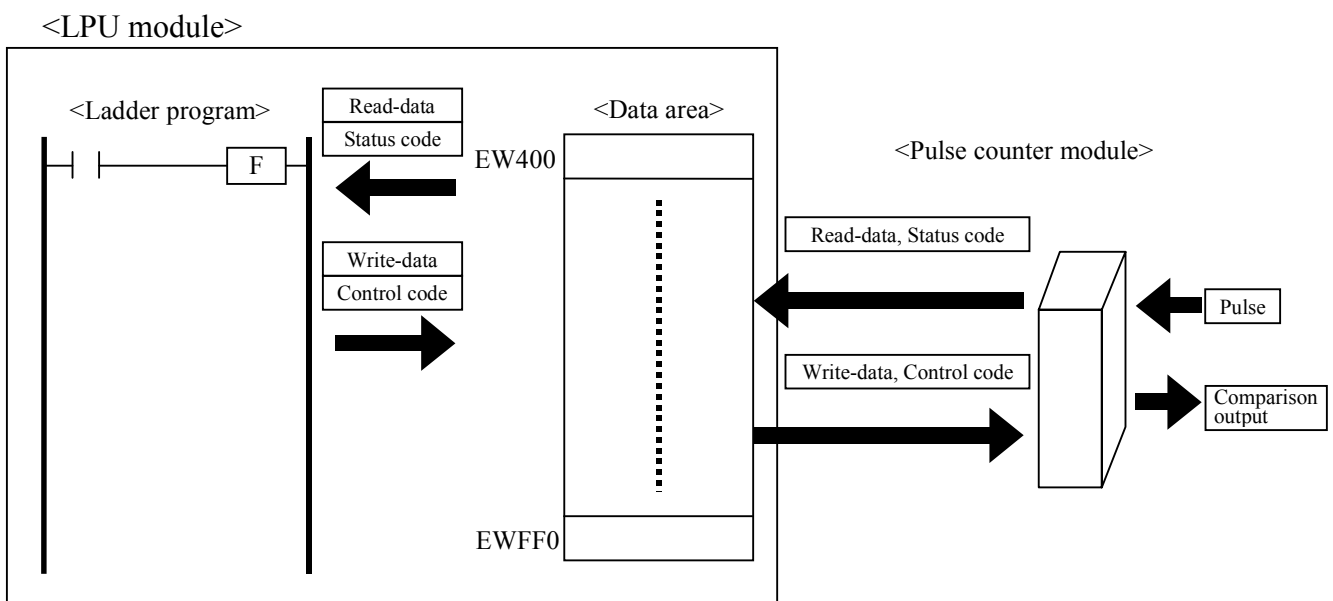
## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### Pulse counter module

The pulse counter module takes pulses from the external source. Then, the LPU transfers the resulting data (read-data and status code) from the pulse counter module to the allocated location in the data area.

The ladder program can control the pulse counter module by writing write-data and control code to the allocated location in the data area for further transfer by the LPU to that pulse counter module.

For details on the data area format for the pulse counter module, refer to the manual on the pulse counter module. (\*2)



## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

(\*1) As shown below, the analog input/output modules that run according to a given mode setting do not require the setting of their installation address in the data area, depending on the set mode. (For details on the mode setting, refer to the S10mini HARDWARE MANUAL I/O MODULES [manual number SME-1-114].)

No.	Module model	Set mode	Installation address setting in data area
1	LQA000	MODE1	Not required
		MODE2	Required
2	LQA100	MODE1	Not required
		MODE2	Required
3	LQA200	MODE1	Not required
		MODE2	Required
4	LQA500	MODE1	Not required
		MODE2	Required
5	LQA600	MODE1	Not required
		MODE2	Required
6	LQA610	MODE1	Not required
		MODE2	Required
7	LQA050	MODE1	Not required
		MODE2	Required
		MODE3	Not required
		MODE4	Required
8	LQA150	MODE1	Not required
		MODE2	Required
		MODE3	Not required
		MODE4	Required

(\*2) The table below shows available I/O module models and their accompanying manuals.

Module model	Manual number
LQA000/050/100/150/200/310/500/600/610/810	SME-1-114
LQC000	SME-1-114
LWA400/401/402/403/404/421/422/423/430/435/450/460	SME-1-126
LWC400/401/402	SME-1-126
PAF300/301/309/320/329	SAE-2-201
PTF300/320	SAE-2-201

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (1) Setting installation addresses in the data area

The installation addresses of I/O modules can be set in the data area while the ladder chart system is running either in online mode or offline mode. The procedures used in the two cases are described below. For information on the online mode and offline mode, see Subsection 4.5.2, “Switching between ‘online’, ‘offline’, ‘only for online monitor’, and ‘online waiting’ modes.”

#### (a) Setting under offline state

- ① Click [Utility] - [PCs edition] - [Analog counter] from the menu.

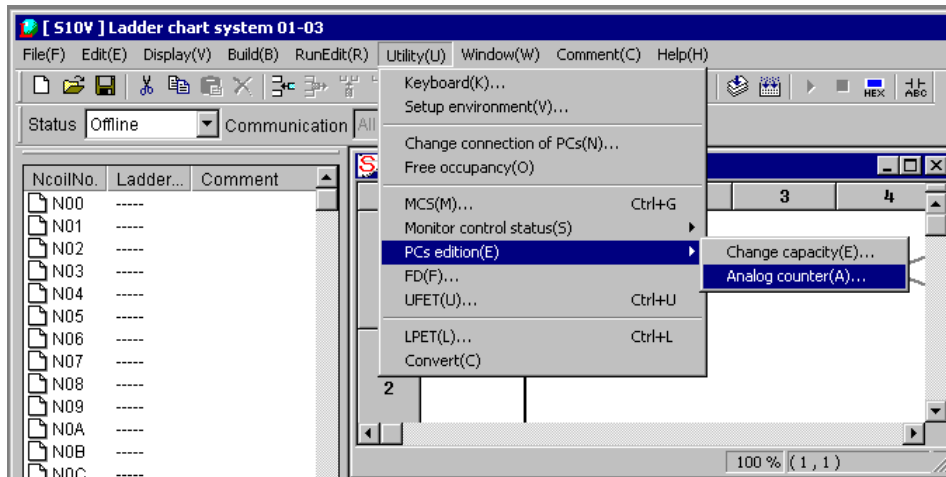


Figure 4-104 Analog Counter Selection

- ② [Analog counter] window is displayed as shown below. The name, type, and address of the module are shown below if modules have already been allocated under the offline state.

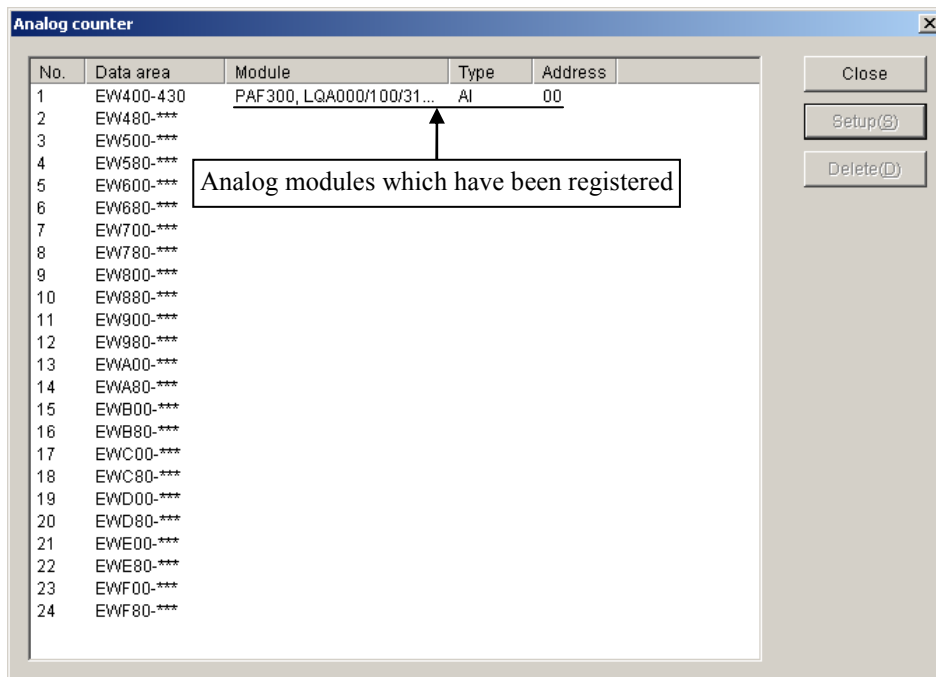


Figure 4-105 [Analog counter] Window Display

- ③ Select the register number of data area allocated from the [Analog counter] window, and then click the **Setup** button.

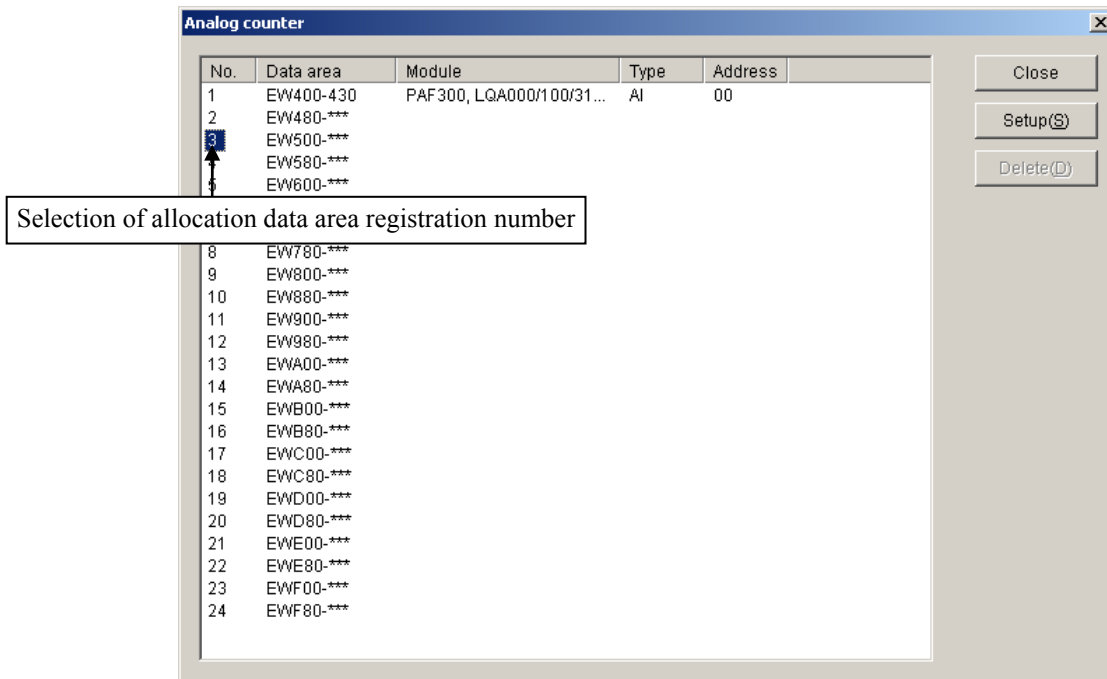


Figure 4-106 [Analog counter] Window (Selection of allocation data area)

- ④ Select a module name to be allocated from the list box of the module name on the [Setup] window shown below. When you select 8-channel analog input module for module name, allocation data range changes from 4-channel to 8-channel. Default of allocation data area displays 4-channel.

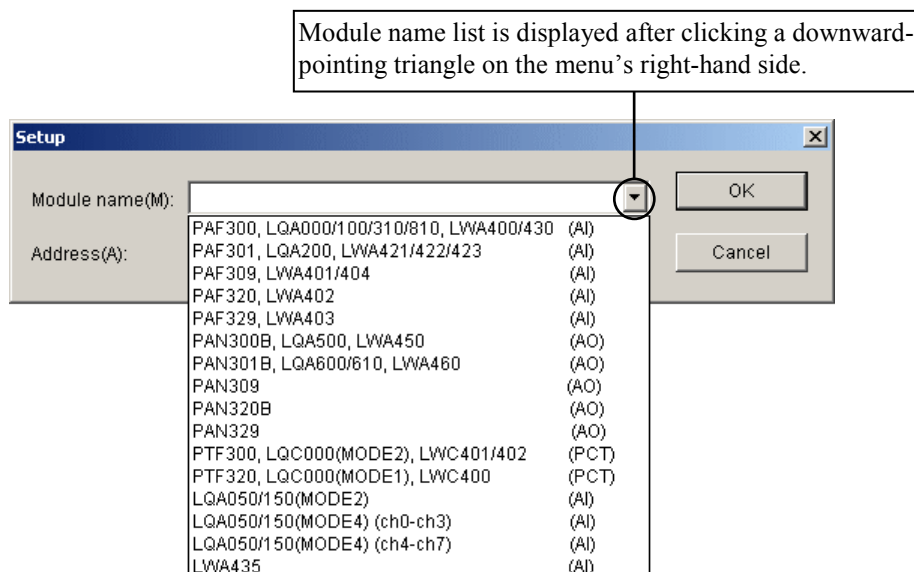


Figure 4-107 [Setup] Window (Display of module name list)

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

Unlike other I/O modules, 8-channel AI modules of models LQA050 or LQA150 are given a different module name as standard for selection by users, depending on the operation mode (MODE2 or MODE4) in which they will be used. For details, see Subsection 4.7.8 (1) (d), “8-channel analog input module.”

After selecting a module name, setup the address for it on the [Setup] window show below. For setting of address, see “(c) Address Setting.”

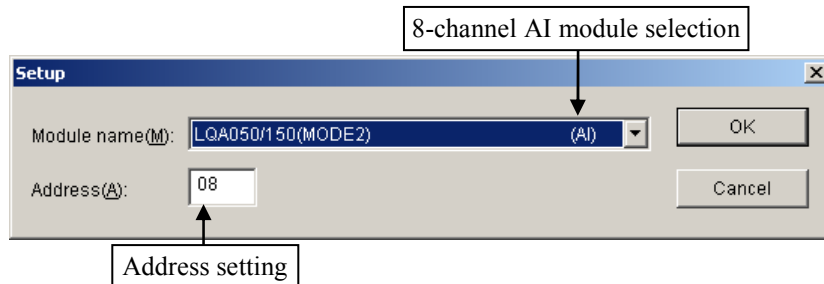


Figure 4-108 [Setup] Window (8-channel AI module selection)

- ⑤ Data setup on the [Setup] window will be displayed on the [Analog counter] window when you click the **OK** button. (The data will be displayed on the line of register number selected at the procedure ③.)

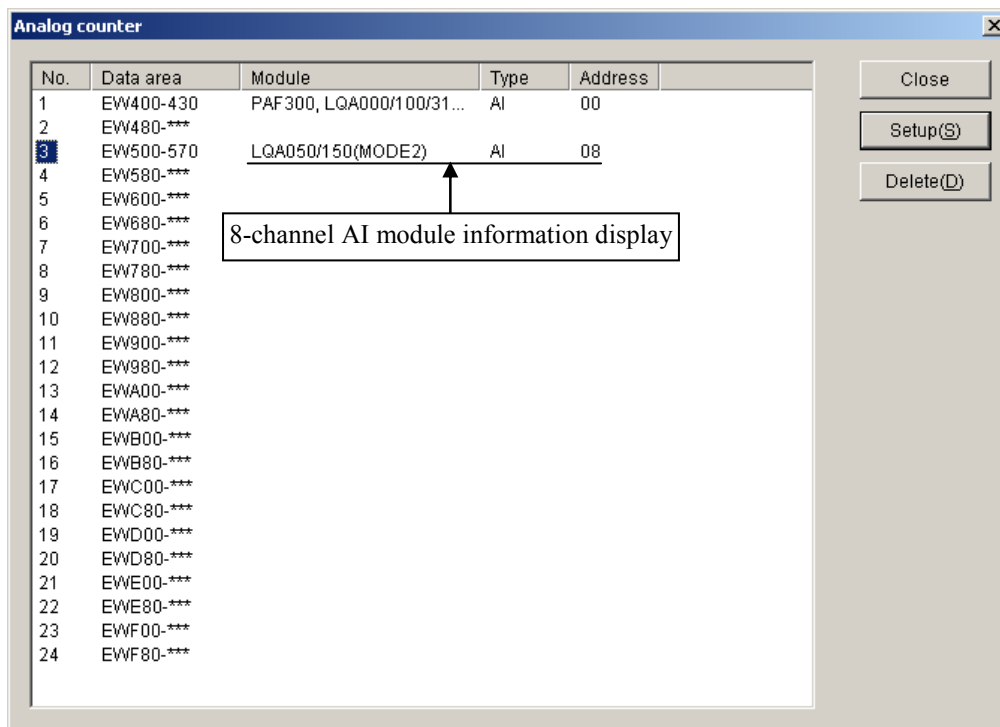


Figure 4-109 [Analog counter] Window (8-channel AI module information display)

This is the end of module registration under the offline state. If you have other modules to be allocated, repeat the procedure from ③ to ⑤.

Clicking the **Cancel** button cancels data setup on the [Setup] window, and does not reflect in the [Analog counter] window.

- ⑥ Clicking the **Close** button closes the [Analog counter] window.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

- ⑦ Click [Build] - [Online] from the menu, and change the communication state to online.

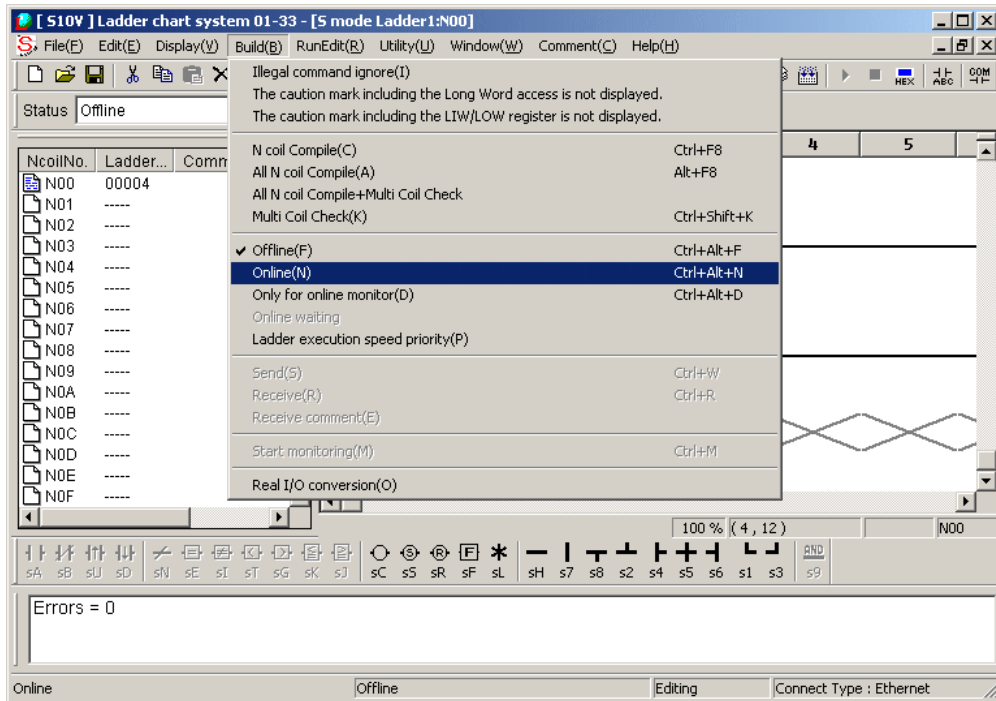


Figure 4-110 Online Switching

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

- ⑧ After switching communication state to online, click [Build] - [Send] from the menu. Then, [Sending setup] window is displayed.

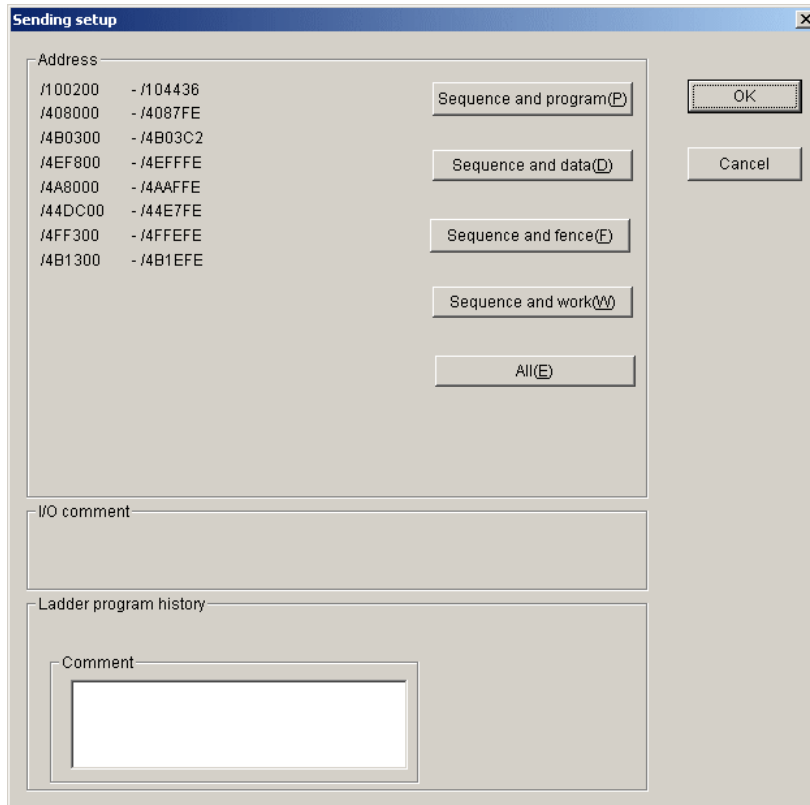
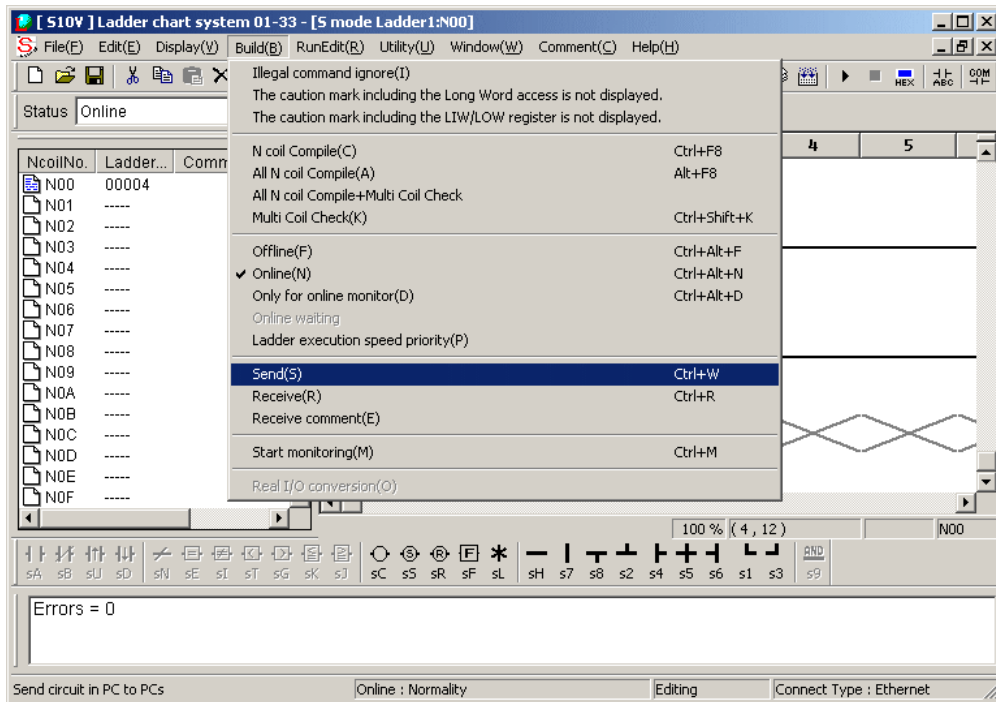


Figure 4-111 [Sending setup] Window Display

- ⑨ Click the  button to send the setup information which was set on the [Analog counter] window for a ladder program to PCs. Then, if any one of the analog input modules listed below has been selected in the [Analog counter] window, the ladder chart system automatically checks whether the destination unit of PCs supports the selected module.

Module name	Module support
LQA050/150(MODE2) (AI)	These 8-channel analog input modules (each using 14 A/D conversion bits) are supported by LPU modules Ver-Rev 0002-0001 and later. (*1)
LWA435 (AI)	This 4-channel analog input module (using 14 A/D conversion bits) is supported by LPU modules Ver-Rev 0002-0009 and later. (*2)

If the selected analog input module is not supported, the ladder chart system will display an error message dialog box as shown below and will not send the ladder program to the destination. If you want to send the ladder program to the destination, either delete the entry for the selected module on the [Analog counter] window or replace the destination's unit of PCs with a one supporting it, such as the one marked with (\*1) or (\*2) above. Then, send the ladder program to the destination (by performing Steps ⑧ and ⑨ above).



where:

- : One of the module names listed below, indicating the following:  
 LQA050/150(MODE2) = 8ch AI(LQA050/150(MODE2))  
 LWA435 = LWA435 AI
- △△△△: One of the module names listed below, indicating the following:  
 LQA050/150(MODE2) = 8ch AI  
 LWA435 = LWA435 AI

Figure 4-112 The Error Message Dialog Box Reporting the Module Is Not Supported

This is the end of module setting under the offline state.

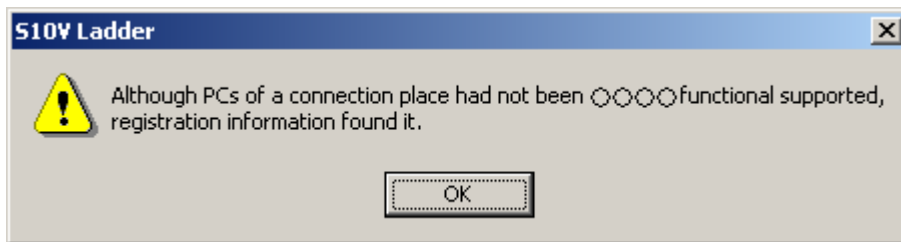


(b) Setting under online state

① Click [Build] - [Online] from the menu (see Figure 4-110). This procedure is not necessary if it has already been in online state.

② Subsequently, proceed with ① to ④ of “(a) Setting under offline state.”

When the [Analog counter] window appears, a warning message as shown below will be displayed if a non-supported analog module is listed in the destination programmable controller’s analog counter table. (The PCs capable of supporting the listed module are those which are marked with (\*1) or (\*2) on the previous page.)



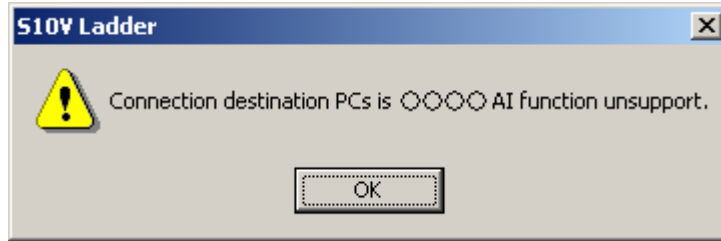
where:

○○○○: One of the module names listed below, indicating the following:  
 LQA050/150(MODE2) = 8ch AI(LQA050/150(MODE2))  
 LWA435 = LWA435 AI

Figure 4-113 The Warning Message Reporting the Destination Does Not Support a Listed Analog Module

③ When clicking the  button on the [Setup] window, data setup at the [Setup] window is displayed on the [Analog counter] window and also is registered. (\*) If you have other modules to be allocated, repeat from the procedure ② to ③. Clicking the  button on the [Sending setup] window does not register data which set at the procedure ②.

(\*) At this moment, if the destination programmable controller does not support the module selected in the [Setup] window, an error message dialog box as shown below will be displayed and no registration will be performed for the selected module.



where:

- : One of the module names listed below, indicating the following:  
LQA050/150(MODE2) = 8ch AI(LQA050/150(MODE2))  
LWA435 = LWA435 AI

Figure 4-114 The Error Message Dialog Box Reporting the Destination Does Not Support a Selected Analog Module

If you want to perform registration, replace the destination's unit of PCs with a one supporting the selected module. (The PCs capable of supporting the selected module are those which are marked with (\*1) or (\*2) on the previous page.)

This is the end of module setting under the online state.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (c) Address setting

The address specified on the [Setup] window is the external input/output (X, Y) corresponding to each I/O slot. (See below.)

Setting condition

Station number: 000 (Variable)

Partition setting: Free

I/O slot point: 16 points

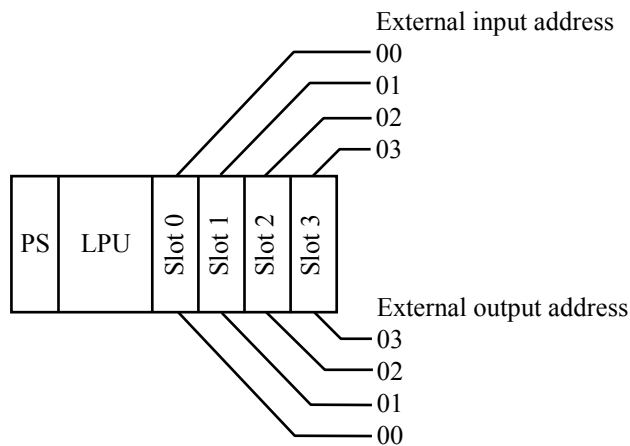


Figure 4-115 4-slot LPU Mount Base (Free setting)

Setting condition

Station number: 000 (Fixed)

Partition setting: Fix

I/O slot point: 16 points

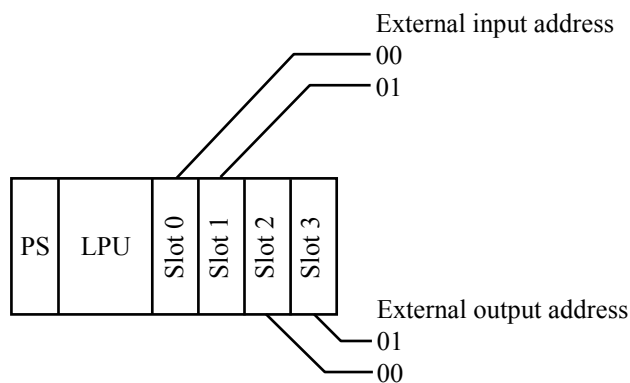


Figure 4-116 4-slot LPU Mount Base (Fix setting)

Setting condition

Station number: 040 (Variable)

Partition setting: Free

I/O slot point: 16 points

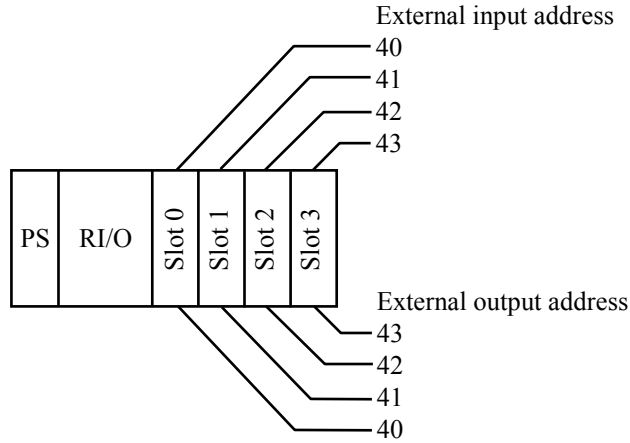


Figure 4-117 4-slot I/O Mount Base (Free setting)

Setting condition

Station number: 040 (Fixed)

Partition setting: Fix

I/O slot point: 16 points

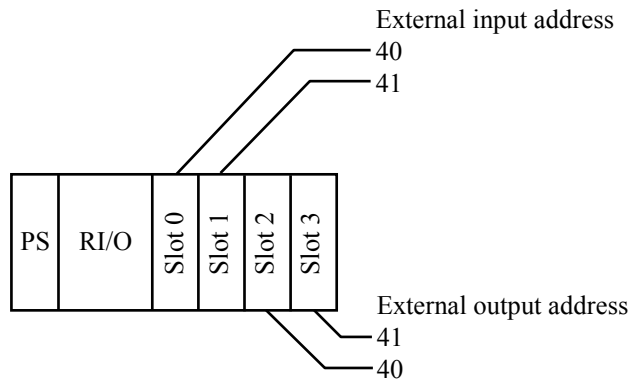


Figure 4-118 4-slot I/O Mount Base (Fix setting)

External input/output address is variable, and its value varies with depending on RI/O station number, I/O point setting, and partition setting (FREE/FIX). For details, refer to “USER’S MANUAL BASIC MODULES (manual number SVE-1-100).”

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

### (d) 8-channel analog input module

When using an 8-channel analog input module with MODE2 or MODE4, you need to register this module in [Analog counter] window of the ladder chart system.

When MODE2 or MODE4 is set, select the following module from the [Analog Counter] window and click the  button.

- When MODE2 is set:

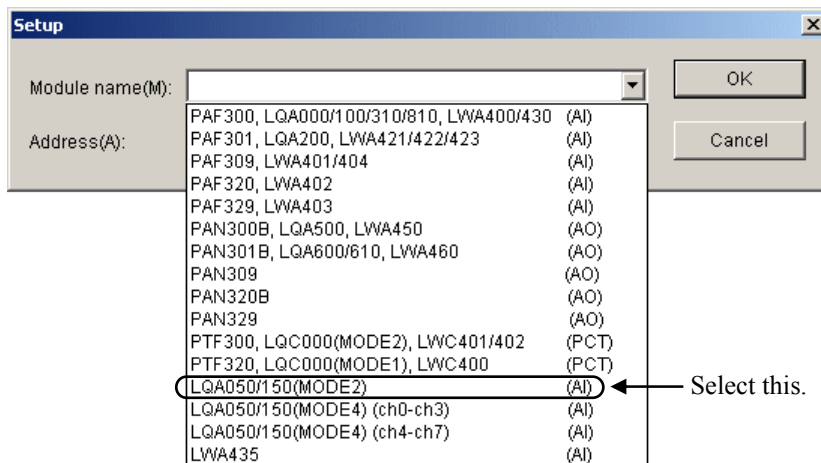


Figure 4-119 When 8ch AI Is Used with MODE2

- When MODE4 is set and channels 0 to 3 are used:

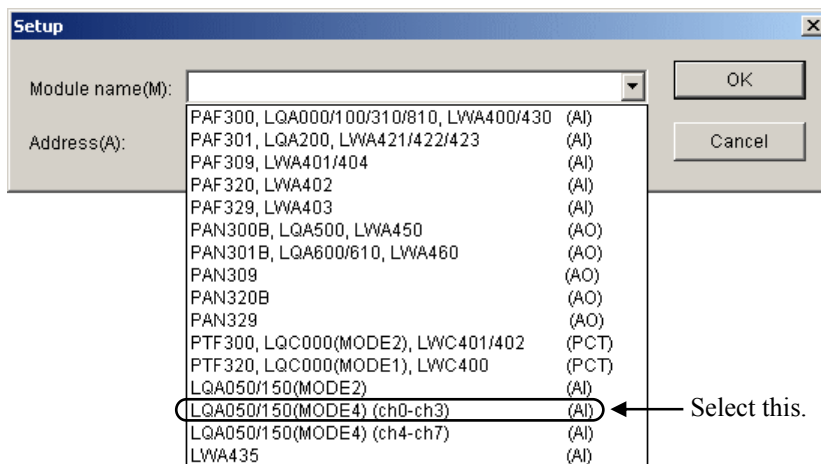


Figure 4-120 When 8ch AI Is Used with MODE4 (Only Channels 0 to 3 are Used)

Note: It is impossible to set as only channels 4 to 7 to be used without channels 0 to 3 not to be used.

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

- When MODE4 is set and channels 0 to 7 are used:

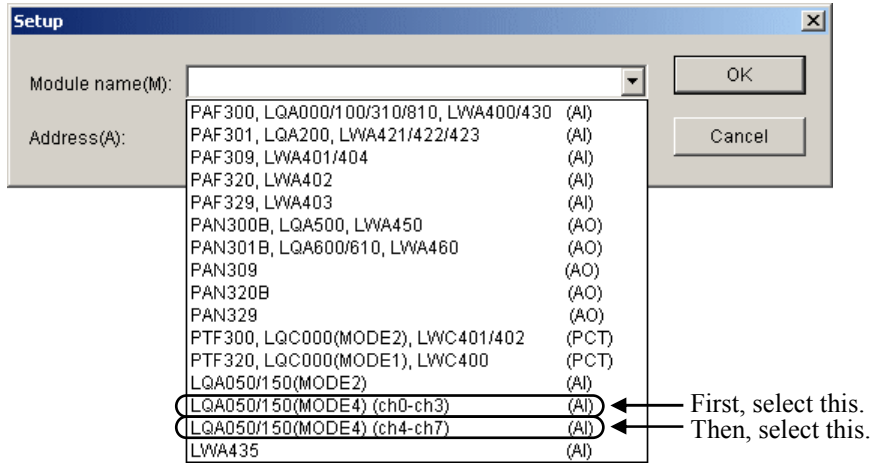


Figure 4-121 When 8ch AI Is Used with MODE4 (All Channels 0 to 7 are Used)

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

First, select “LQA050/150(MODE4) (ch0-ch3) (AI)” from the module name list and click the  button. Then, select “LQA050/150(MODE4) (ch4-ch7) (AI)” from the module name list and click the  button. Set the setting position of “LQA050/150(MODE4) (ch4-ch7) (AI)” immediately after the registration number of “LQA050/150(MODE4) (ch0-ch3) (AI).”

When “LQA050/150(MODE4) (ch4-ch7) (AI)” is not set immediately after the registration number of “LQA050/150(MODE4) (ch0-ch3) (AI)” (see the following figure which shows that it is not set to No. 3 immediately after No. 2 in which “LQA050/150(MODE4) (ch0-ch3) (AI)” is set but set to No. 4), the error message dialog box is displayed as shown below.

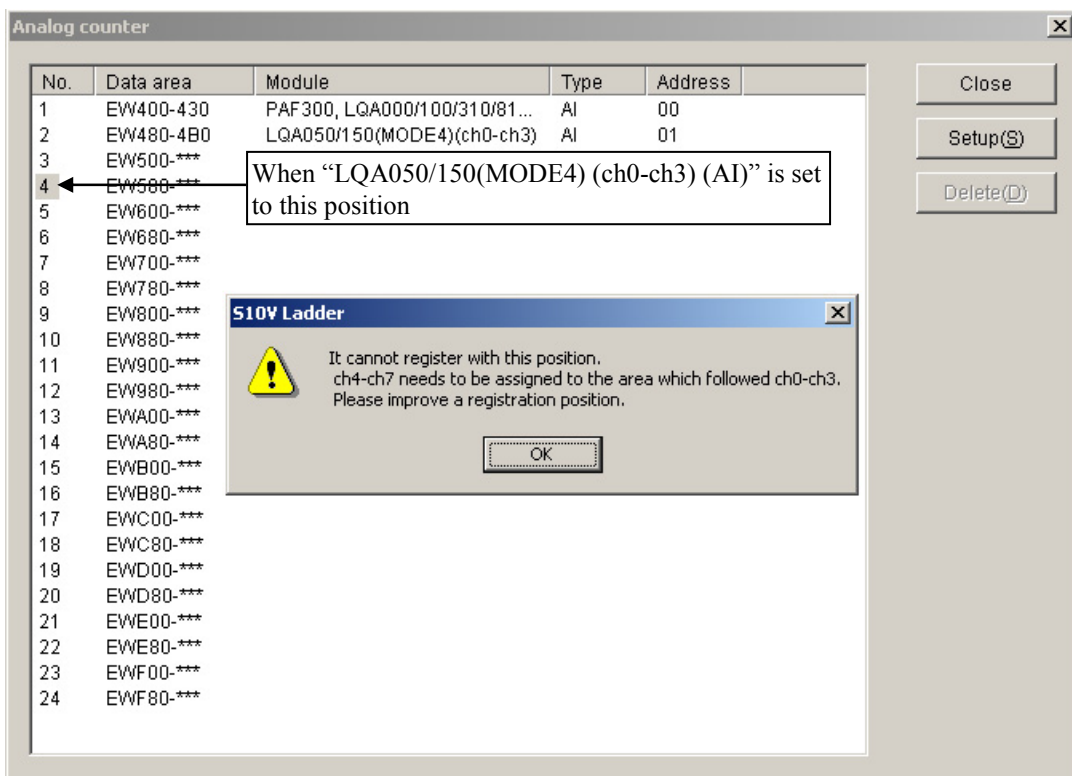


Figure 4-122 When MODE4 (ch4-ch7) for 8ch AI Is Set to an Incorrect Position

In case of setting MODE1 or MODE3, you do not need to register a module in [Analog counter] window. (Do not use it.) For details of mode setting, see the “S10mini HARDWARE MANUAL I/O MODULE (manual number SME-1-114).”

## (2) Analog pulse counter deleting

## (a) Deleting under offline state

- ① Click [Utility] - [PCs edition] - [Analog counter] from the menu (see Figure 4-104).
- ② [Analog counter] window is displayed as shown below. The name, type, and address of the module are displayed as shown below if modules have already been allocated under the offline state.
- ③ Select the registration number of module to be deleted, and click the  button.

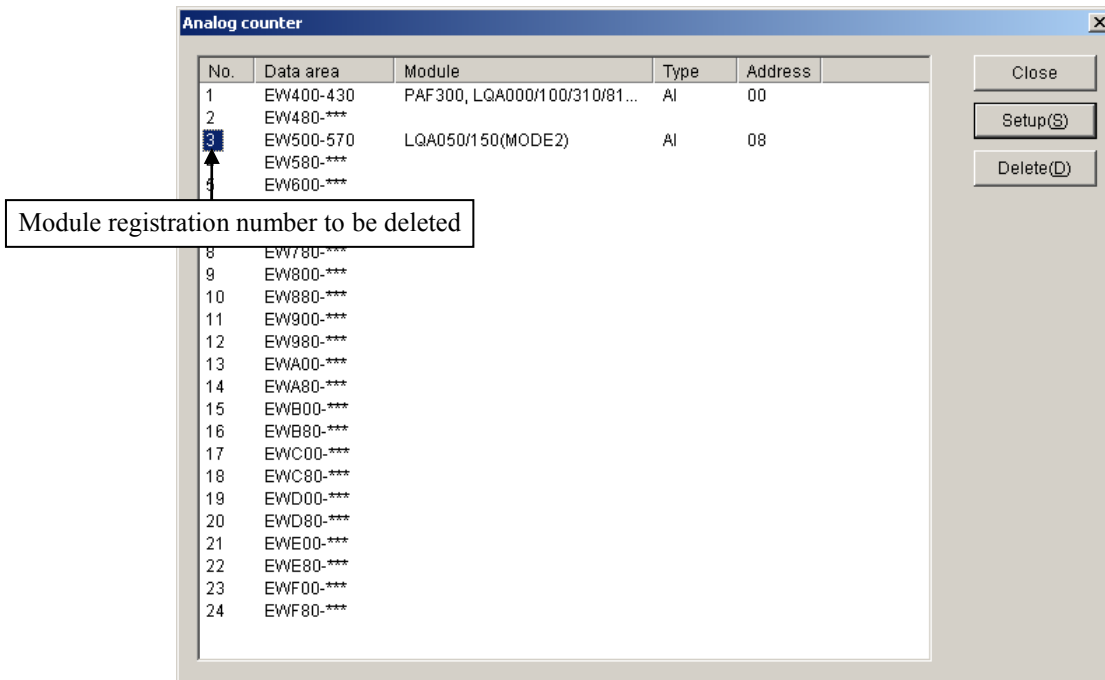


Figure 4-123 [Analog counter] Window (Allocation date deletion)

- ④ The [S10V Ladder] message dialog box which is “Going to delete. OK?” is displayed as shown below.

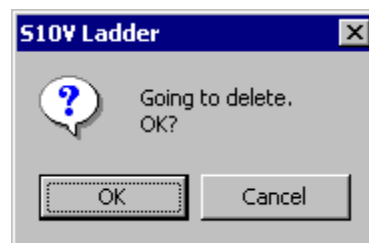


Figure 4-124 Allocation Data Deletion Confirmation Dialog Box

Module setting selected on the procedure ③ will be deleted from the [Analog counter] window when you click the  button on the [S10V Ladder] message dialog box (deleting under offline state).

Clicking the  button on it does not register data which set at the procedure ②.



- ⑤ Clicking the  button cancels on the [Analog counter] window closes the [Analog counter] window.
- ⑥ Click [Build] - [Online] from the menu, and change the communication state to online (see Figure 4-110).
- ⑦ After switching communication state to online, click [Build] - [Send] from the menu. Then, [Sending setup] window is displayed (see Figure 4-111).
- ⑧ Click the  button to send the setup information which was set on the [Analog counter] window with a ladder program.

This is the end of deleting module under the offline state.

(b) Setting under online state

- ① Click [Build] - [Online] from the menu. This procedure is not necessary if it has already been in online state.
- ② [Analog counter] window is displayed. The name, type, and address of the module are displayed if modules have already been allocated under the offline state.
- ③ Select the registration number of module to be deleted, and click the  button.
- ④ Message dialog box which is “Going to delete. OK?” is displayed. Module setting selected on the procedure ③ will be deleted from the [Analog counter] window, and also deleted from PCs when you click the  button on the [S10V Ladder] message dialog box.  
Clicking the  button on it does not delete module setting.

This is the end of deleting module registration under the online state.

(3) Notes on analog pulse counter

- Registration of 8-channel AI modules (models LQA050 or LQA150) from the old ladder chart system's [Analog counter] window is not supported. Therefore, if an attempt to read-access either a unit of PCs in which any of the modules listed below is registered or a ladder program file that is used in that unit of PCs is made from the [Analog counter] window of the old ladder chart system (Ver-Rev number 01-02 or earlier), an undefined module name or blank space will be displayed erroneously. Further, if the registered module name is "LWA435", the old ladder chart system will display it erroneously as blank space.

<Modules to which the above applies>

Module name		Remarks
LQA050/150(MODE2)	(AI)	8-channel AI (with 14 A/D conversion bits)
LQA050/150(MODE4)(ch0-ch3)	(AI)	8-channel AI, used as 4-channel AI (with 12 A/D conversion bits)
LQA050/150(MODE4)(ch4-ch7)	(AI)	8-channel AI, used as 4-channel AI (with 12 A/D conversion bits)
LWA435	(AI)	4-channel AI (with 14 A/D conversion bits)

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

No.	Data area	Module	Type	Address
1	EW400-430	PAF300, LQA000/100/31...	AI	00
2	EW480-4B0	PAF301, LQA200, LWA42...	AI	01
3	EW500-570	LQA050/150(MODE2)	AI	02
4	EW580-5B0	LQA050/150(MODE4)(ch...	AI	03
5	EW600-630	LQA050/150(MODE4)(ch...	AI	04
6	EW680-6B0	PAN300B, LQA500, LWA...	AO	05
7	EW700-730	PAN301B, LQA600/610, ...	AO	06
8	EW780-7B0	PAN309	AO	07
9	EW800-830	PAN320B	AO	08
10	EW880-8B0	PAN329	AO	09
11	EW900-930	PTF300, LQC000(MODE...	PCT	0A
12	EW980-9B0	PTF320, LQC000(MODE...	PCT	0B
13	EWA00-A30	LWA435	AI	0C
14	EWA80-***			
15	EWB00-***			
16	EWB80-***			
17	EW C00-***			
18	EW C80-***			
19	EW D00-***			
20	EW D80-***			
21	EW E00-***			
22	EW E80-***			
23	EW F00-***			
24	EW F80-***			

8-channel AI (LQA050/150) and 4-channel AI (LWA435) both supported

No.	Data area	Module	Type	Address
1	EW400-430	PAF300, LQA000/100/31...	AI	00
2	EW480-4B0	PAF301, LQA200, LWA42...	AI	01
3	EW500-570	...	AI	02
4	EW580-5B0	...	AI	03
5	EW600-630	...	AI	04
6	EW680-6B0	PAN300B, LQA500, LWA...	AO	05
7	EW700-730	PAN301B, LQA600/610, ...	AO	06
8	EW780-7B0	PAN309	AO	07
9	EW800-830	PAN320B	AO	08
10	EW880-8B0	PAN329	AO	09
11	EW900-930	PTF300, LQC000(MODE...	PCT	0A
12	EW980-9B0	PTF320, LQC000(MODE...	PCT	0B
13	EWA00-A30	...	AI	0C
14	EWA80-***			
15	EWB00-***			
16	EWB80-***			
17	EW C00-***			
18	EW C80-***			
19	EW D00-***			
20	EW D80-***			
21	EW E00-***			
22	EW E80-***			
23	EW F00-***			
24	EW F80-***			

Neither 8-channel AI (LQA050/150) nor 4-channel AI (LWA435) supported

Figure 4-125 [Analog counter] Window Wrong Display

## 4 LADDER SHEET PROCESSING FUNCTIONALITY AND ITS USAGE

- It may happen that one of the AI modules listed in Table 4-16 is installed for use with the LPU not supporting them and is registered along with its analog counter information. In this case, the result will be unsuccessful read-access to the input value of that AI module during the operation of that LPU.

**Table 4-16 Available Module Models and LPUs that Support Them**

Module model	LPUs supporting it		Remarks
	LPU-OS Ver-Rev	Module Rev	
LQA050/150	Ver 2.0, Rev 1.0 or later	F or later	This combination can be used only in MODE2.
LWA435	Ver 2.0, Rev 9.0 or later	R or later	

Further, any attempt to register one of the AI modules listed below from the [Analog counter] window in online mode by using ladder program transmission (to the destination unit of PCs) will be subjected to a check to see whether or not the destination LPU supports that AI module. If the AI module is not supported, the attempt will fail, as shown in Table 4-17, with an error message displayed. A similar check is also made when the ladder chart system's FD function is used for transmitting a binary file (to the destination unit of PCs). In this case, if the AI module is not supported, a warning message dialog box will be displayed.

**Table 4-17 Relationships between Ladder Chart System Ver-Rev and LPU-OS Ver-Rev**

No.	Operation	AI module model	Ladder chart system Ver-Rev	LPU-OS Ver-Rev					
				Ver 2.0, Rev 0.0 or earlier		Ver 2.0, Rev 1.0 to 8.0		Ver 2.0, Rev 9.0 or later	
				Access succeeds or not	Registration possible or not	Access succeeds or not	Registration possible or not	Access succeeds or not	Registration possible or not
1	Ladder program transmission	LQA 050/150	01-02 or earlier	–	–	–	–	–	–
2			01-03 or later	ns	Not possible	√	Possible	√	Possible
3		LWA435	01-20 or earlier	–	–	–	–	–	–
4			01-21 or later	ns	Not possible	ns	Not possible	√	Possible
5	Binary file transmission by FD	LQA 050/150	01-02 or earlier	–	–	–	–	–	–
6			01-03 to 01-20	ns	Possible	√	Possible	√	Possible
7			01-21 or later	ns	Possible (*)	√	Possible	√	Possible
8		LWA435	01-20 or earlier	–	–	–	–	–	–
9			01-21 or later	ns	Possible (*)	ns	Possible (*)	√	Possible

√: With this combination, read-access to the AI module's input value will succeed.

ns: With this combination, read-access to the AI module's input value will not succeed.

(\*) In this case, a warning message dialog box will be displayed. Clicking the  button will cancel the send request issued, without performing registration.

4.7.9 Comparing ladder charts

The S10V Ladder Chart System provides a support function to help users compare two ladder charts and visually detect any differences between them. This support function is useful in cases where changes have been made to a ladder chart. By comparing the original ladder chart with its altered version, the user can check out the locations of differences in the two. In practice, the comparison by this support function is done on the ladder sheet currently displayed on screen and the corresponding ladder instruction file stored on disc, so in any case it requires a ladder sheet currently displayed on screen. For information on how to display a ladder sheet on screen, see “4.2 Ladder Sheet File Processing Functions.”

The rest of this subsection explains how to compare ladder charts, by using two terms: the on-screen chart, which is a ladder sheet currently displayed on screen, and the on-disc chart, which is the corresponding ladder instruction file stored on disc.

(1) Operation procedure

(a) Selecting an on-disc chart

Click [DIFF] - [Circuit] from the [Utility] menu. The [Circuit DIFF Setting] window will then appear. If, in this window, you enter the file name of the desired on-disc chart file and click the [DIFF] button, the [Nesting DIFF List] window will appear. If, in that same window, the [Cancel] button is clicked instead of the [DIFF], the [Circuit DIFF Setting] window will close without doing anything.

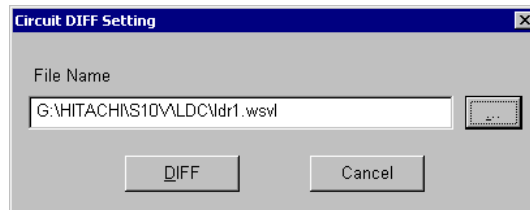


Figure 4-126 The [Circuit DIFF Setting] Window -- an Example

Further, if the [...] button near the right edge of the [Circuit DIFF Setting] window is clicked instead, the [Open] window as shown below will then appear.

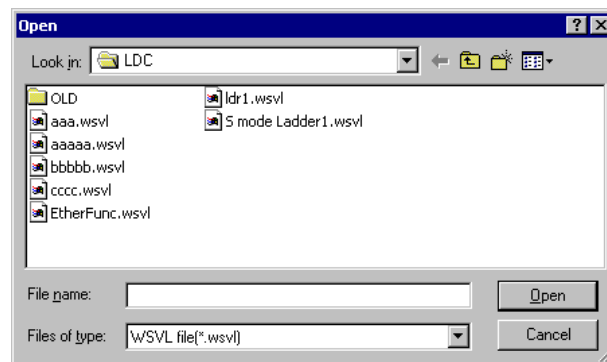


Figure 4-127 The [Open] Window -- an Example

In this window, choose the desired on-disc chart file and click the [Open] button. The selected on-disc chart file’s file name will then appear in the [File Name] box of the [Circuit DIFF Setting] window.

(b) The [Nesting DIFF List] window

When you have clicked the **[DIFF]** button in the [Circuit DIFF Setting] window, the [Nesting DIFF List] window is on screen, with the [Circuit DIFF Setting] window closed. The [Nesting DIFF List] window shows the presence or absence of differences for each nesting (N coil).

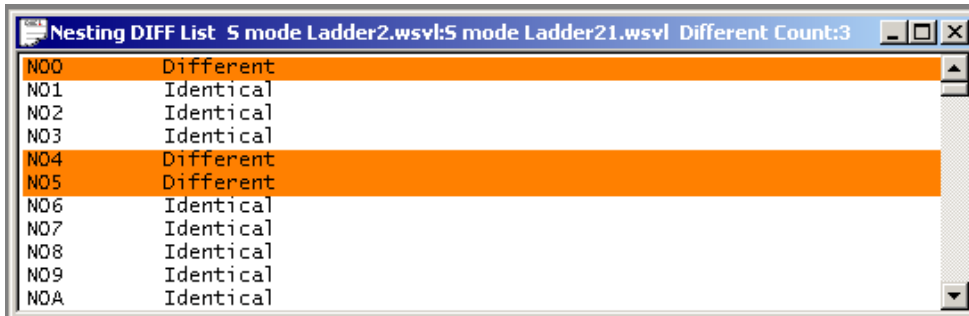


Figure 4-128 The [Nesting DIFF List] Window -- an Example

In this window:

- Window title  
Shows the file names of the on-screen and on-disc chart files compared and a count of the number of “Different” nestings detected.
- Result of comparison  
Shows the result of the comparison for each nesting by providing the following information:

No.	Result of comparison	Displayed string	Display color
1	No differences detected or no circuit data found	Identical	White
2	Differences detected	Different	Red

If you want to exit the [Nesting DIFF List] window, click the **[X]** button in the upper right corner of that window.

The result (nesting DIFF) of the comparison can be saved to a file in text format by performing the following steps:

- ① When the [Nesting DIFF List] window is on screen, click [Save file] or [Save file as...] from the [File] menu, or hold down the [Ctrl] key and enter the [S] key.
- ② The [Save file as ...] window appears.
- ③ Enter the desired file name in the [Save file as ...] window and save it.

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(c) The [Circuit DIFF] window

If you double-click a “Different” nesting in the [Nesting DIFF List] window, the [Circuit DIFF] window will appear. The [Circuit DIFF] window shows the presence or absence of differences for each circuit by shading in different colors.

The display size of circuit data is fixed at 100% -- a factor of zooming.

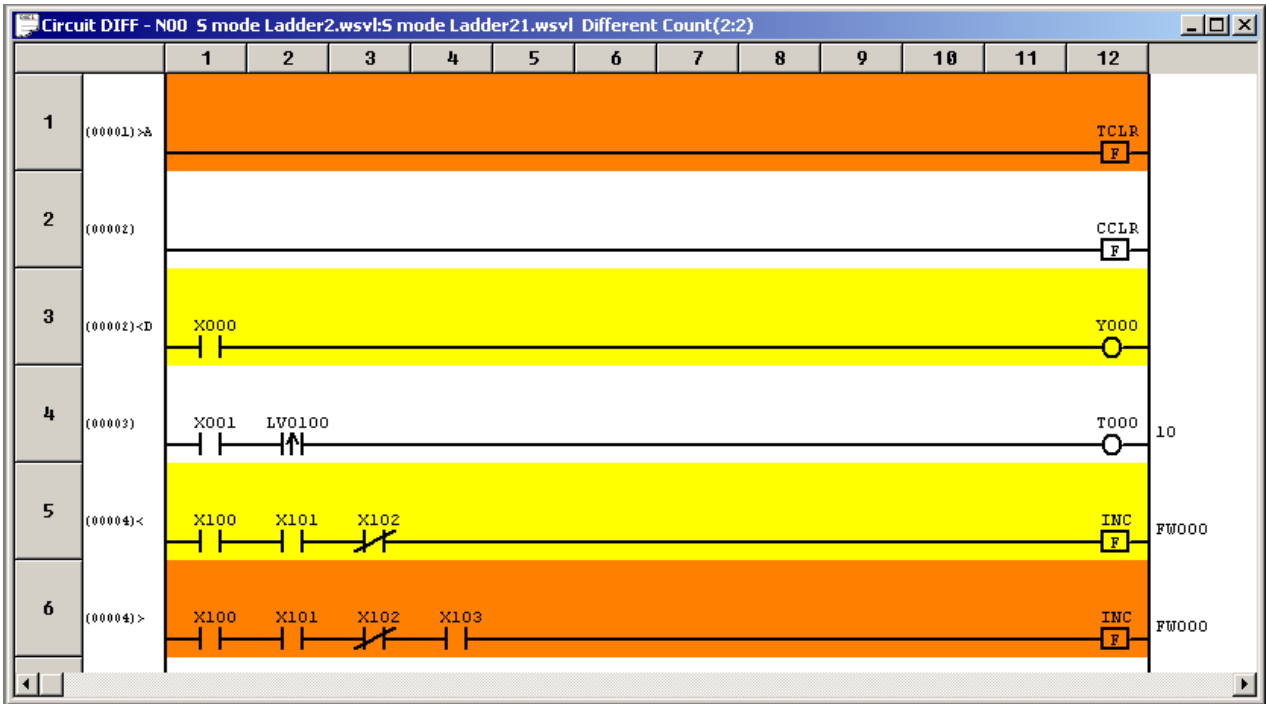


Figure 4-129 The [Circuit DIFF] Window -- an Example

In this window:

- Window title

Shows the nesting number of the selected nesting, the file names of the on-screen and on-disc chart files compared, and counts of the number of non-matching circuits in the two chart files (these counts are shown in the format “on-screen:on-disc”).

● Result of comparison

The result of the comparison is shown shaded in different colors for its details, as described in the table below. As shown above, the column near the left edge of the [Circuit DIFF] window presents the circuit numbers of the compared circuits and the symbols indicating the result of the comparison. These items are described in the table below.

No.	Result of comparison	Display color	Circuit number	Symbol
1	Identical lines	White	On-disc	None
2	Non-identical line (on-screen circuit)	Yellow	On-screen	<
3	Non-identical line (on-disc circuit)	Red	On-disc	>
4	Deleted line (*1)	Yellow	On-screen	<D
5	Added line (*2)	Red	On-disc	>A

(\*1) The deleted line here is a circuit that is existent in the on-screen chart but not existent in the on-disc chart.

(\*2) The added line here is a circuit that is existent in the on-disc chart but not existent in the on-screen chart.

If you want to exit the [Circuit DIFF] window, click the  button in the upper right corner of that window. If you double-click another nesting in the [Nesting DIFF List] window instead of clicking that  button, the [Circuit DIFF] window currently displayed closes and the [Circuit DIFF] window for that other nesting appears.



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### (2) Displaying only differences

The result of a comparison of ladder charts is displayed in two different modes: only-differences display and all-inclusive display. Switching between these two modes can be accomplished by clicking [Display only differences] from the [Display] menu while the [Circuit DIFF] window is active on screen. Which display mode is currently used is indicated by the presence or absence of a check mark in the pull-down menu. The default display mode is “Display only differences”.

#### (a) Only-differences display mode (check mark present)

As exemplified below, the only-differences display mode displays only circuits containing a difference(s) (other than identical circuits).

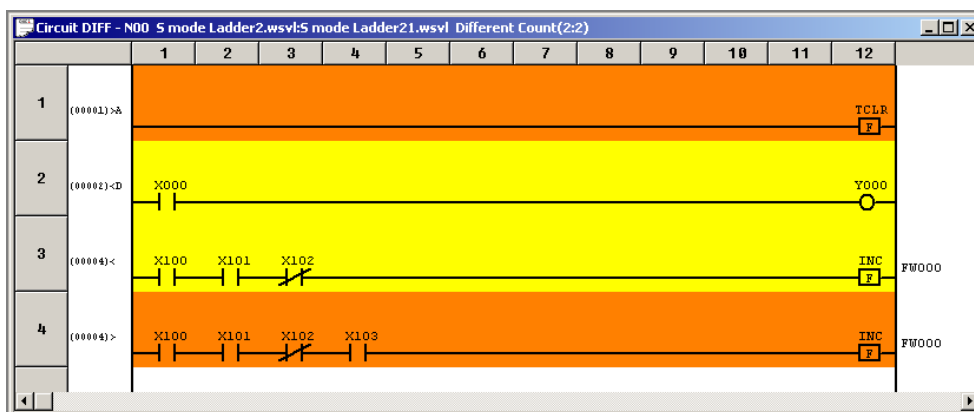


Figure 4-130 The [Circuit DIFF] Window -- an Example Showing Only Differences

#### (b) All-inclusive display mode (check mark absent)

As exemplified below, the all-inclusive mode displays all the details of the comparison result, including differences.

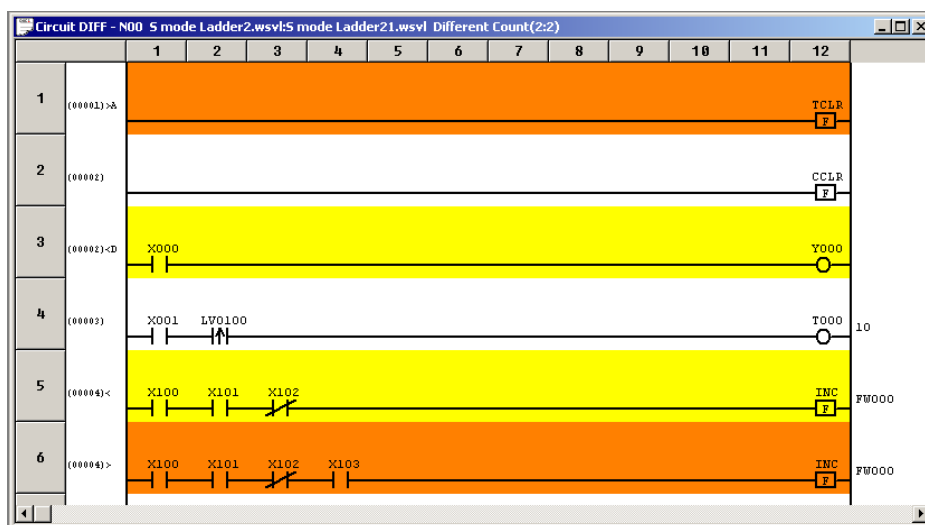



Figure 4-131 The [Circuit DIFF] Window -- an Example Showing All the Details Including Differences

## (3) Displaying I/O comments

You can display I/O comments on-screen along with the result of a comparison by reading their comment files in. To accomplish this, choose the comment file of the on-screen chart and that of the on-disc chart, then either click [Display] - [Display] from the [Comment] menu or click the  (“I/O comment display./ Suppose un-displaying I/O comment.”) button in the tool bar. The display size of comments is fixed at ordinary size (i.e., 16 characters long).

## (a) Choosing comment files

Click [Open file] from the [Comment] menu to display the [Comment File Setting] window as shown below. When the window is displayed, specify the comment files of both the on-screen and on-disc charts in its input boxes.

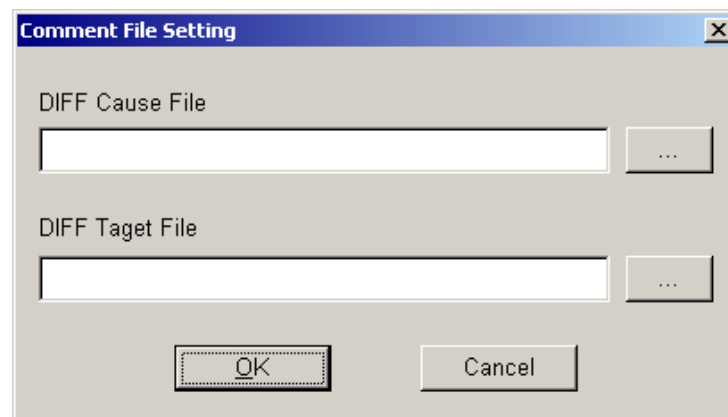

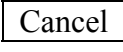




Figure 4-132 The [Comment File Setting] Window -- an Example

where the DIFF Cause File is the on-screen chart file and the DIFF Target File is the on-disc chart file. Then, click the  button to the right of each input box, and choose the desired file in the displayed [Open] window. Do this for each of the two chart files. If you click the  button in the [Comment Setting File] window, the window will close immediately, aborting the comment file selection process.

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### (b) Displaying I/O comments

To display I/O comments, either click [Display] - [Display] from the [Comment] menu or click the  (“I/O comment display./ Suppose un-displaying I/O comment.”) button in the tool bar. If you want to hide the displayed I/O comments, either click [Display] - [Nothing] from the [Comment] menu or click the  button in the tool bar again.

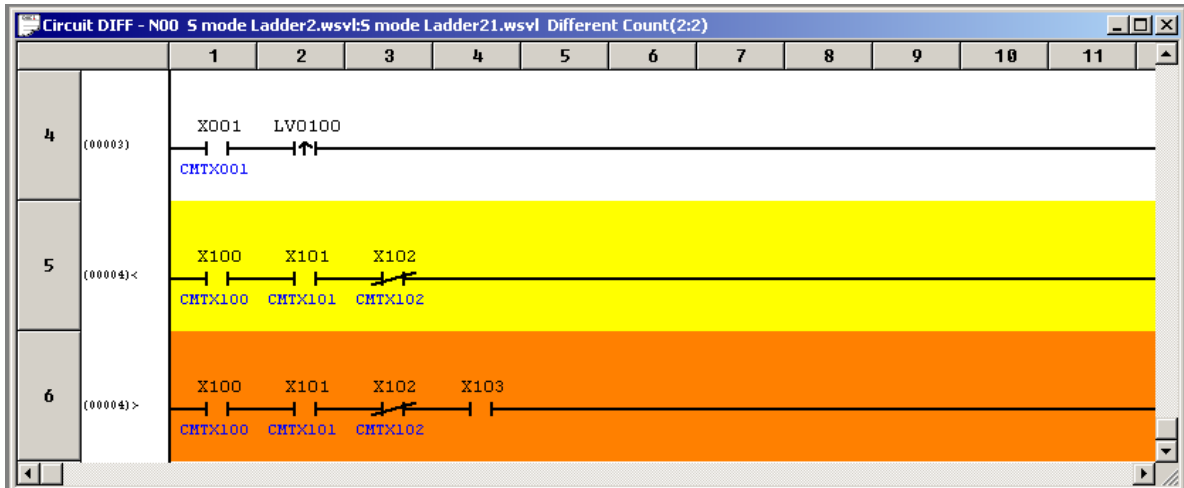


Figure 4-133 A Comment Display Window

### (4) Printing the result of a comparison

To print the result of a comparison on the printer, click [Print] from the [File] menu. If you want to check the details of the result on-screen before printing, click [Print preview] from the [File] menu. Printing the result of a comparison can be accomplished only when the [Nesting DIFF List] window or [Circuit DIFF] window is active on-screen.

### (5) Operational precautions

- This ladder chart comparison function cannot be used during editing of a ladder sheet. Before use, be sure to compile the ladder sheet.
- The comparison of user arithmetic functions is done on their function names and parameters. Therefore, if changes are made to their registered addresses and program bodies, they are not shown in any display of the result of a comparison done on the arithmetic functions.
- A support is provided for displaying I/O comments but not for comparing them. So, no differences between I/O comments are shown in a display of the result of a comparison. As for line comments, they are not supported at all.
- Of all the available arithmetic functions, the jump functions (JT, JMP, and JSE) may be shown as if there were differences between their on-screen and on-disc versions, although the two versions are identical to each other in their displayed circuit.

## 4.7.10 Comparing memory data

The S10V Ladder Chart System provides a support function to help users compare the contents of registers used in two ladder charts and visually detect any differences between them. This support function is useful in cases where changes have been made to the contents of registers in a ladder chart. By comparing the original ladder chart with its altered version with regard to the contents of registers, the user can check out the details of differences in the two. In practice, the comparison by this support function is done on the ladder sheet currently displayed on screen and the corresponding ladder instruction file stored on disc, so in any case it requires a ladder sheet currently displayed on screen.

The rest of this subsection explains how to compare the contents of registers used in ladder charts, by using two terms: the on-screen chart, which is a ladder sheet currently displayed on screen, and the on-disc chart, which is the corresponding ladder instruction file stored on disc.

Here, the user should note that registers comparable by this support function are those registers in which set values and other similar data are stored, and do not include work registers whose contents are cleared at power-off time. The table below shows the registers whose contents can be compared by this support function.

No.	Register name	Memory area name
1	K	Keep-relay
2	FW	Work register
3	DW	Data register
4	LML	Long-word work register
5	LG	Floating-point work register
6	LXW	Word work register
7	TS	T set value
8	US	U set value
9	CS	C set value
10	---	TUC set values (*)
11	ANC	Analog pulse counter

(\*) These are the T, U, and C set values displayed at a time in the result of a comparison.

Note: Some of the contents of registers compared may not be saved in the file, depending on the file save format used. For a description of the relationships between save formats and types of data saved in them, see “(4) Operational precautions.”

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### (1) Operation procedure

#### (a) Selecting an on-disc chart

Click [DIFF] - [Data] from the [Utility] menu. The [Data DIFF Setting] window will then appear. If, in this window, you enter the file name of the desired on-disc chart file and click the **DIFF** button, the [Data DIFF List] window will appear. If, in that same window, the **Cancel** button is clicked instead of the [DIFF], the [Data DIFF Setting] window will close without doing anything.

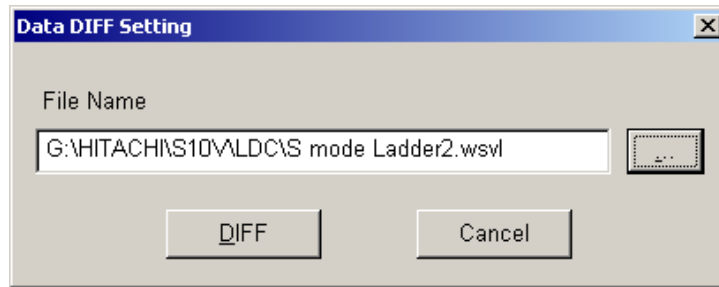


Figure 4-134 The [Data DIFF Setting] Window -- an Example

Further, if the **...** button near the right edge of the [Data DIFF Setting] window is clicked instead, the [Open] window as shown below will then appear.

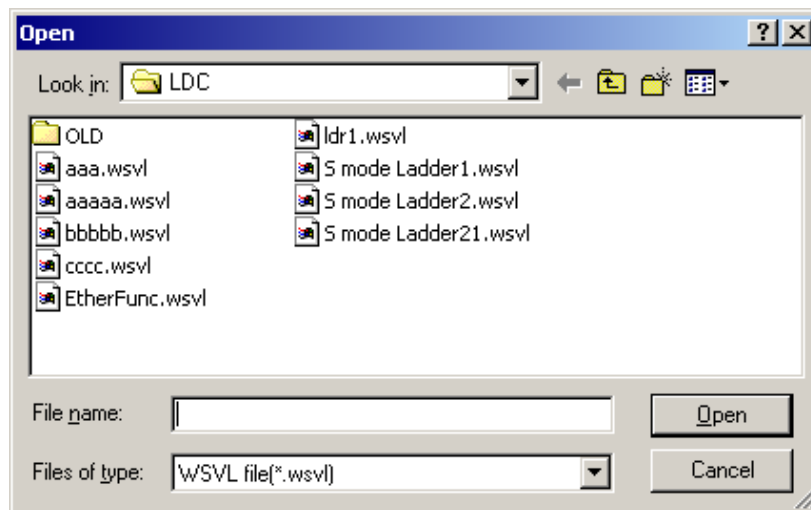


Figure 4-135 The [Open] Window -- an Example

In this window, choose the desired on-disc chart file and click the **Open** button. The selected on-disc chart file's file name will then appear in the [File Name] box of the [Data DIFF Setting] window.

(b) The [Data DIFF List] window

When you have clicked the  button in the [Data DIFF Setting] window, the [Data DIFF List] window is on screen, with the [Data DIFF Setting] window closed. The [Data DIFF List] window shows the presence or absence of differences for each memory area (register).

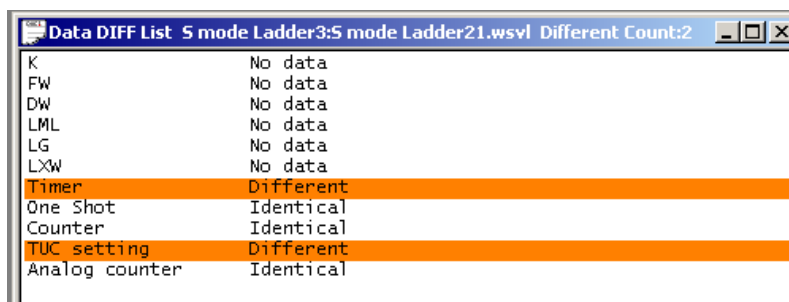


Figure 4-136 The [Data DIFF List] Window -- an Example

In this window:

- Window title

Shows the file names of the on-screen and on-disc chart files compared and a count of the number of memory areas with a [Different] content detected.

- Result of comparison

Shows the result of the comparison for each memory area by providing the following information:

No.	Result of comparison	Displayed string	Display color	Remarks
1	No difference detected	Identical	White	
2	A difference detected	Different	Red	
3	Data found only in the on-screen chart	Data only in on-screen chart (*1)	Red	(*2)
4	Data found only in the on-disc chart	Data only in on-disc chart (*1)	Red	(*2)
5	No comparison data found	No data	White	(*2)

(\*1) In this case, the data found only in the on-screen or on-disc chart is shown along with its file name.

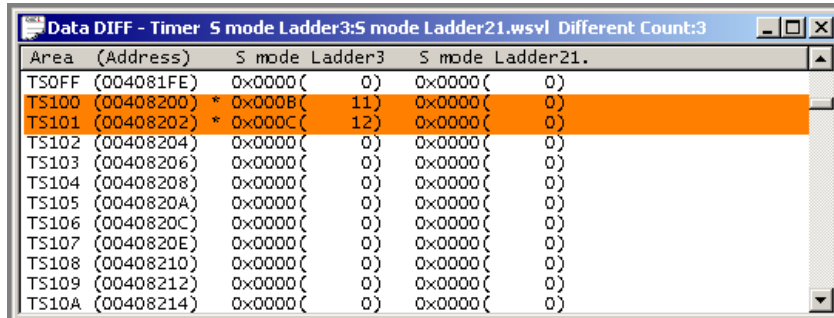
(\*2) This is a case where a given data piece is not saved in both the on-screen and on-disc charts or nothing is saved in the two. For a description of the relationships between save formats and types of data saved in them, see “(4) Operational precautions.”

If you want to exit the [Data DIFF List] window, click the  button in the upper right corner of that window.

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### (c) The [Data DIFF] window

If you double-click an area name in the [Data DIFF List] window, the [Data DIFF] window will appear. The [Data DIFF] window shows the presence or absence of differences for each data piece by shading in different colors.



Area	(Address)	S mode Ladder3	S mode Ladder21.
TS0FF	(004081FE)	0x0000( 0)	0x0000( 0)
TS100	(00408200) *	0x0008( 11)	0x0000( 0)
TS101	(00408202) *	0x000C( 12)	0x0000( 0)
TS102	(00408204)	0x0000( 0)	0x0000( 0)
TS103	(00408206)	0x0000( 0)	0x0000( 0)
TS104	(00408208)	0x0000( 0)	0x0000( 0)
TS105	(0040820A)	0x0000( 0)	0x0000( 0)
TS106	(0040820C)	0x0000( 0)	0x0000( 0)
TS107	(0040820E)	0x0000( 0)	0x0000( 0)
TS108	(00408210)	0x0000( 0)	0x0000( 0)
TS109	(00408212)	0x0000( 0)	0x0000( 0)
TS10A	(00408214)	0x0000( 0)	0x0000( 0)

Figure 4-137 The [Data DIFF] Window -- an Example

In this window:

- Window title

Shows the area name of the selected memory area, the file names of the on-screen and on-disc chart files compared, and a count of the number of non-matching data pieces in the two chart files.

- Column titles

Each identifies a type of information presented in the displayed result of the comparison. As shown, each data column has a file name displayed as part of its title, which is the file name of the on-screen or on-disc chart file compared. If the file name to be displayed is long, its trailing part may be cut off for displaying.

- Result of comparison

The result of the comparison is shown shaded in different colors for its details. The data pieces that are found different between the on-screen and on-disc charts are shown in red color along with an asterisk (“\*”) added to the beginning of their displayed address. For those registers in which no comparison data piece is found, a string of four asterisks (“\*\*\*\*”) is displayed in the data column.

If you want to exit the [Data DIFF] window, click the  button in the upper right corner of that window. If you double-click another area name in the [Data DIFF List] window instead of clicking that  button, the [Data DIFF] window currently displayed closes and the [Data DIFF] window for that other area name appears.

<Comparison result displays>

The result of a comparison is displayed in conformity with the data type of data contained in each memory area compared. This is exemplified below.

- An example of bit-type data (K) displayed

Area (Address)	S mode	L S mode
K000 (00210000)	0	0
K001 (00210002)	0	0
K002 (00210004)	0	0
K003 (00210006)	0	0
K004 (00210008)	0	0
K005 (0021000A)	0	0
K006 (0021000C)	0	0
K007 (0021000E)	0	0
K008 (00210010)	0	0

- An example of word-type data (FW, DW, LXW, TS, US, CS, ANC) displayed

Area (Address)	S mode	L S mode
DW000 (00470000)	* 0x1111 ( 4369)	0x0000 ( 0)
DW001 (00470002)	* 0x2222 ( 8738)	0x0000 ( 0)
DW002 (00470004)	0x0000 ( 0)	0x0000 ( 0)
DW003 (00470006)	0x0000 ( 0)	0x0000 ( 0)
DW004 (00470008)	0x0000 ( 0)	0x0000 ( 0)

- An example of long-type data (LMN) displayed

Area (Address)	S mode	L S mode
LML0000 (00490000)	* 0x00000064 ( 100)	0x00000000 ( 0)
LML0001 (00490004)	* 0x00000065 ( 101)	0x00000000 ( 0)
LML0002 (00490008)	0x00000000 ( 0)	0x00000000 ( 0)
LML0003 (0049000C)	0x00000000 ( 0)	0x00000000 ( 0)
LML0004 (00490010)	0x00000000 ( 0)	0x00000000 ( 0)

- An example of float-type data (LG) displayed

Area (Address)	S mode	L S mode
LG0000 (00498000)	* 0x5037E15D ( 1.234000e+010)	0x00000000 ( 0.000000e+000)
LG0001 (00498004)	* 0x53043384 ( 5.678000e+011)	0x00000000 ( 0.000000e+000)
LG0002 (00498008)	0x00000000 ( 0.000000e+000)	0x00000000 ( 0.000000e+000)
LG0003 (0049800C)	0x00000000 ( 0.000000e+000)	0x00000000 ( 0.000000e+000)
LG0004 (00498010)	0x00000000 ( 0.000000e+000)	0x00000000 ( 0.000000e+000)



(2) Displaying only differences

The result of a comparison of memory data is displayed in two different modes: only-differences display and all-inclusive display. Switching between these two modes can be accomplished by choosing [Display only differences] from the [Display] menu while the [Data DIFF] window is active on screen. Which display mode is currently used is indicated by the presence or absence of a check mark in the pull-down menu. The default display mode is “Display only differences”.

(a) Only-differences display mode (check mark present)

As exemplified below, the only-differences display mode displays only memory areas containing a different value (other than memory areas containing an identical value).

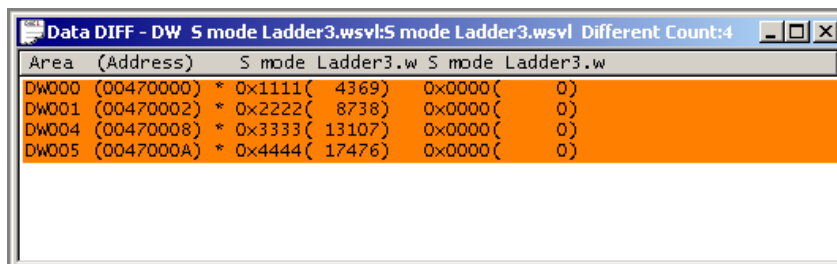


Figure 4-138 The [Data DIFF] Window -- an Example Showing Only Differences

(b) All-inclusive display mode (check mark absent)

As exemplified below, the all-inclusive mode displays all the details of the comparison result, including differences.

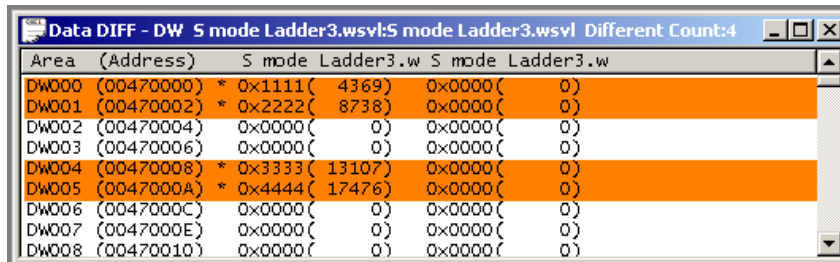


Figure 4-139 The [Data DIFF] Window -- an Example Showing All the Details Including Differences

(3) Printing the result of a comparison

To print the result of a comparison on the printer, choose [Print] from the [File] menu. If you want to check the details of the result on-screen before printing, choose [Print preview] from the [File] menu. Printing the result of a comparison can be accomplished only when the [Data DIFF List] window or [Data DIFF] window is active on-screen.

(4) Operational precautions

- This memory data comparison function cannot be used during editing of a ladder sheet. Before use, be sure to compile the ladder sheet.
- The types of data that can be saved in a ladder instruction file vary depending on the save format used. The table below shows the relationships between save formats and types of data saved in them.

No.	Save format	K	FW	DW	LML	LG	LXW	TS	US	CS	ANC
1	Sequence	–	–	–	–	–	–	√	√	√	√
2	Sequence + data	–	–	√	–	–	–	√	√	√	√
3	Sequence + fence	–	–	√	–	–	–	√	√	√	√
4	Sequence + work	–	√	√	√	√	√	√	√	√	√
5	All areas	√	√	√	√	√	√	√	√	√	√

√: Data saved for this combination

–: No data saved for this combination

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### 4.7.11 Using the MCS

The [Online MCS] dialog box allows you to read data from or write data to memory locations or PI/O registers by selection. As shown in the table below, the source of reading, the destination of writing, and the range of accessible addresses vary depending on the status of data communication currently prevailing.

Status of data communication	Source of reading / Destination of writing	Range of accessible addresses
Online (*1)	PCs' memory	/0000 0000 to /004F FFFE (/7FFF FFFE)
		/00C8 0000 to /00C8 3FFE (*2)
Offline	Personal computer's internal memory	/0010 0000 to /004F FFFE

(\*1) This state of data communication includes "only for online monitor" mode.

Note: In the above table, the address enclosed in parentheses is the last address that is accessible in the following case: the type of data communication used is Ethernet and the connecting module used is either CMU or ET.NET (model LQE720).

(\*2) This range of accessible addresses is accessible only when an HS.RI/O module is installed in place.

#### <Operating procedures>

##### (1) Displaying memory contents

- ① Click on the [Utility] menu in the ladder chart sheet and select [MCS].
- ② The [Online MCS] dialog box as shown in Figure 4-140 appears.

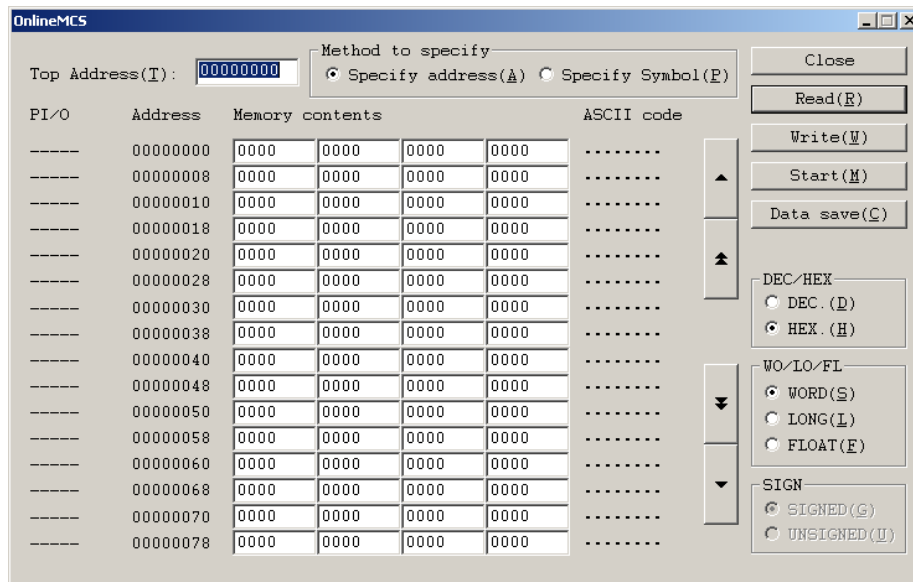


Figure 4-140 The [Online MCS] Dialog Box

- ③ Select one of the following methods of specifying the beginning of a memory area to be accessed for read:

“Specify address”: Selected when it needs to be specified with an address value.

“Specify Symbol”: Selected when it needs to be specified with a PI/O symbol (register name).

The default is “Specify address”.

- ④ Enter the desired address value or PI/O register name in the “Top Address” edit box and click the  button. Then, the data contents of 64 consecutive words will be read from the memory, starting from the specified address or PI/O register, and displayed in the dialog box. Clicking any of the scroll buttons will present you with the hidden content values.

If you want to change the display format of the displayed content values, choose the desired radio buttons in the following radio button lists:

■ [DEC/HEX] group box

“DEC.”: Displays the requested data contents in decimal format.

“HEX.”: Displays the requested data contents in hexadecimal format. (This is the default.)

This group box allows selection only when either “WORD” or “LONG” is selected in the [WO/LO/FL] group box.

■ [WO/LO/FL] group box

“WORD”: Displays the requested data contents in units of words (two bytes long each). (This is the default.)

“LONG”: Displays the requested data contents in units of long words (four bytes long each).

“FLOAT”: Displays the requested data contents in single-precision floating-point format.

■ [SIGN] group box

“SIGNED”: Displays the requested data contents in signed number format. (This is the default.)

“UNSIGNED”: Displays the requested data contents in unsigned number format.

This group box allows selection only when the following condition is met: either “WORD” or “LONG” is selected in the [WO/LO/FL] group box and “DEC.” is selected in the [DEC/HEX] group box.

### (2) Editing memory contents

- ① Specify in the “Top Address” box the desired starting address or PI/O register whose data content you want to change to another value, and then click the  button.
  - ② Specify the desired data format to which you want to change the contents of the specified starting address or PI/O register onwards. The specifiable data format is one of the following:
    - [DEC/HEX] group box
      - “DEC.”: Changes the contents to specified values in decimal format.
      - “HEX.”: Changes the contents to specified values in hexadecimal format.

This group box allows selection only when either “WORD” or “LONG” is selected in the [WO/LO/FL] group box.
    - [WO/LO/FL] group box
      - “WORD”: Changes the contents to specified values in units of words (two bytes long each). (This is the default.)
      - “LONG”: Changes the contents to specified values in units of long words (four bytes long each).
      - “FLOAT”: Changes the contents to specified values in single-precision floating-point format.
    - [SIGN] group box
      - “SIGNED”: Changes the contents to specified values in signed number format.
      - “UNSIGNED”: Changes the contents to specified values in unsigned number format.

This group box allows selection only when the following condition is met: either “WORD” or “LONG” is selected in the [WO/LO/FL] group box and “DEC.” is selected in the [DEC/HEX] group box.
  - ③ In the displayed memory contents, click the desired input box whose content you want to change, and enter a new value in the input box (focus position). At the end of the entry, press the  or  key. This action causes the content of the memory location indicated as the focus position to be rewritten with the entered new value either in the PCs’ memory (in online mode) or the personal computer’s internal memory (in offline mode). Here, you should note that, if you have used a means (such as the mouse or a shortcut key) other than the  and  keys, the indicated memory location will not be rewritten with the entered value.
- When you want to rewrite all of the displayed memory contents (a total of 128 bytes) with the entered values at one time, click the  button. However, clicking  causes the message dialog box shown in Figure 4-141 to appear if the status of data communication currently prevailing is online and the LPU module’s LADDER switch is set in RUN position.

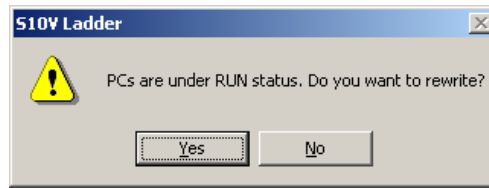


Figure 4-141 The Message Dialog Box Reporting a “PCs in RUN State” Condition

Clicking either of the  and  buttons in the above message dialog box produces one of the following effects:

Clicking  : Rewrites all the displayed memory contents with the entered values.

Clicking  : Does not rewrite them at all.

- In “only for online monitor” mode, neither the on-screen editing of displayed memory contents nor their rewriting is possible via the [Online MCS] dialog box.
- If TUC set values are rewritten with new values in online mode, the result will also be reflected in the TUC set-value backup area. For more information on the rewriting of TUC set values, see Subsection 4.3.8, “TUC set-value listing and editing.”

### (3) Displaying memory contents for monitoring purposes

This feature is not available when the status of data communication is offline (the  button is grayed out). Displaying is done at regular intervals of 50 ms, called the monitoring interval.

- ① Specify in the “Top Address” edit box the desired address or PI/O register whose data content you want to monitor, and then click the  button. Monitoring starts and the  button is replaced by the  button. During the monitoring, the displayed memory content will change dynamically.
- ② To stop the monitoring, click the  button. When the monitoring stops, the  button is replaced by the  button.

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### (4) Saving the displayed memory contents

You can save the displayed memory contents to a file in text format by performing the following procedure:

- ① Specify in the “Top Address” box the desired starting address or PI/O register whose data content you want to save, and then click the **Read** button. (This step may be skipped if the desired memory contents are already displayed.)
- ② Click the **Data save** button. The [Save As] dialog box as shown in Figure 4-142 appears.

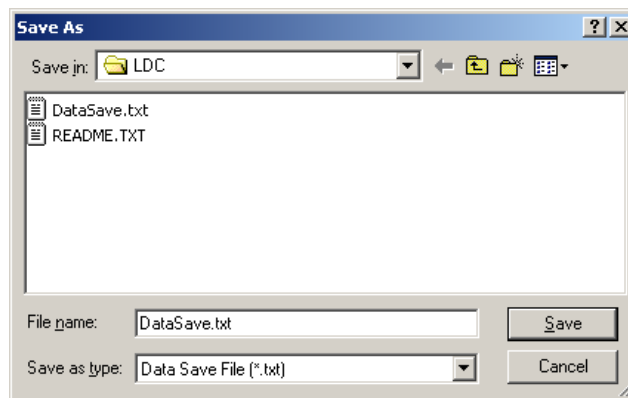


Figure 4-142 The [Save As] Dialog Box

- ③ Enter a unique file name in the “File name” box of the [Save As] dialog box. The default file name is ‘DataSave.txt’. If you want to use the default file name, skip this step.
- ④ Click the **Save** button in the [Save As] dialog box. The displayed memory contents will then be saved to the specified file in text format.  
If you need not save them, click the **Cancel** button instead of **Save**.

HEX, WORD, UNSIGNED	PI/O	address	Memory contents	ascii
	XW000	00414000	1234 5678 9ABC 0000	.4Vx...
	XW040	00414008	0000 0000 0000 0000	.....
	XW080	00414010	0000 0000 0000 0000	.....
			S	
	XW340	00414068	0000 0000 0000 0000	.....
	XW380	00414070	0000 0000 0000 0000	.....
	XW3C0	00414078	0000 0000 0000 0000	.....

Figure 4-143 The Displayed Memory Contents Saved Starting from XW000 -- an Example

4.8 Ladder Sheet Window Functions

The ladder sheet window functions are contained in the [Window] pull-down menu, as shown below.

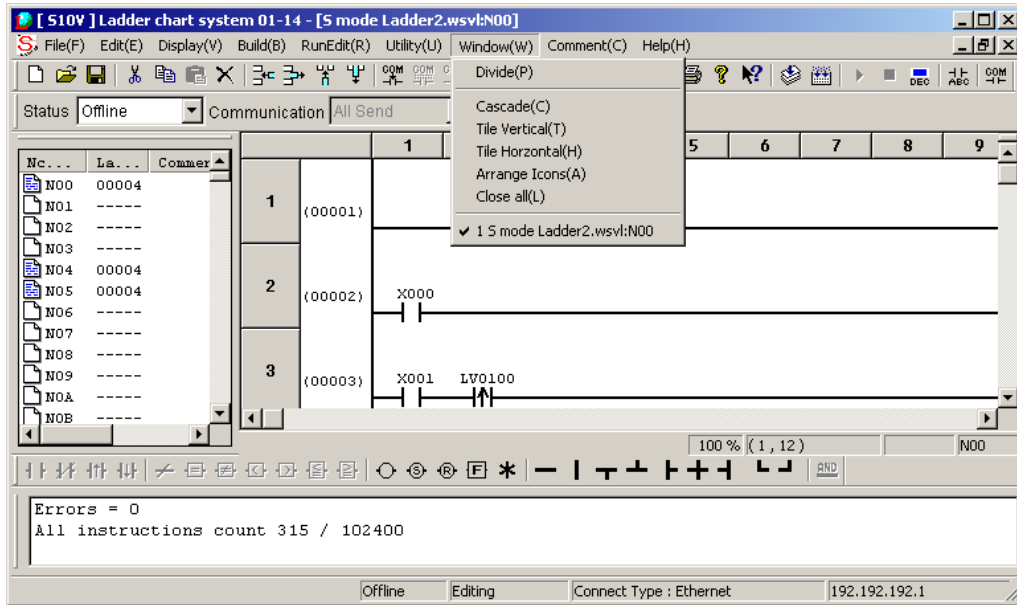


Figure 4-144 Selecting the [Window] Option

The window functions provided in the [Window] menu are listed below along with their descriptions.

Table 4-18 [Window] Menu Options

No.	Level 1	Level 2	Level 3	Description
1	Window	Divide		Splits a given window into smaller windows.
2		Cascade		Cascades more than one currently open N coil window.
3		Tile Vertical		Tiles more than one currently open N coil window vertically.
4		Tile Horizontal		Tiles more than one currently open N coil window horizontally.
5		Arrange Icons		Arranges a given set of icons.
6		Close all		Closes all currently open N coil windows.
7		Window lists 1,2,3,4,...		Displays a list of all currently open windows.

The [Window lists 1,2,3,4,...] option displays a list of all currently open windows in the order of from foremost to backmost on the screen.



4.9 Ladder Sheet Comment Functions

The ladder sheet comment functions are contained in the [Comment] pull-down menu, as shown below.

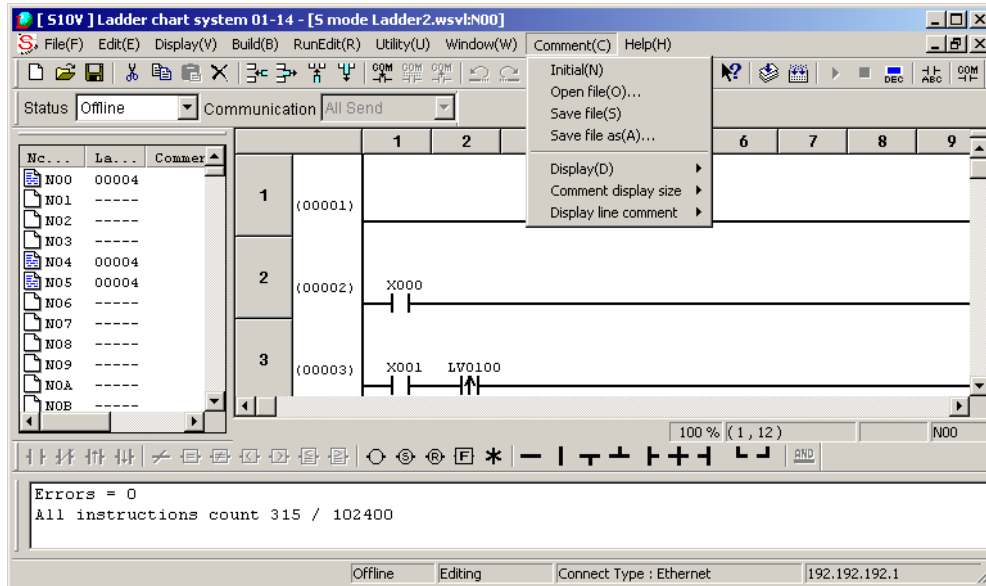


Figure 4-145 Selecting the [Comment] Option

The comment functions provided in the [Comment] menu are listed below along with their descriptions.

Table 4-19 [Comment] Menu Options

No.	Level 1	Level 2	Level 3	Description
1	Comment	Initial		Sets all existing comment information to its initial condition.
2		Open file		Opens existing comment files.
3		Save file		Saves the comment file you are working on.
4		Save file as		Saves the comment file you are working on with a specified file name.
5		Display	Nothing	Switches the comment display mode to no-display (Nothing).
6			Display	Switches the comment display mode to display (Display).
7		Comment display size	Usually (16 characters)	Switches the comment display size to the standard size (16 characters).
8			Usually (32 characters)	Switches the comment display size to the standard size (32 characters).
9			Smallness (32 characters)	Switches the comment display size to the small size (32 characters).
10		Display line comment	No display	Hides all the comments currently displayed.
11			Display	Display all existing line comments.

(1) “Initial” function

The “Initial” function initializes (clears) all comment information attached to each register in the currently open ladder program file.

(2) “Open file” function

The “Open file” function reads already edited comment files (having the file names with extension “.cmt”), and automatically assigns comments to the registers in the currently open ladder program file.

You can use a commercially available general-purpose text editor to edit a comment file, which is a text-format file.

A comment is described on one line. The comment must be separated from the register name by two space characters. When character “#” is entered in the first column of a line in the comment file, the comment line is ignored. The following shows the comment file format:

[Comment file format]

○○○○\_□□□□□□□□□□□□□□□□

○○○○: Register name

\_ : Two space characters

□□ … □: Comment assigned to a specified register. Table 4-20 lists the maximum number of comment characters. If the maximum number of comment characters is exceeded, a message (shown in Figure 4-146) appears in the output window, and the excess part of the string exceeding the maximum number of characters is not read.

(Example) Assigning a comment on starting motor A to register X0000

X000 A-Motor Start

Table 4-20 Maximum Number of Comment Characters

	Single-byte characters only	Double-byte characters only	Mixed single- and double-byte chars.
Maximum number of chars.	32	16	32 (*)

(\*) Each double-byte character should be counted as two bytes.

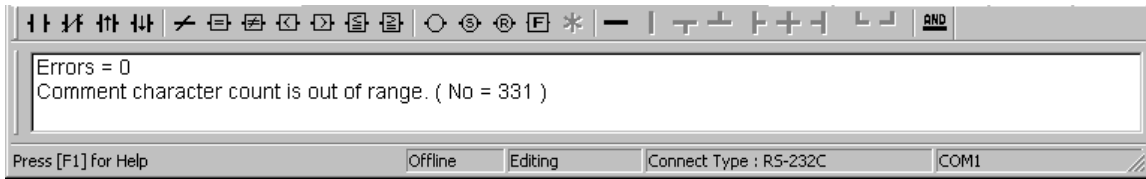


Figure 4-146 Output Window Message Displayed When Exceeding Maximum Number of Comment Characters

<Notes>

- Enter the register name in the first and subsequent columns. Note that a register name entered beginning in the second column will not be read correctly.
- Separate the register name and comment by two space characters.

(3) “Save file” function

The “Save file” function saves the currently open comment file by overwriting the original comment file. After changing the comment on a register described in the ladder program file you are editing, you can use the “Save file” function to reflect the change in the corresponding comment file.

(4) “Save file as” function

The “Save file as” function is used to save the comment attached to a register in a ladder program as a new comment file.

(5) “Display” function

The “Display” function of the [Comment] menu switches the comment display mode between show (Display) and hide (Nothing). An icon on the tool bar can also be used to select whether to display or hide comments.

(a) Displaying comments

<Operation>

● Operation using a menu in the main window

- ① From the [Comment] menu, click [Display] - [Display].
- ② The comments attached to the registers in the ladder sheet circuit diagram are displayed (see Figure 4-147).

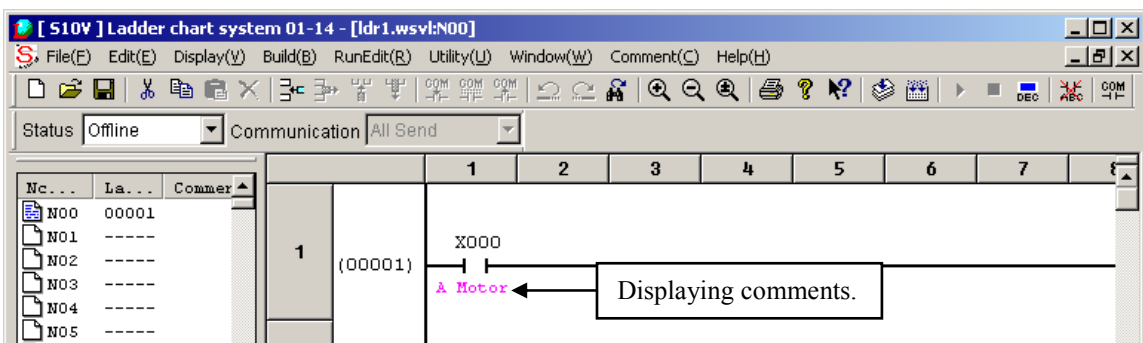


Figure 4-147 Displaying Comments in Ladder Circuit

● Operation using the tool bar

- ① Click the [I/O comment display] icon on the tool bar (see Figure 4-148).
- ② The comments attached to the registers in the ladder sheet circuit diagram are displayed (see Figure 4-147).

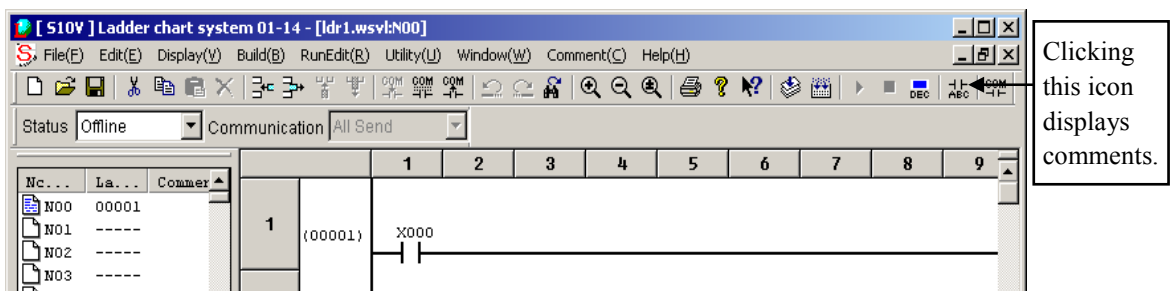


Figure 4-148 Displaying Comments via the Tool Bar

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### (b) Hiding comments

<Operation>

- Operation using a menu in the main window

- ① From the [Comment] menu, click [Display] - [Nothing].
- ② The comments attached to the registers in the ladder sheet circuit diagram are hidden (see Figure 4-149).

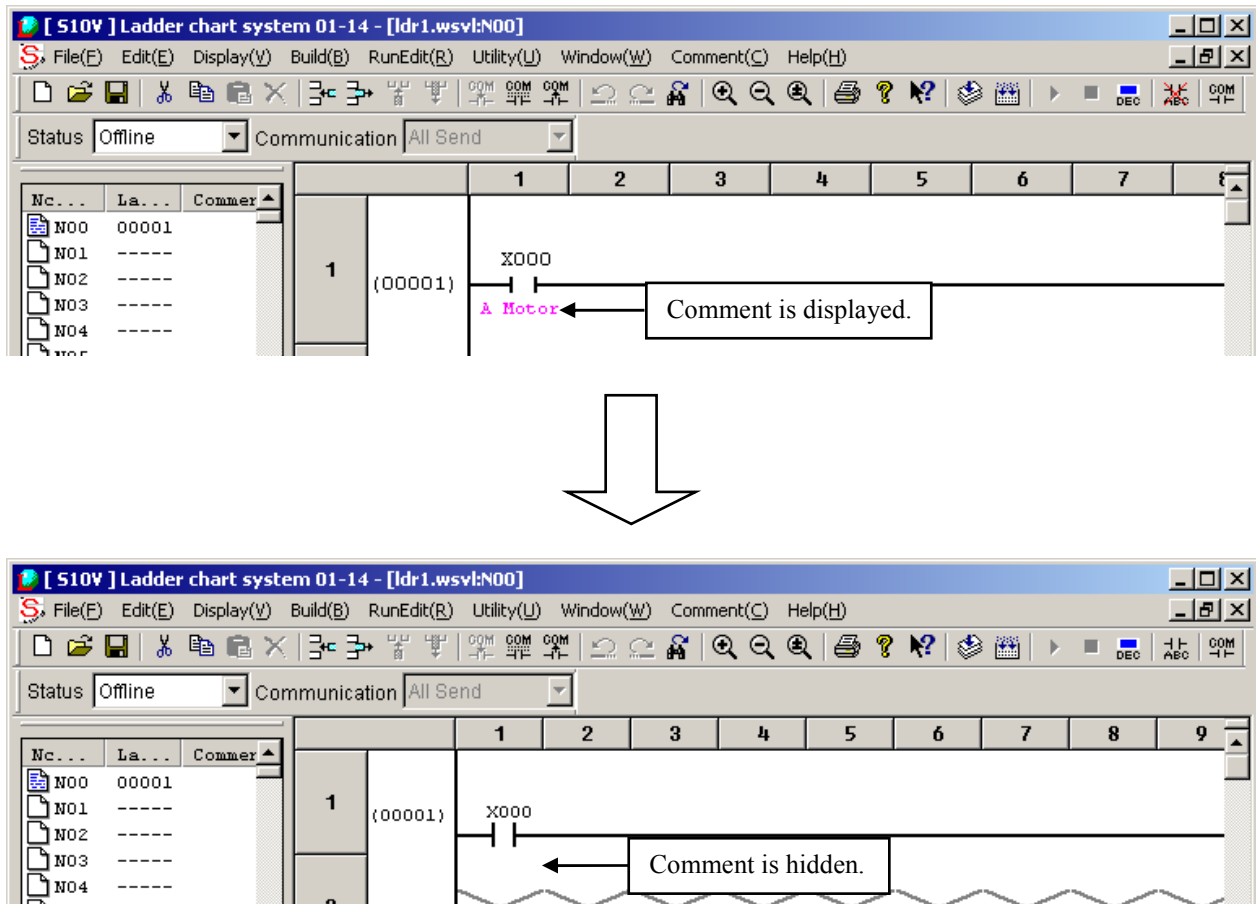


Figure 4-149 Hiding Comments in Ladder Circuit

● Operation using the tool bar

- ① Click the [Suppose un-displaying I/O comment] icon on the tool bar (see Figure 4-150).

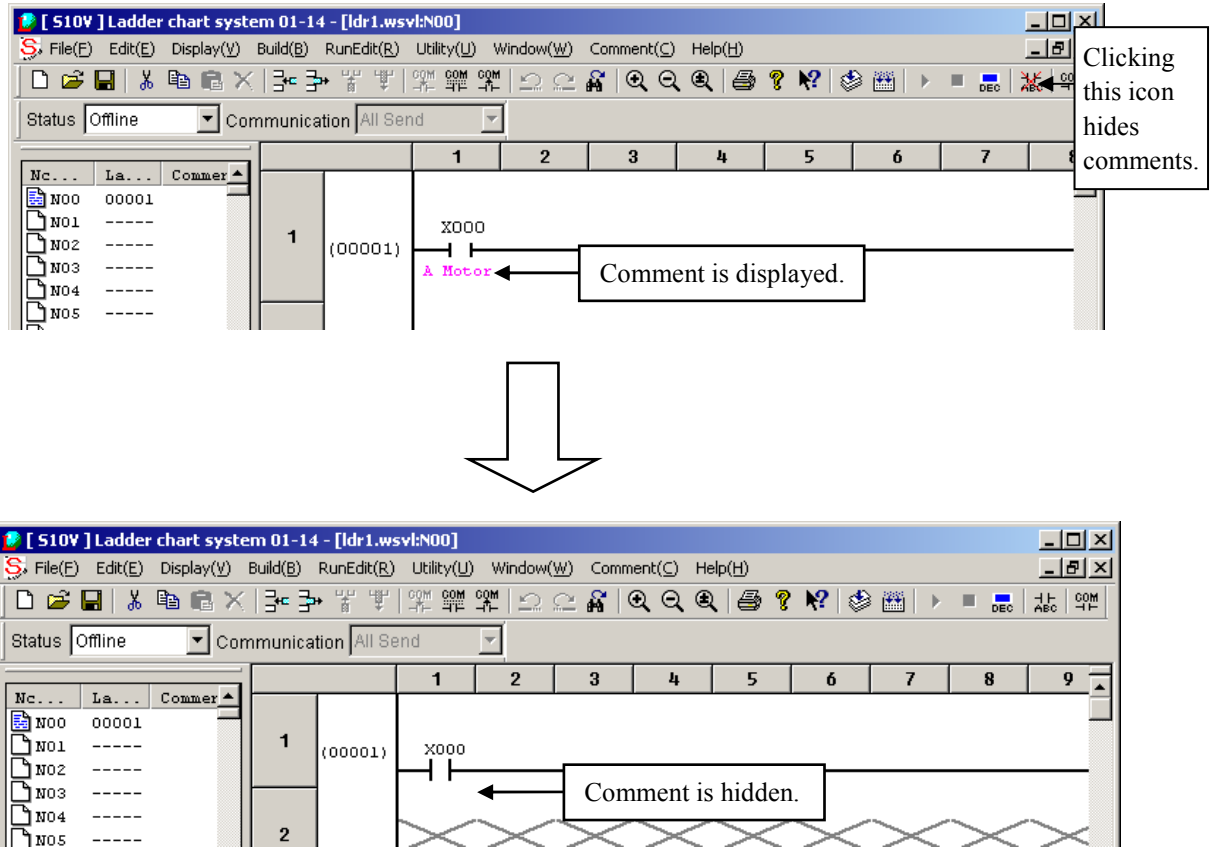


Figure 4-150 Hiding Comments in Ladder Circuit via the Tool Bar

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### (6) “Comment display size” function

The “Comment display size” function switches the size of characters in displayed comments. There are three kinds of character sizes: “Usually (16 characters),” “Usually (32 characters),” and “Smallness (32 characters).” You can switch the character size by selecting the “Comment display size” function from the [Comment] menu in the main window (see Figure 4-151). The default size is “Usually (16 characters).”

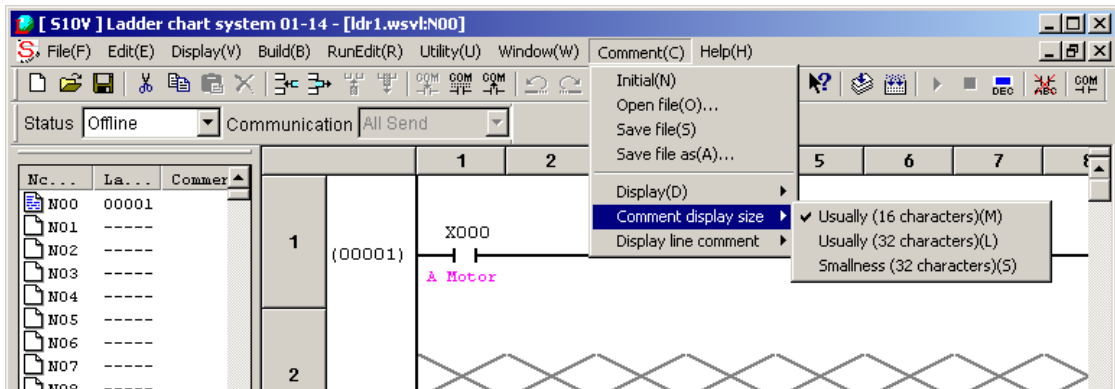


Figure 4-151 Switching the Comment Character Size

**Usually (16 characters):** Displays characters in the font size specified in the [Setup environment] window, which is a ladder sheet utility function. When there is no word break, up to 8 characters by 2 lines can be displayed (although the maximum number of comment characters is 16).

The cell size is smaller than that of the display size “Usually (32 characters).”

**Usually (32 characters):** Displays characters in the font size specified in the [Setup environment] window, which is a ladder sheet utility function. When there is no word break, up to 8 characters by 4 lines can be displayed.

The cell size is larger than that of the display sizes “Smallness (32 characters)” and “Usually (16 characters).”

**Smallness (32 characters):** Displays characters of a size about 70% of the font size specified in the [Setup environment] window, which is a ladder sheet utility function.

When there is no word break, up to 11 characters by 3 lines can be displayed (although the maximum number of comment characters is 32).

The cell size is smaller than that of the display size “Usually (32 characters).”

## (7) Fonts

You can switch the display font for ladder circuits through settings made in the [Setup environment] window, which is a ladder sheet utility function. However, be sure to use the default setting of font (\*). The default setting of font remains effective unless you change the font setting in the [Setup environment] window. To revert to the default setting, click the **Set a default font** button on the “Edit” tab in the [Setup environment] window (see Figure 4-152).

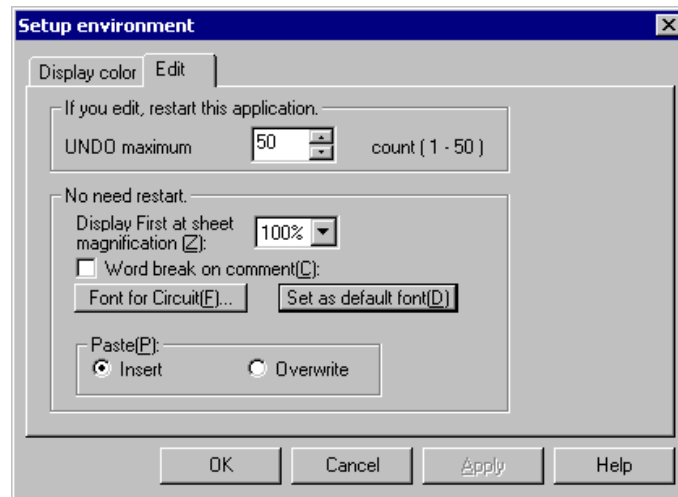


Figure 4-152 [Setup environment] Window

(\*)

Version of OS

Font name: Arial

Size: 9 points



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# APPENDIXES

APPENDIX A SYSTEM FUNCTIONS

This appendix lists all available system functions. For details on these functions, refer to the “SOFTWARE MANUAL PROGRAMMING S10V LADDER CHART For Windows® (manual number SVE-3-121).”

Table A-1 System Functions (1/4)

Classification	Function	Input format	Functional outline
Arithmetic instructions	ADD	ADD S + D → R	Adds the values of S and D together and assigns the result to R.
	SUB	SUB S - D → R	Subtracts the value of D from S and assigns the result to R.
	INC	INC S	Adds one to the value of S and assigns the result to S.
	DEC	DEC S	Subtracts one from the value of S and assigns the result to S.
	MUL	MUL S × D → R	Multiplies the values of S and D together and assigns the result to R.
	DIV	DIV S / D → R	Divides the value of S by that of D and assigns the quotient to R.
	MOD	MOD S % D → R	Divides the value of S by that of D and assigns the remainder to R.
	SCL	SCL S : D1 : D2 → R	Multiplies the values of S and D1 together, divides the result by D2, and assigns the quotient to R.
Logical instructions	AND	AND S : D → R	ANDs the values of S and D together and assigns the result to R.
	OR	OR S : D → R	ORs the values of S and D together and assigns the result to R.
	EOR	EOR S : D → R	EORs the values of S and D together and assigns the result to R.
	NOT	NOT S → R	Logically negates the value of S and assigns the result to R.
Comparison instructions	EQU	EQU S : D → R	If the value of S is equal to that of D, assigns the value 1 to R. If not, assigns the value 0 to R.
	NEQ	NEQ S : D → R	If the value of S is not equal to that of D, assigns the value 1 to R. If they are equal, assigns the value 0 to R.
	GT	GT S : D → R	If S > D, assigns the value 1 to R. If S ≤ D, assigns the value 0 to R.
	LT	LT S : D → R	If S < D, assigns the value 1 to R. If S ≥ D, assigns the value 0 to R.
	GE	GE S : D → R	If S ≥ D, assigns the value 1 to R. If S < D, assigns the value 0 to R.
	LE	LE S : D → R	If S ≤ D, assigns the value 1 to R. If S > D, assigns the value 0 to R.
	TST	TST S	Tests S to determine which one of the three conditions P (positive), N (negative), or Z (zero) it meets and sets its associated flag (P, N, or Z).

The symbols “S” (source) and “D” (destination) above denote a register or a constant -- some functions do not allow specification of constants. The symbol “R” (result) denotes a register.

Table A-1 System Functions (2/4)

Classification	Function	Input format	Functional outline
Transfer instructions	MOV	MOV S → R	Moves the value of S to R.
	MOM	MOM S : N → R	Moves as many values as N steps to R, starting from S.
	INI	INI S : N → R	Initializes as many locations as N steps with the value of S, starting from R.
	EXC	EXC S : D	Exchanges the values of S and D.
	PSH	PSH S → D	Pushes the value of S to FIFO table D.
	POP	POP S → D	Pops a value out of FIFO table S and assign the value to D.
	AST	AST S → R	Assigns the address of S to R.
	SCH	SCH S : D : N → R	Searches a sequence of as many locations as N steps for the value of S, starting from address D, and stores the result in R.
	PSHO	PSHO S → D	Pushes the S data to FIFO table D. [Dedicated to S10/2α and S10mini- compatible FIFO]
	POPO	POPO S → D	Pops data from FIFO table S and inserts it into D. [Dedicated to S10/2α and S10mini- compatible FIFO]
Conversion instructions	BTF	BTF S → R	Converts the value of S in binary to floating-point format and assigns the result to R.
	FTB	FTB S → R	Converts the value of S in floating-point format to binary and assigns the result to R.
	BTD	BTD S → R	Converts the value of S in binary to BCD format and assigns the result to R.
	DTB	DTB S → R	Converts the value of S in BCD format to binary and assigns the result to R.
	SEG	SEG S → R	Converts the value of S in binary to 7-segment format and assigns the result to R.
	ASP	ASP S → R	Converts the value of S in binary to ASCII format and assigns the result to R in pack mode.
	ASU	ASU S → R	Converts the value of S in binary to ASCII format and assigns the result to R in unpack mode.
	APB	APB S → R	Converts the value of S in packed ASCII format to binary and assigns the result to R.
	AUB	AUB S → R	Converts the value of S in unpacked ASCII format to binary and assigns the result to R.
	STD	STD S → R	Converts the word-value of S to long-word format and assigns the result to R.
	DTS	DTS S → R	Converts the long-word value of S to word format and assigns the result to R.
	ABS	ABS S → R	Finds an absolute value from the value of S and assigns the result to R.
	NEG	NEG S → R	Makes the value of S negative and assigns the result to R.
	DCD	DCD S → R	Decodes the value of S and assigns the result to R.
	ECD	ECD S → R	Encodes the value of S and assigns the result to R.

The symbols “S” (source) and “D” (destination) above denote a register or a constant -- some functions do not allow specification of constants. The symbol “R” (result) denotes a register.

Table A-1 System Functions (3/4)

Classification	Function	Input format	Functional outline
Shift instructions	LSR	LSR S : N → R	Logically shifts the content of S by N bits to the right and assigns the result to R.
	LSL	LSL S : N → R	Logically shifts the content of S by N bits to the left and assigns the result to R.
	ASR	ASR S : N → R	Arithmetically shifts the content of S by N bits to the right and assigns the result to R.
	ASL	ASL S : N → R	Arithmetically shifts the content of S by N bits to the left and assigns the result to R.
Rotation instructions	ROR	ROR S : N → R	Rotates the content of S by N bits to the right and assigns the result to R.
	ROL	ROL S : N → R	Rotates the content of S by N bits to the left and assigns the result to R.
Function processing instructions	LIM	LIM S : D1 : D2 → R	Compares the value of S with boundary values D1 (upper) and D2 (lower) and assigns the result (one of the D1 [if D1 < S], D2 [if D2 > S], and S [if D2 ≤ S ≤ D1] values) to R.
	BND	BND S : D1 : D2 → R	Compares the value of S with boundary values D1 and D2 and, if the value is within the limits, assigns the value 0 to R.
	ZON	ZON S : D1 : D2 → R	Adds one of bias values D1 (if S > 0) or D2 (if S < 0) to the value of S and assigns the result to R. Alternatively, assigns the value 0 (if S = 0) to R.
	SQR	SQR S → R	Finds a square root for the value of S and assigns the result to R.
	SIN	SIN S → R	Converts the value (angle) of S to a sine value and assigns the result to R.
	COS	COS S → R	Converts the value (angle) of S to a cosine value and assigns the result to R.
	TAN	TAN S → R	Converts the value (angle) of S to a tangent value and assigns the result to R.
	ASIN	ASIN S → R	Converts the value (angle) of S to an arcsine value and assigns the result to R.
	ACOS	ACOS S → R	Converts the value (angle) of S to an arccosine value and assigns the result to R.
	ATAN	ATAN S → R	Converts the value (angle) of S to an arctangent value and assigns the result to R.
	EXP	EXP S → R	Calculates the exponential number raised to the power of the value of S and assigns the result to R.
	LOG	LOG S → R	Calculates the natural logarithm of the value of S and assigns the result to R.
	MAX	MAX S : D → R	Compares the values of S and D and assigns whichever value is larger to R.
MIN	MIN S : D → R	Compares the values of S and D and assigns whichever value is smaller to R.	

The symbols “S” (source) and “D” (destination) above denote a register or a constant -- some functions do not allow specification of constants. The symbol “R” (result) denotes a register.

Table A-1 System Functions (4/4)

Classification	Function	Input format	Functional outline
Special instructions	XCLR	XCLR	Clears the X register area.
	YCLR	YCLR	Clears the Y register area.
	GCLR	GCLR	Clears the G register area.
	RCLR	RCLR	Clears the R register area.
	KCLR	KCLR	Clears the K register area.
	TCLR	TCLR	Clears the T register area.
	UCLR	UCLR	Clears the U register area.
	CCLR	CCLR	Clears the C register area.
	VCLR	VCLR	Clears the V register area.
	ECLR	ECLR	Clears the E register area.
FCLR	FCLR	Clears operation result flags.	
Jump instructions	JT	JT label	If a given condition is true, jumps to a specified label.
	JMP	JMP label	Unconditionally jumps to a specified label.
	JSE	JSE	If a given condition is true, jumps to the end of the sequence.

The symbols “S” (source) and “D” (destination) above denote a register or a constant -- some functions do not allow specification of constants. The symbol “R” (result) denotes a register.

APPENDIX B SYSTEM EXTENSION FUNCTIONS

This appendix lists all available system extension functions. For details on these functions, refer to the hardware manuals on the related optional modules. You should note that the system extension functions do not allow the use of indices and indirect registers as their parameters.

Table B-1 System Extension Functions

Optional module	Function	Input format	Functional outline
J.NET (J.NET-INT)	JCMD	JCMD S:N	Service request function
	JRSP	JRSP S:N	Service confirmation function
	JSND	JSND S:N	Data transmission function
	JRCV	JRCV S:N	Data reception function
RS-232C	SD0	SD0 S:N	Transmission function (for use with channel No. 0)
	SD1	SD1 S:N	Transmission function (for use with channel No. 1)
	SD2	SD2 S:N	Transmission function (for use with channel No. 2)
	SD3	SD3 S:N	Transmission function (for use with channel No. 3)
	RV0	RV0 S:N	Reception function (for use with channel No. 0)
	RV1	RV1 S:N	Reception function (for use with channel No. 1)
	RV2	RV2 S:N	Reception function (for use with channel No. 2)
	RV3	RV3 S:N	Reception function (for use with channel No. 3)
FL.NET	FLCM	FLCM S	Message request function (in main module)
	FLCS	FLCS S	Message request function (in submodule)
(*1)	SAT	SAT 0	NX initialization function
	ACP	ACP M (*2)	NX data transmission function
	SATO	SATO 0	Initialization arithmetic function of NX [old NX/Ladder specification] (*4)
	ACPO	ACPO M (*2)	Data transmission arithmetic function of NX [old NX/Ladder specification] (*4)
(*3)	TOP	TOP S (N)	TCP connection open (Client)
	TPOP	TPOP S (N)	TCP connection open (Server)
	TCLO	TCLO S (N)	TCP connection close
	TRCV	TRCV S (N)	TCP receive
	TSND	TSND S (N)	TCP send
	UOP	UOP S (N)	UDP open
	UCLO	UCLO S (N)	UDP close
	URCV	URCV S (N)	UDP receive
	USND	USND S (N)	UDP send

The symbol “S” denotes a word-type register, “N” denotes an immediate value in the range 0x0000 to 0xFFFF, and “M” denotes an immediate value in the range 100001 to 25559999.

(\*1) SAT and ACP are NX's functions and require no dedicated optional modules.

For details on the NX instructions, refer to Section 2.5, "System Extension Arithmetic Functions" in the "SOFTWARE MANUAL OPERATION NX/Tools-S10V For Windows® (manual number SVE-3-137)." You can install the arithmetic functions by transferring the system program referring to Subsection 4.4.1, "Cases where the system program has not been transferred yet" in the "SOFTWARE MANUAL OPERATION NX/Tools-S10V For Windows® (manual number SVE-3-137)."

(\*2) For information on immediate values that can be set as parameters of the ACP function, refer to the "SOFTWARE MANUAL OPERATION NX/Tools-S10V For Windows® (manual number SVE-3-137)."

(\*3) These are the system extension functions of Ethernet communication instructions.

Either the word-type resistor (S) or the displayed value (N) is available. For details of Ethernet communication instructions, refer to the "SOFTWARE MANUAL PROGRAMMING S10V LADDER CHART For Windows® (manual number SVE-3-121)." For details on installing Ethernet communication arithmetic functions, refer to Item (2), "Setting Ethernet communication parameters" in Subsection 2.7.2, "Usage" in the "SOFTWARE MANUAL PROGRAMMING S10V LADDER CHART For Windows® (manual number SVE-3-121)."

(\*4) Specifications for NX/Ladder-S10 whose Ver.-Rev. is earlier than 02-00.



## APPENDIX C F/D FUNCTION'S NEW OPERATION ON PCS NUMBERS (VER-REV 01-26 OR LATER ONLY)

In S10V ladder chart systems of Ver-Rev 01-26 or later, the F/D function's operation on PCs numbers, or the ID numbers of programmable controllers, is revised as described below.

### 1. F/D function's operation in S10V ladder chart system, Ver-Rev 01-25 or earlier (before the revision)

In S10V ladder chart systems of Ver-Rev 01-25 or earlier, if the PCs number in a ladder program file under overwrite-saving does not match the PCs number of an S10V controller whose ladder program is being overwrite-saved to that file, the following is the case: the F/D function will correct only the PCs number in the ladder program file's data section to the same PCs number as that of the S10V controller under overwrite-saving, but it will not correct the PCs number in that file's header section. For this reason, after the rewriting, if you send the overwrite-saved file to the original S10V controller (destination) that is receiving that file, the receiving S10V controller's PCs number will be automatically changed to the same PCs number as that in its header section without any warning.

## &lt;Example&gt;

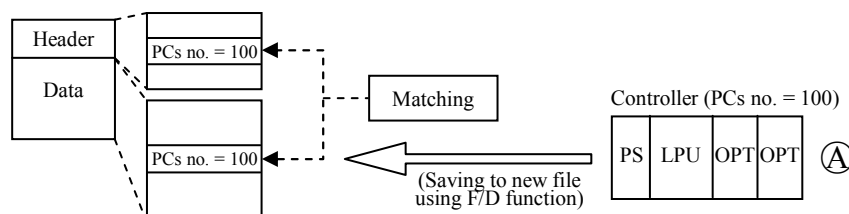
Assume that there are two S10V controllers, named ① and ②, in a user application system, as shown below. In this system, if the user saves the ladder program used on controller ① to a new file by using the F/D function, the same PCs number (= 100) will be written to both the header section and data section of that file (①). Then, if the user overwrite-saves the ladder program from controller ② with a different PCs number (= 200) (than the PCs number [= 100] displayed on-screen [\*1]) to that ladder program file, the resulting ladder program file will have the PCs number in its data section updated with the PCs number of controller ②, resulting in a difference in PCs number between the header section (= 100) and the data section (= 200) (②). After the overwrite-saving, if the user sends the ladder program file to controller ① by using the F/D function's send command (\*2), the PCs number (= 100) of destination controller ① will be automatically changed to the same PCs number as that (= 200) of controller ② in the ladder program file without any warning.

(\*1) The PCs number displayed on-screen is the PCs number from the header section of the saved ladder program file (①).

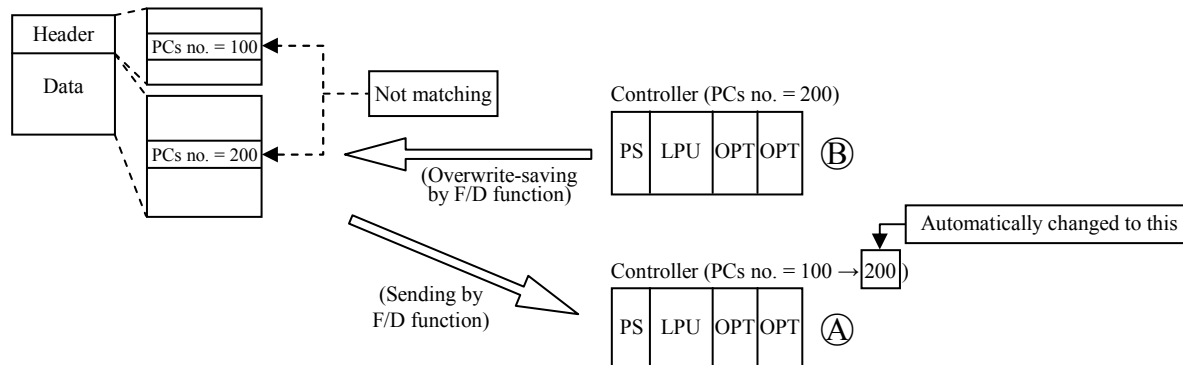
(\*2) The F/D function's send command can perform sending only to the S10V controller that has the same PCs number as that in the header section of the file to be sent.

[Ladder program file]

① Before overwrite-saving by F/D function



② After overwrite-saving by F/D function



2. F/D function's operation in S10V ladder chart system, Ver-Rev 01-26 or later (after the revision)

2.1 Overwrite-Saving by F/D Function

In S10V ladder chart systems of Ver-Rev 01-26 or later, if the PCs number in the header section of a ladder program file under overwrite-saving is different from the PCs number of an S10V controller whose ladder program is being overwrite-saved to that file, the following is the case: the F/D function will correct both of the PCs numbers in the ladder program file's header section and data section to the same PCs number as that of the S10V controller under overwrite-saving.

<Example>

Assume that, during overwrite-saving by the F/D function, the PCs number in the header section of a ladder program file under overwrite-saving is found different from the PCs number of an S10V controller whose ladder program is being overwrite-saved to that file. Then, the F/D function will display a warning message as shown in Figure C-1, except when the PCs number in that file's header section is "9999".

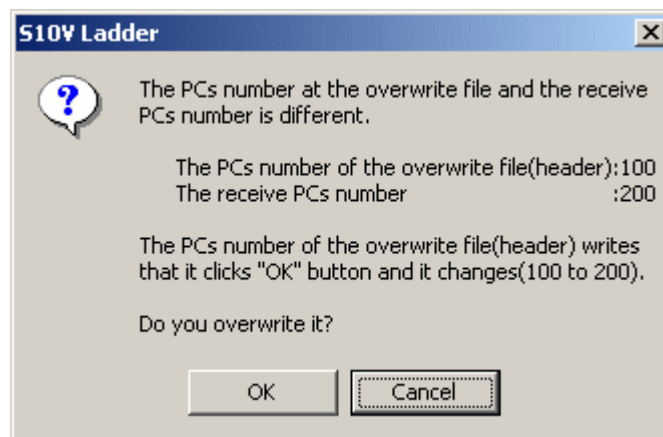
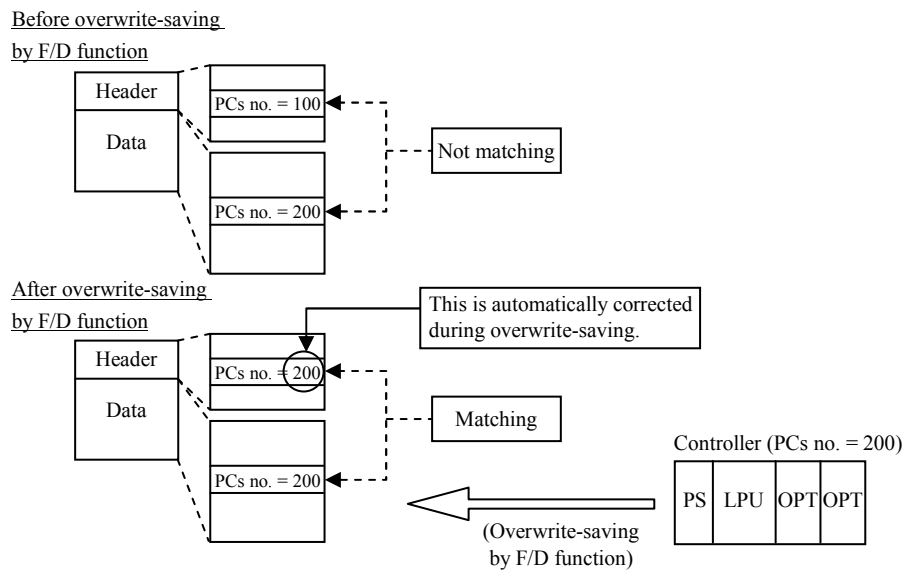


Figure C-1 A Warning Message Dialog Box Displayed during Overwrite-Saving by F/D Function

Clicking the  button in the dialog box as shown above will force the F/D function to correct the PCs number in the ladder program file's header section to the same PCs number as that of the S10V controller under overwrite-saving.

If the  button is clicked instead of [OK] in the dialog box, the F/D function will abort the requested overwrite-saving.



## 2.2 Sending by the F/D Function

In sending, the F/D function will display a warning message as shown in Figure C-2 if the PCs number in the data section of the file under sending is different from that of the destination S10V controller to which the file is being sent. Such message displaying is done so as not to automatically change the non-matching PCs number of the destination without any warning.

<Example>

Assume that an attempt is made to send a file to the destination S10V controller and that the PCs number in the data section of that file is found different from the PCs number of the destination. Then, a warning message as shown in Figure C-2 will be displayed.

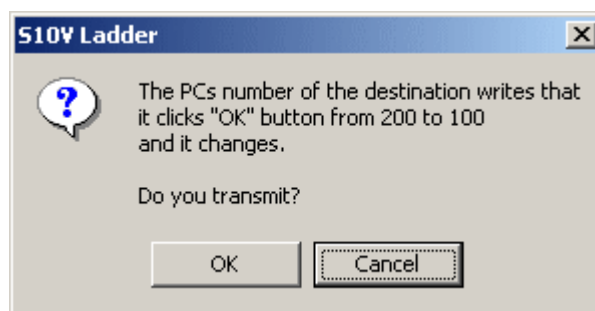


Figure C-2 A Warning Message Dialog Box Displayed during Sending by F/D Function

Clicking the  button in the dialog box as shown above will force the F/D function to send the file to the destination as usual and, at the same time, change the PCs number of the destination to the same PCs number as that in the file's data section.

If the  button is clicked instead of [OK] in the dialog box, the F/D function will abort the requested sending.

If the PCs number in the header section of the file under sending is found different from the PCs number of the destination, an error message to that effect will be displayed. In this case, no sending will be performed by the F/D function (this is the case with every available Ver-Rev of the S10V ladder chart system).

## APPENDIX D HOW TO USE THE S10V DUPLICATED INDEX REGISTER SEARCH TOOL

This appendix provides information on S10V Duplicated Index Register Search Tool (model S-7895-CK), Ver-Rev 01-00 and on how to use it.

### 1. Background and Purpose of the Tool

In S10V ladder chart systems (model S-7895-02) of Ver-Rev 01-23 or earlier, when a ladder program is built (by using one of the choices: all N coil compile, N coil compile, or run-time editing), the following is often the case: some index registers of contacts (e.g., A-, B-, and edge contacts) used with indexing are automatically duplicated erroneously at another such contact used with no indexing in the same program line in which the original index register is used. This common problem with Ver-Rev 01-23 or earlier has been solved in S10V ladder chart systems of Ver-Rev 01-24 or later. However, such a problem will not be automatically corrected even if the ladder program causing it is re-compiled using an S10V ladder chart system of Ver-Rev 01-24 or later. The purpose of the S10V Duplicated Index Register Search Tool (hereinafter simply called the ladder check tool) is to find out erroneous duplications of index registers in possibly flawed ladder programs.

The ladder check tool should be used by those users who use contacts along with index registers in a ladder program built by an S10V ladder chart system of Ver-Rev 01-23 or earlier. The tool performs the following two things: 1) it searches every program line for more than one contact used with the same index register, and 2) it displays the result of search indicating the locations of those contacts, including the index register(s) erroneously duplicated by the compilation. By referring to the displayed result, the user should check if each reported index register is an erroneously duplicated one or not.

### 2. Limitations

- The ladder check tool does not support files with the “.vcm” file extension. To check VCM files, take the following steps: 1) convert the VCM file into WSVL format and 2) check the resulting WSVL file with the tool.
- Any N coil just drug-copied in the N coil window is placed in an editing state and is not checkable by the tool. To check the file with the tool, close the file and then open it again.

### 3. Installing the Tool

First, check if the operating system you are using on your PC is Microsoft® Windows® XP or Microsoft® Windows® 2000, and also check if the S10V Base System (model S-7895-38) is already installed in the PC. When the conditions are verified, just copy the “Lchktool” folder from the Tool CD into the PC. Installing is then complete.

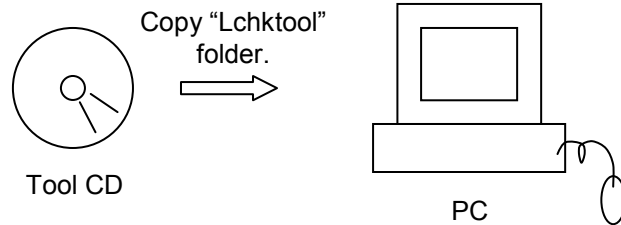


Figure D-1 Installing the Ladder Check Tool

### 4. Starting the Tool

To start the ladder check tool, open the “Lchktool” folder that you have copied into your PC, and double-click the “Ladchk.exe” file in that folder. The tool will then be started. In the initial window displayed (Figure D-2), click the [Display] menu and, if they are not selected, select each of the [Project], [Status-bar], and [Output] menu items (check marks appear in the menu) to display the corresponding window panes and bar in the window.

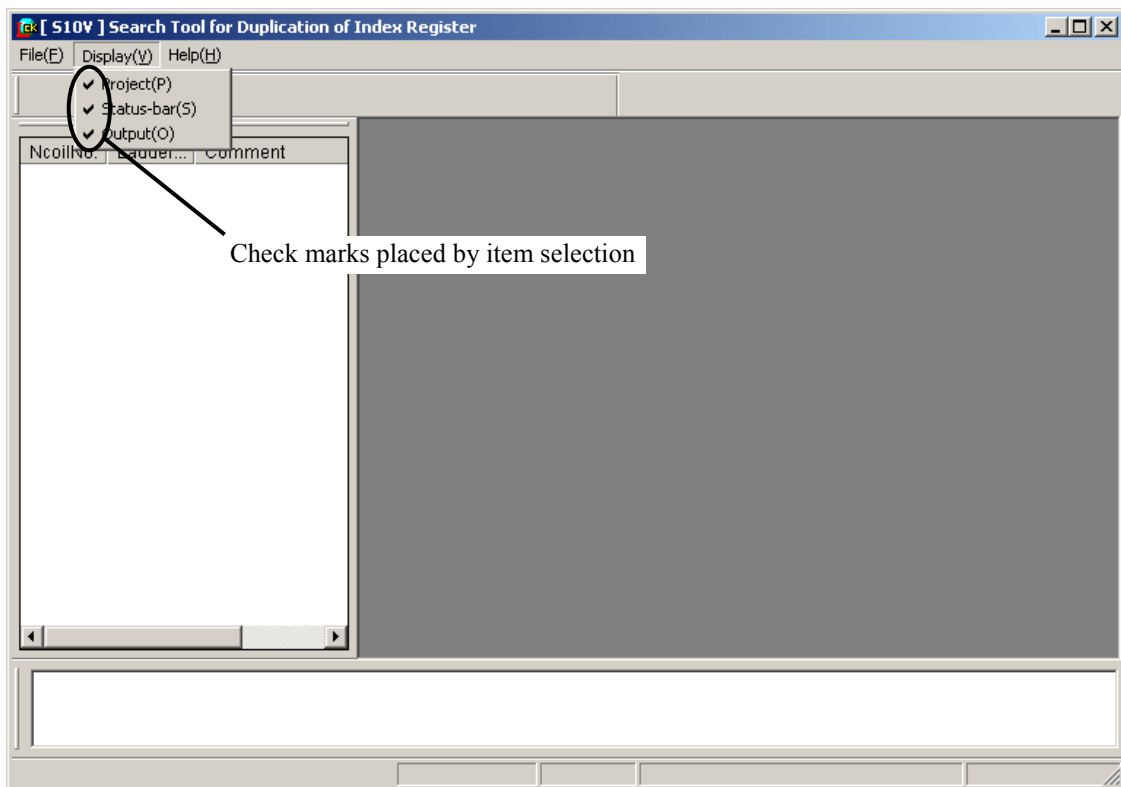


Figure D-2 The Ladder Check Tool’s Initial Window

## 5. Opening the Desired Ladder Program File

The ladder program file you want to check can be opened either by choosing [Open] from the [File] menu in the initial window or use the short-cut key [Ctrl] + [O]. When you take either of the actions, the window as shown below will appear. Choose the desired ladder program file in the window. The type of file you can select is only WSVL. The rest of this appendix describes the procedure for locating erroneous duplications of index registers in a ladder program. The description is given using a sample program named “aaa.wsvl”, which is shown in Supplement 1, “A Sample Program Causing the Problem in Question.”

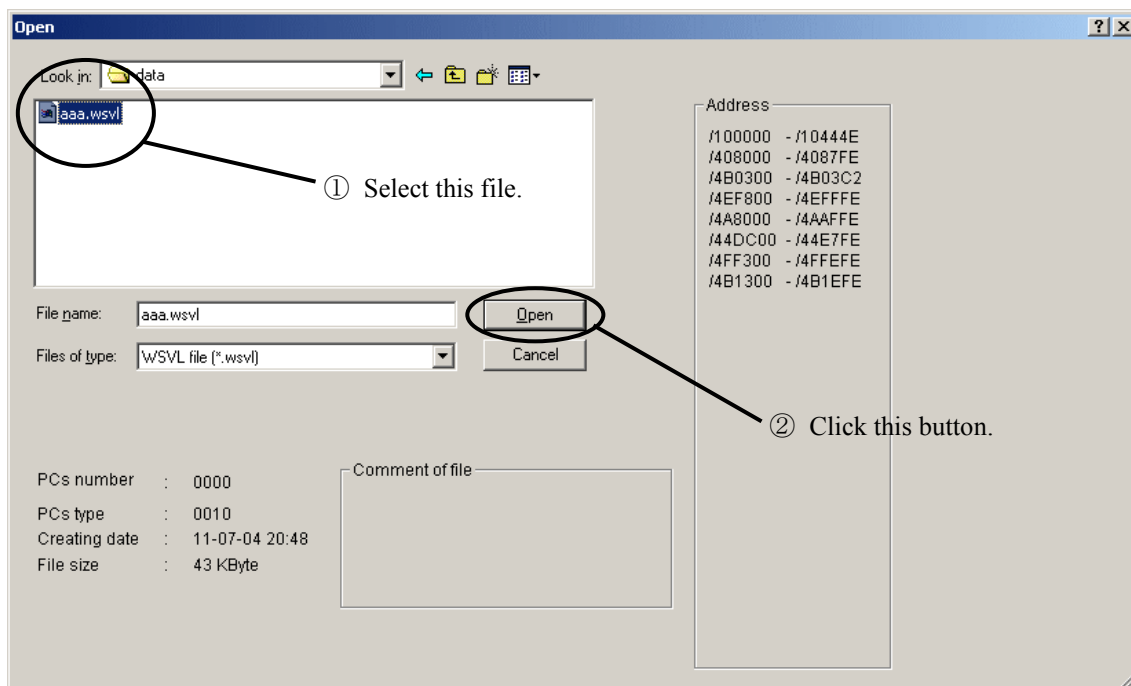


Figure D-3 Opening a Ladder Program File



6. Displaying the [Search Tool for Duplication of Index Register] Window with the Selected File

To display the [Search Tool for Duplication of Index Register] window along with the contents of the selected file, either choose [Search Duplication of Index Register] from the [Search] menu in the initial window or use the short-cut key [Ctrl] + [E]. The resulting [Search Tool for Duplication of Index Register] window is displayed as shown below.

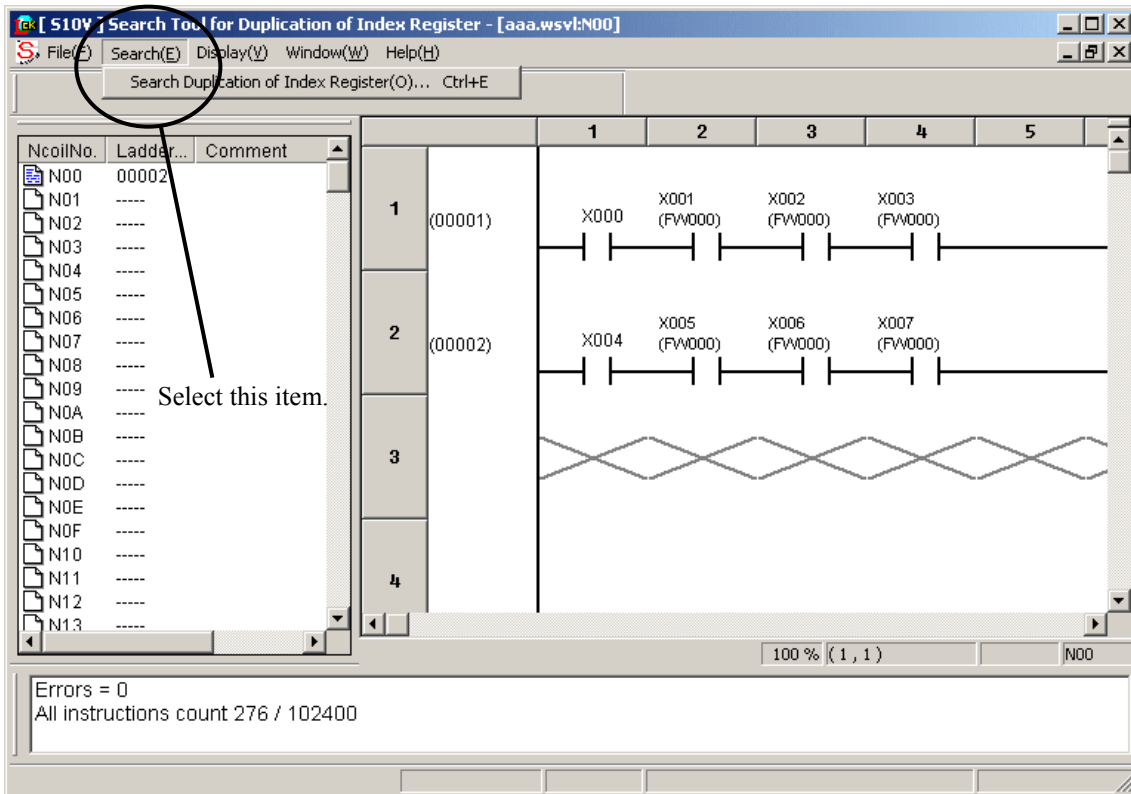
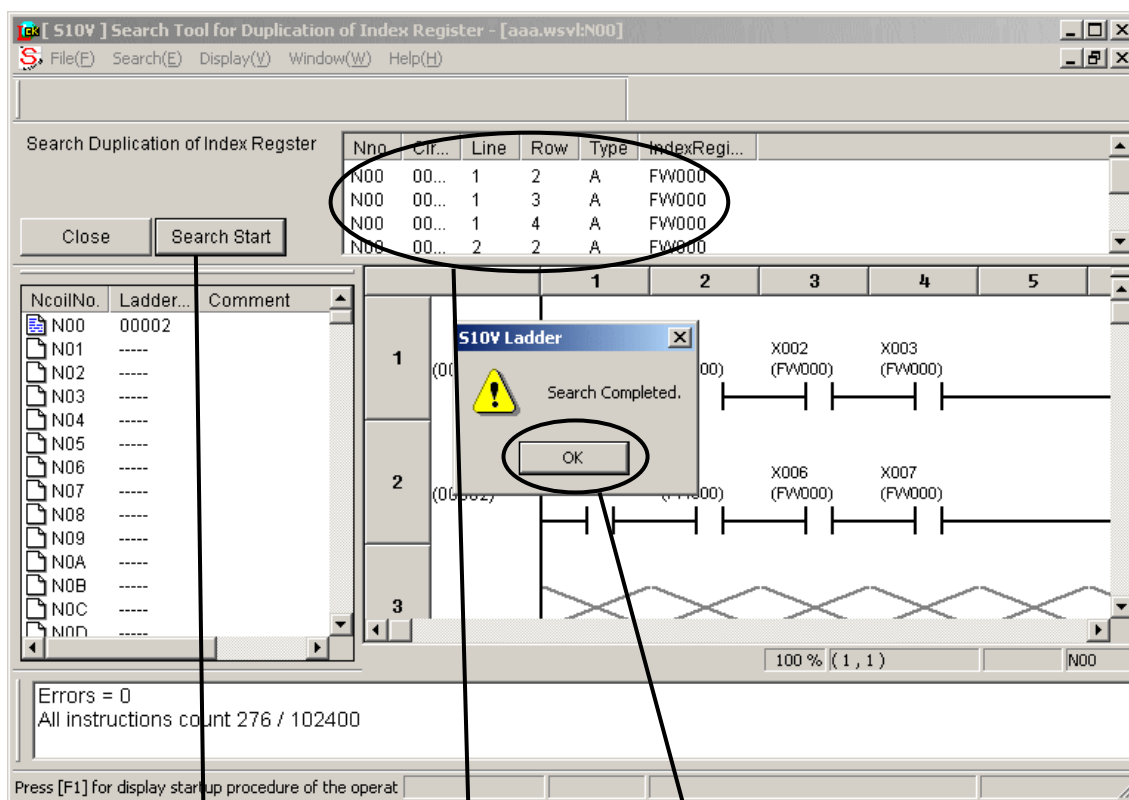


Figure D-4 [Search Tool for Duplication of Index Register] Window with the Selected File

## 7. Carrying Out a Search

Click the **Search Start** button in the [Search Tool for Duplication of Index Register] window, and then a search will be started in the selected file. When the search is ended, the “Search Completed” message dialog box as shown below will appear along with the result of the search. The search conditions used in the search are described in Supplement 2, “Search Conditions Used by the Ladder Check Tool.”

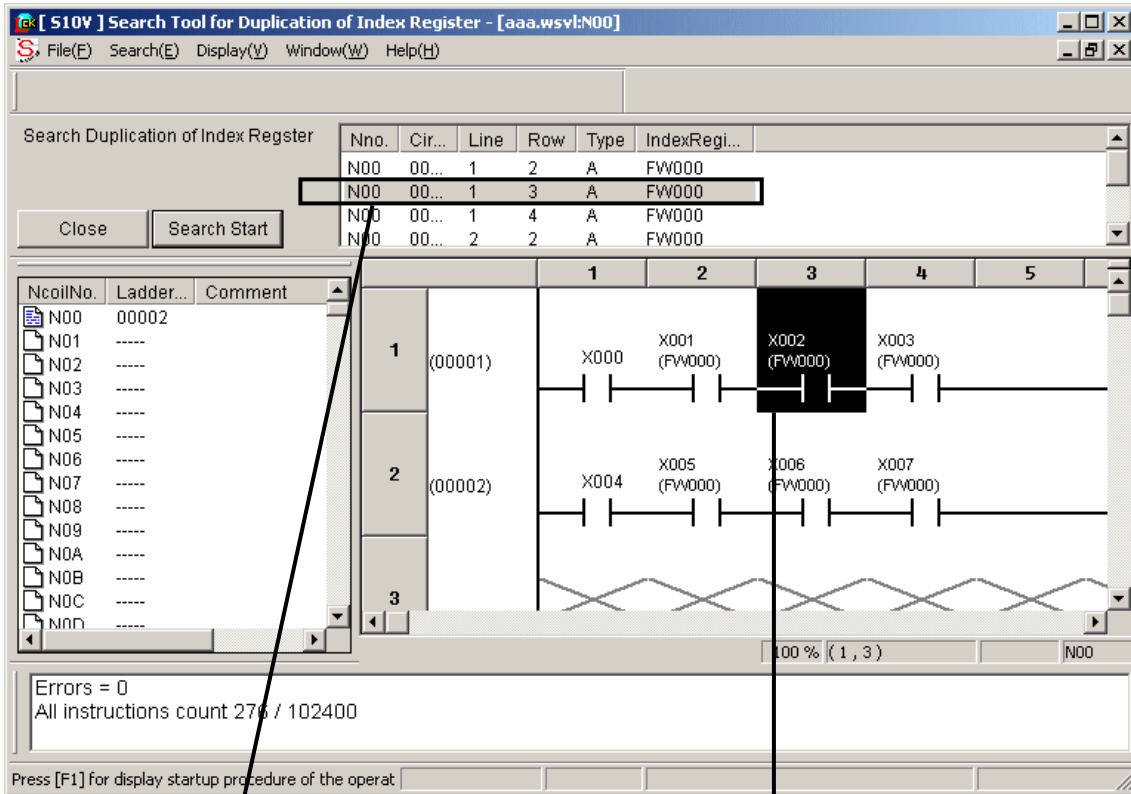


- ① Click this button.    ② Search result    ③ Click this button and proceed to the next step (checking the reported registers one by one).

Figure D-5 Carrying Out a Search

### 8. Checking the Reported Registers One-by-One

To check each of the reported index registers, double-click on the corresponding line in the displayed search result. The cursor will then move to the corresponding location in the displayed ladder chart, as shown below.



- ① Double-click on this line as an example.
- ② Cursor moves to the corresponding location in the chart.

Figure D-6 Checking the Reported Registers One-by-One

Now, check if the reported index register in the selected line is an erroneously duplicated one or not. If it is an erroneously duplicated one, mark it in a text file created beforehand from the search result, as described in the next section. Repeat this for all the other reported registers.

The screenshot shows the 'S10V Search Tool for Duplication of Index Register' interface. The search results table is as follows:

Nno	Cir	Line	Row	Type	IndexRegi
N00	00...	1	2	A	FW000
N00	00...	1	3	A	FW000
N00	00...	1	4	A	FW000
N00	00...	2	2	A	FW001

The ladder logic diagram shows three rungs (1, 2, 3) with various contacts (X000, X001, X002, X003, X004, X005, X006, X007) and coils (FW000, FW001). A callout box highlights the search table and the ladder logic, with the text 'Check each reported register.' pointing to the index register values.

Errors = 0  
All instructions count 276 / 102400

Press [F1] for display startup procedure of the operat

Figure D-7 Checking the Reported Registers One-by-One

9. Outputting the Search Result in CSV Format and Marking the Erroneous Duplication(s)

To output the displayed search result in CSV (comma-separated values) format, either choose [CSV Output] - [Search Duplication of Index Register] from the [File] menu, as shown below, or use the short-cut key [Ctrl] + [R].

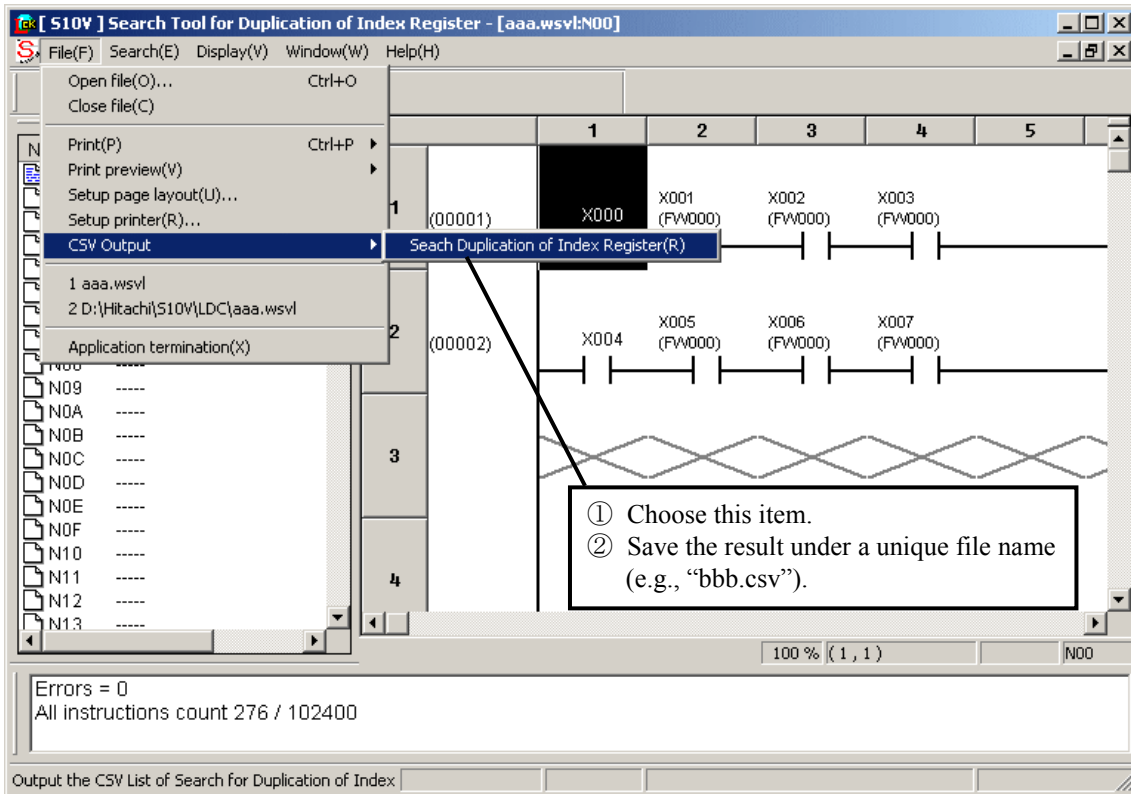


Figure D-8 Outputting the Search Result in CSV Format

A CSV file will then be created under the specified file name. Open the created CSV file by using Memo Pad or the like and mark the erroneously duplicated register(s) in the file, as shown in an example below (each “NG” is such a marking).

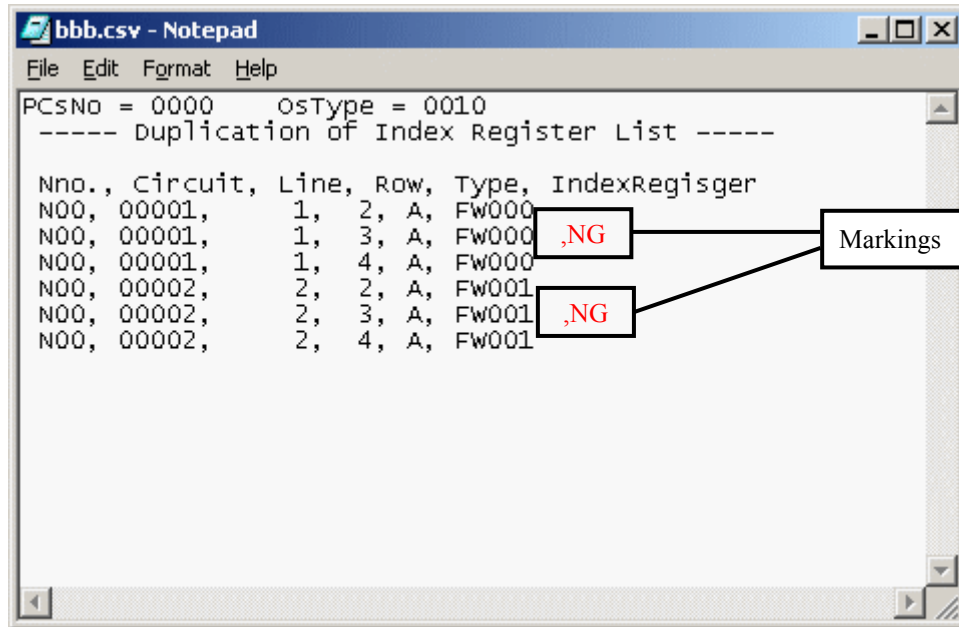



Figure D-9 User-Made Markings in the CSV File

10. Exiting the Tool

When a check of the ladder program is completed, you can exit the ladder check tool by taking either of the following actions: 1) click the  button in the upper right corner of the [[S10V] Search Tool for Duplication of Index Register] window or 2) choose [Application termination] from the [File] menu.

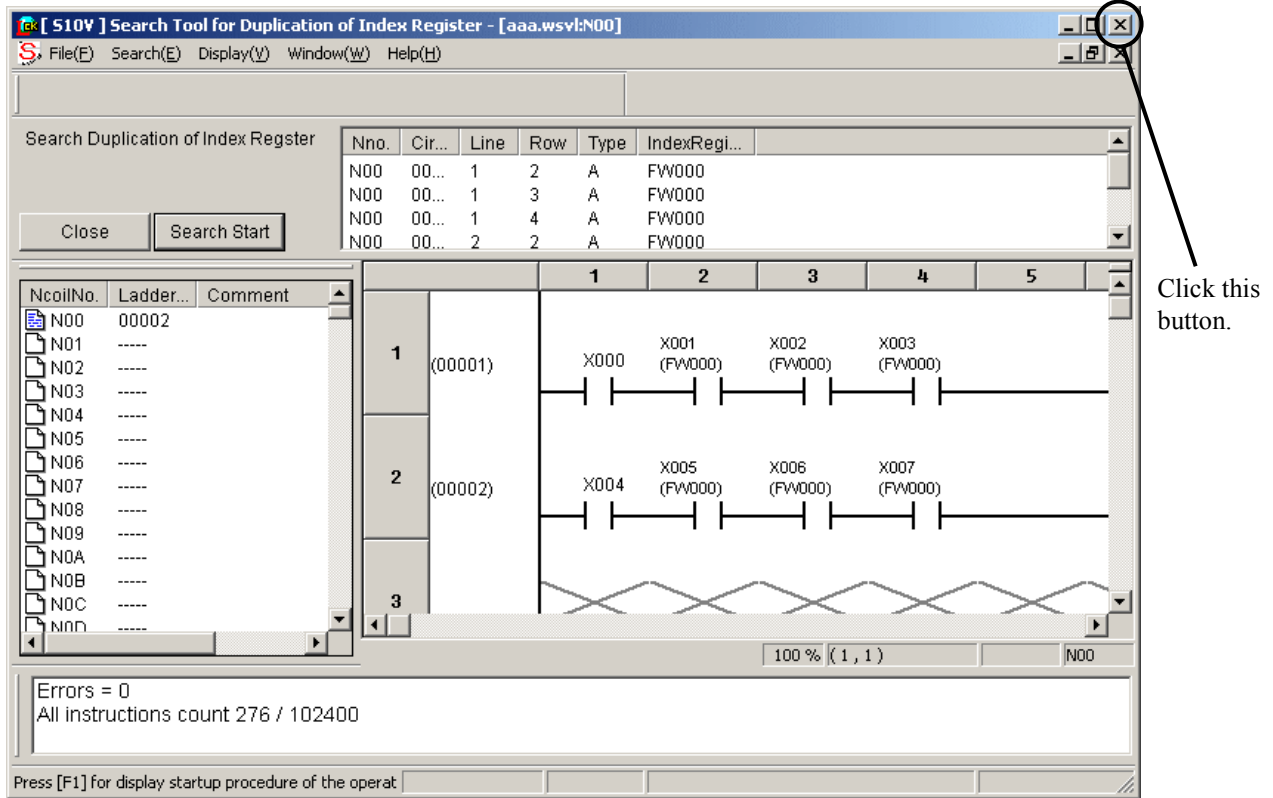


Figure D-10 Exiting the Ladder Check Tool

### 11. Correcting the Ladder Program with the S10V Ladder Chart System

The ladder program in which the erroneously duplicated register(s) are found needs to be corrected by using S10V ladder chart system (model S-7895-02), Ver-Rev 01-27 or later. To accomplish this, open the ladder program file you have checked, and delete the erroneously duplicated register(s) marked in Section 9 from the program. When the correction is completed, recompile the program by using the [All N Coil Compile] option in the [Build] pull-down menu.

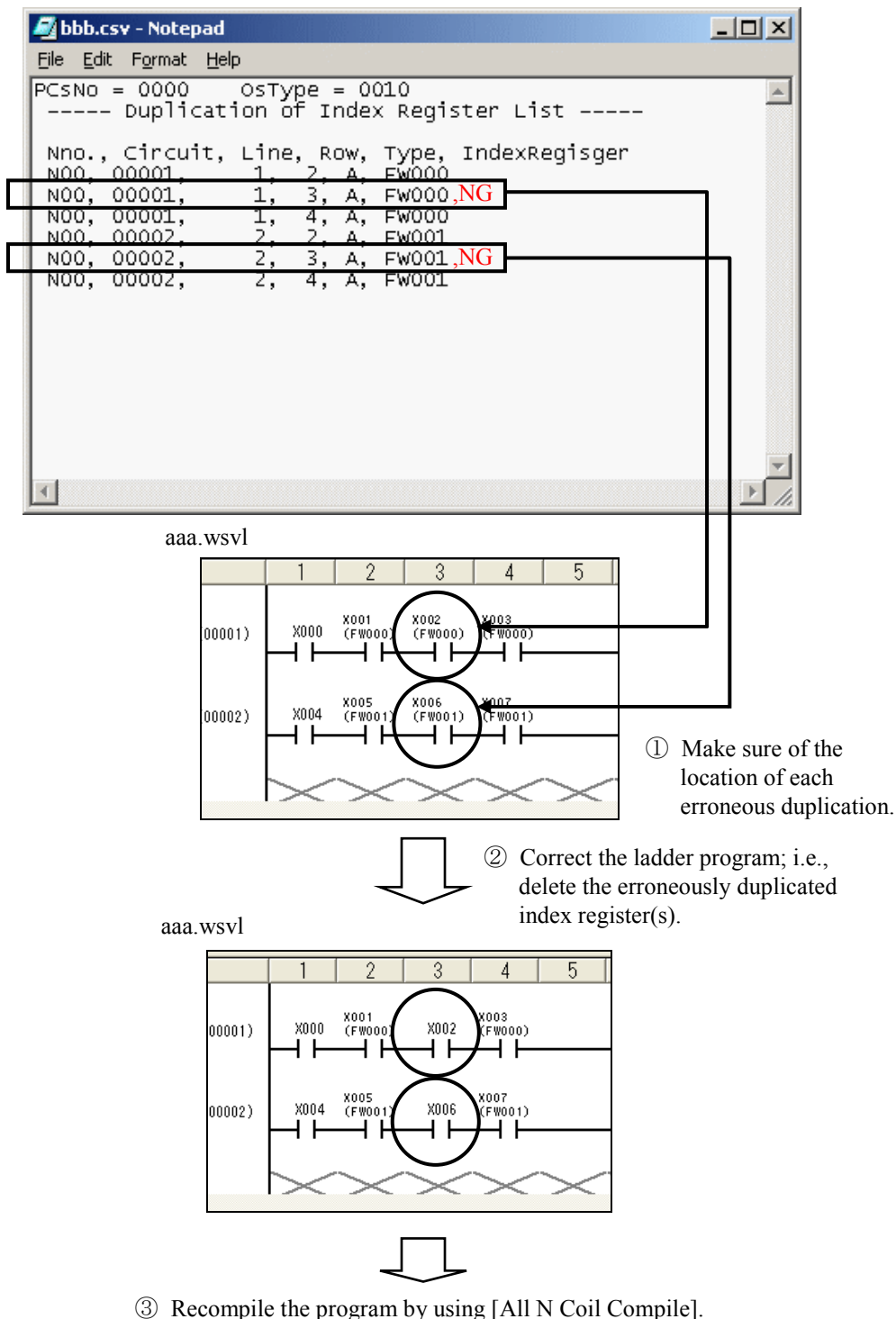


Figure D-11 Correcting the Ladder Program



### 12. Saving the Corrected Program and Checking Its Operation

The corrected ladder program needs to be saved to the file. To achieve this, take either of the actions: choose [Save file] from the [File] menu in the [[S10V] Search Tool for Duplication of Index Register] window or use the short-cut key [Ctrl] + [S]. Then, send the program to the S10V controller and check its operation.

### 13. Uninstalling the Tool

You can uninstall the ladder check tool if you want to. To uninstall it, just delete from your computer the “Lchktool” folder that you copied as described in Section 3. The deletion can be done using the Explorer or a similar application.

Supplement 1. A Sample Program Causing the Problem in Question

As a sample program, create a ladder program as shown below by using S10V ladder chart system, Ver-Rev 01-23 or earlier and save it under the file name “aaa.wsv1”.

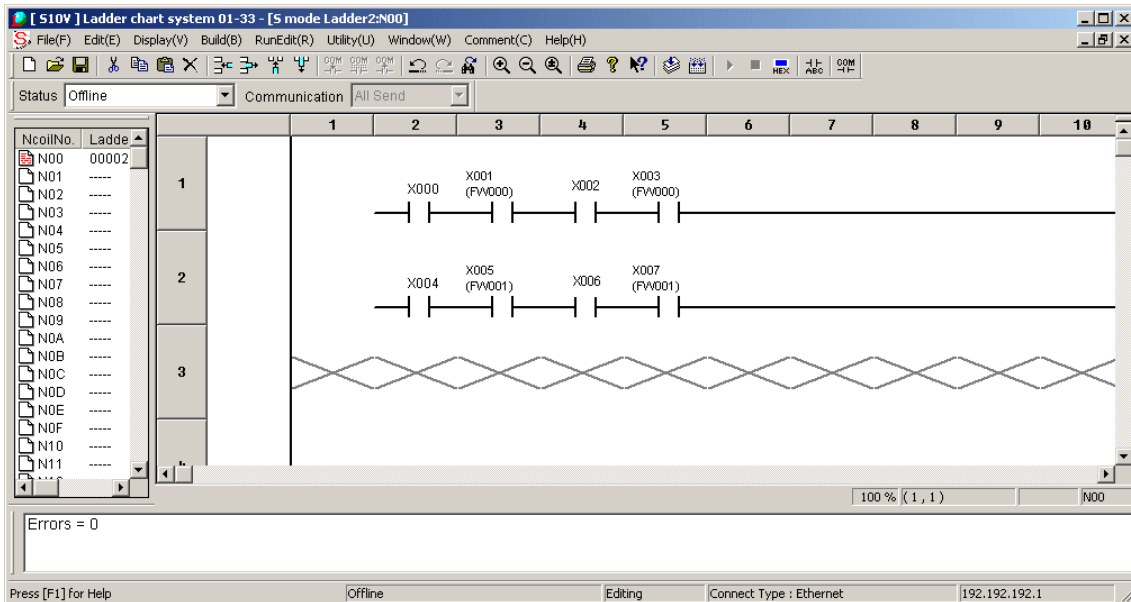


Figure D-12 A Sample Program Created Using S10V Ladder Chart System, Ver-Rev 01-23 or Earlier

Then, start compiling the created program by choosing [All N Coil Compile] from the [Build] pull-down menu. The compilation will proceed normally to the end without any error reported. However, when you open the resulting program in the window, erroneously duplicated index registers appear as shown below.

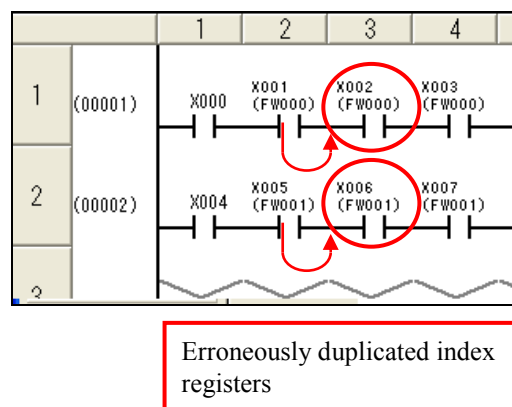


Figure D-13 A Result of Using [All N Coil Compile] in S10V Ladder Chart System, Ver-Rev 01-23 or Earlier

APPENDIXES

Supplement 2. Search Conditions Used by the Ladder Check Tool

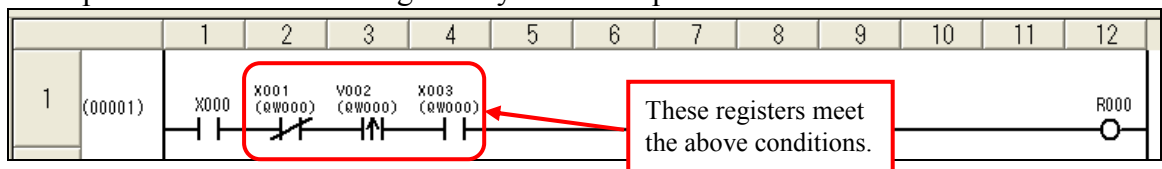
The ladder check tool uses the two conditions listed below when searching a ladder program. It finds out only the index registers that meet the conditions.

Condition 1: The index register is used along with a contact (an A-, B-, rising-edge, or a falling-edge contact).

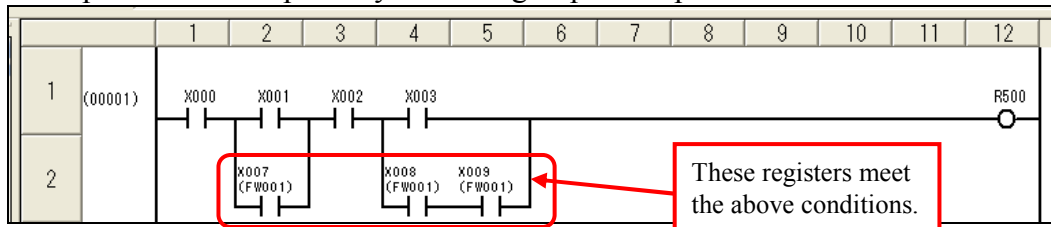
Condition 2: The index register used with a contact is duplicated at another such contact in the same program line. (Note that two or more consecutive program lines each ending with the continuation sign “✱” are parts of a single large program line ending with other than the continuation sign.)

Shown below are examples of ladder programs meeting the above two conditions.

Example 1: A circuit consisting of only one serial path:



Example 2: A circuit partially consisting of parallel paths:



Example 3: A circuit drawn in a single large program line (continued using only one instance of the continuation sign):

