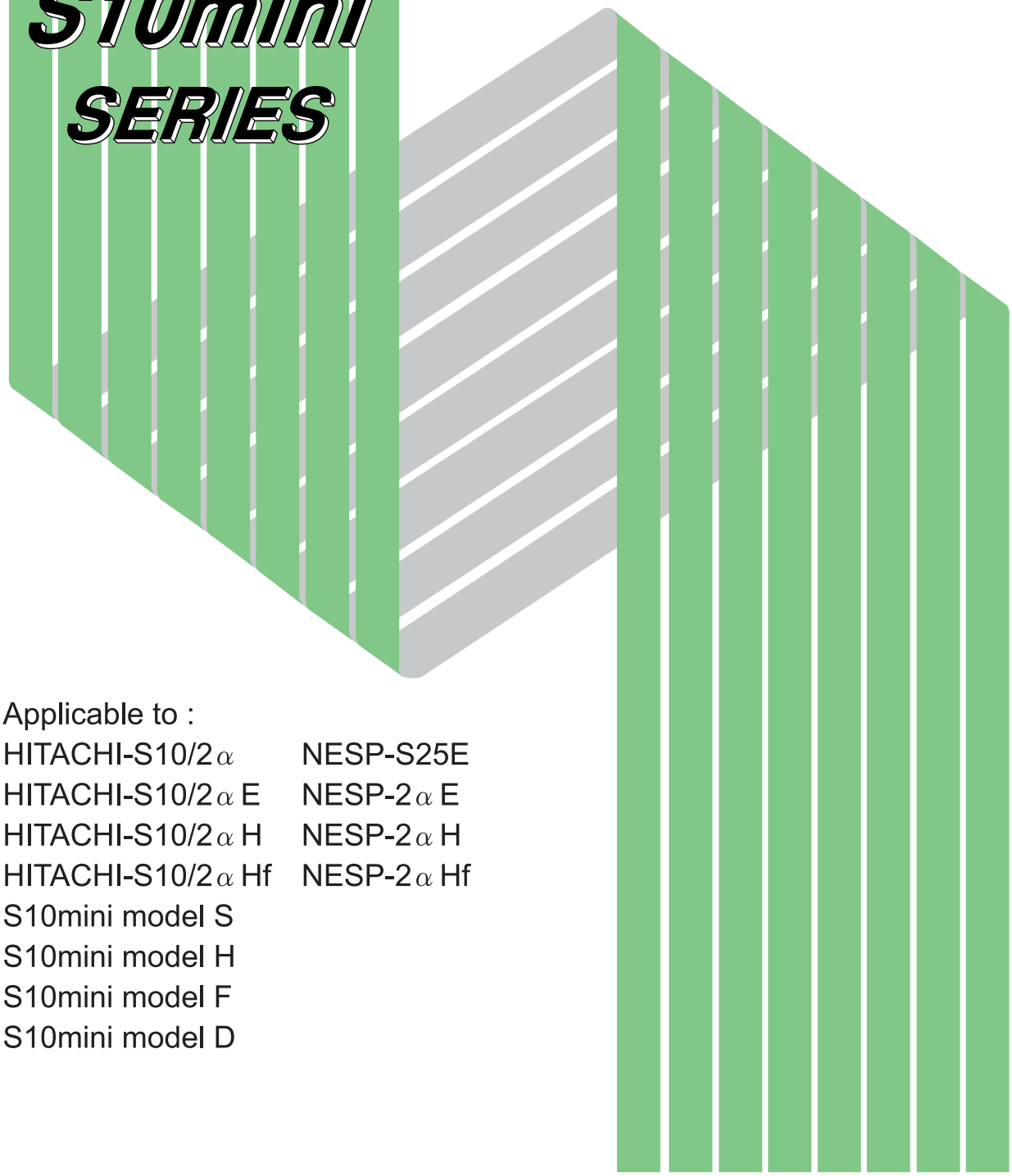
HITACHI
S10α SERIES

SOFTWARE MANUAL
OPERATION

S10Tools For Windows® V7

2α S10mini SERIES



Applicable to :

HITACHI-S10/2α	NESP-S25E
HITACHI-S10/2α E	NESP-2α E
HITACHI-S10/2α H	NESP-2α H
HITACHI-S10/2α Hf	NESP-2α Hf
S10mini model S	
S10mini model H	
S10mini model F	
S10mini model D	

SAE-3-120 (J)

HITACHI

NOTE

All information in this manual is based on the latest product information available at the time of printing. Hitachi has reviewed the accuracy of this manual, but assumes no responsibility for any omissions or errors which may appear. The design of the product is under constant review and, while every effort is made to keep this manual up to date, the right is reserved to change specifications and equipment at any time without prior notice.

PROHIBITION

These products should not be used for medical, power supply, nuclear, water supply, drainage plants, traffic control, military, space, nor disaster prevention equipment.

Diversion and/or resale of these products without this manual is prohibited.

Reproduction of the contents of this manual in whole or in part, without written permission of Hitachi, is prohibited.

TRADEMARKS

HITACHI-S10/2α, S10/4α and PSEα are registered trademarks of Hitachi, Ltd.

FIRST EDITION, JULY, 1997, SAE - 3 - 120 (A) (out of print)
SECOND EDITION, NOVEMBER, 1997, SAE - 3 - 120 (B) (out of print)
THIRD EDITION, SEPTEMBER, 1998, SAE - 3 - 120 (D) (out of print)
FOURTH EDITION, DECEMBER, 2000, SAE - 3 - 120 (F) (out of print)
FIFTH EDITION, OCTOBER, 2001, SAE - 3 - 120 (G) (out of print)
SIXTH EDITION, AUGUST, 2003, SAE - 3 - 120 (I) (out of print)
SEVENTH EDITION, DECEMBER, 2004, SAE - 3 - 120 (J)
All Rights Reserved, Copyright © 1997, 2004, Hitachi, Ltd.

BI-NR-HS<IC-IC> (FL-MW20)

LIMITED WARRANTY

Hitachi, Ltd., warrants its products to be manufactured in accordance with published specifications and free from defects in materials and/or workmanship.

Hitachi, Ltd., warrants its products against defects in parts and workmanship for one full year from date of purchase.

HITACHI, LTD., MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED EXCEPT AS PROVIDED HEREIN, INCLUDING WITHOUT LIMITATION THEREOF, WARRANTIES AS TO MARKETABILITY FOR A PARTICULAR PURPOSE OF USE, OR AGAINST INFRINGEMENT OF ANY PATENT. IN NO EVENT SHALL HITACHI BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR COSTS, CHARGES, LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.

SOFTWARE UP–TO DATE POLICY

Hitachi, Ltd., constantly reviews its software so as to incorporate the latest technology. Hitachi reserves the right to make changes to any software to improve reliability, function, or design. Hitachi cannot be held responsible for any errors in its software.

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 the 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.

"RUN/STOP" SWITCH CAUTION

The "RUN/STOP" switch only stops execution of the ladder logic program or HI-FLOW program. Digital and analog outputs are left in the active state when execution stops, unless the optional rungs described in the CPU manual have been added. The "RUN/STOP" switch does not affect the operation of C-language or FA-BASIC language programs. Outputs can still be produced in response to C-language or FA-BASIC programs, or by the action of programmers typing in commands in these languages, while the "RUN/STOP" switch is in the "STOP" position.

DO NOT DEPEND ON THE STOP SWITCH TO STOP MOVING PARTS OR TO PREVENT UNEXPECTED MOTION OR ENERGIZATION. USE HARDWIRED SAFETY DISCONNECT AND LOCK OUT POWER AND CONTROL VOLTAGES BEFORE WORKING ON ELECTRICAL CIRCUITS OR PARTS THAT CAN MOVE.

PREFACE

We greatly appreciate your purchase of the S10Tools system.

This system, running on a personal computer, is used for creation and correction of ladder diagrams and HI-FLOW application programs, and many other operations.

This manual describes how to operate the S10Tools system.
This manual is applicable to the following system versions.

System name/version
S10Tools System For Windows®　07-06

For ladder diagrams and HI-FLOW programs (instructions), refer to the manuals listed below.

<Related manual>

- SOFTWARE MANUAL　PROGRAMMING　LADDER CHART For Windows®
  (manual number SAE-3-121)
- SOFTWARE MANUAL　PROGRAMMING　HI-FLOW For Windows®
  (manual number SAE-3-122)

See the following list when you use the NESP
(Nissan Electronic Sequence Processor) series.

【HITACHI-S10α series】		【NESP series】
HITACHI-S10/2α	·····	NESP-S25E
HITACHI-S10/2αE	·····	NESP-2αE
HITACHI-S10/2αH	·····	NESP-2αH
HITACHI-S10/2αHf	·····	NESP-2αHf

<Trademarks>

- Microsoft® Windows® operating system, Microsoft® Windows® 95 operating system, Microsoft® Windows® 98 operating system, Microsoft® Windows® 2000 operating system, Microsoft® Windows® XP operating system are registered trademarks of Microsoft Corporation in the United States and/or other countries.
- Ethernet is a registered trademark of Xerox Corp.

Other product names written in this manual are the trademarks of each manufacturer.

Systems Supported by Windows® 2000 and Windows® XP

The systems supported by Microsoft® Windows® 2000 operating system (hereafter abbreviated as Windows® 2000) and Microsoft® Windows® XP operating system (hereafter abbreviated as Windows® XP) are shown in the following table.

Systems of earlier versions than those shown in the following table are not supported by Windows® 2000 and Windows® XP but supported by only Microsoft® Windows® 95 operating system (hereafter abbreviated as Windows® 95) and Microsoft® Windows® 98 operating system (hereafter abbreviated as Windows® 98). (The system names in the following table are hereafter abbreviated as each system.)

<Table of Systems Supported by Windows® 2000 and Windows® XP>

No.	System name	Type	Version	Windows® 2000	Windows® XP
1	S10Tools SYSTEM	S-7890-01	07-05	√	√
2	LADDER CHART SYSTEM	S-7890-02	07-05	√	√
3	HI-FLOW SYSTEM	S-7890-03	07-02	√	√
4	CPMS LOADING SYSTEM	S-7890-04	07-04	√	√
5	CPMSE LOADING SYSTEM	S-7890-05	07-04	√	√
6	CPMS DEBUGGER SYSTEM	S-7890-06	07-02	√	√
7	CPMSE DEBUGGER SYSTEM	S-7890-07	07-02	√	√
8	GP-IB LOADING SYSTEM	S-7890-08	07-01	√	√
9	BACKUP RESTORE SYSTEM	S-7890-09	08-01	√	√
10	RPDP/S10 SYSTEM	S-7891-10	03-03	√ (*2)	ns (*1)
11	NX/Tools-S10 SYSTEM	S-7890-13	07-02	√	√
12	4α LADDER CHART SYSTEM	S-7890-17	07-05	√	√
13	4αH LADDER CHART SYSTEM	S-7890-18	07-05	√	√
14	LADDER COMMENT CONVERTER SYS	S-7890-19	06-01	√	√
15	HIGH SPEED REMOTE I/O SYSTEM	S-7890-21	07-01	√	√
16	CPU LINK SYSTEM	S-7890-22	07-01	√	√
17	4ch ANALOG PULSE COUNTER SYS	S-7890-23	07-01	√	√
18	EXTERNAL SERIAL LINK SYSTEM	S-7890-24	07-02	√	√
19	S10ET LINK SYSTEM	S-7890-25	07-02	√	√
20	J.NET SYSTEM	S-7890-27	07-02	√	√
21	OD.RING/SD.LINK SYSTEM	S-7890-28	07-03	√	√
22	ET.NET SYSTEM	S-7890-29	07-01	√	√
23	FL.NET SYSTEM	S-7890-30	07-03	√	√
24	D.NET SYSTEM	S-7890-31	07-04	√	√
25	LADDER CHART MONITOR SYSTEM	S-7890-34	07-04	√	√
26	HI-FLOW MONITOR SYSTEM	S-7890-35	07-01	√	√
27	IR.LINK SYSTEM	S-7890-36	07-02	√	√
28	Crossing C compiler (manufactured by Mentor Graphics Corporation)	MCP68K	5.3	√ (*2)	ns (*1)

√: Supported ns: Not supported

(*1) Crossing C compiler (No.28) is not supported by Windows® XP. Use it on Windows® 2000.

(*2) Crossing C compiler (No.28) must be a version supported by Windows® 2000 (later than version 5.3) as a premise.

<Definitions of Terms>

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

Process: A HI-FLOW program converted into a form that can be run on the PCs by pasting a symbol on the sheet displayed on a PC.

Compile: To convert an application program such as a ladder chart and HI-FLOW into a form (N coil, process, etc.) that can be run on the PCs.

Build: To compile only a corrected application program.

Rebuild: To compile every existing application program.

Sheet: Paper to prepare an application program of ladder chart and HI-FLOW, etc. This paper is controlled on a PC.

PCs: An abbreviation of Programmable Controllers.
This is a general term for PLC such as the S10α and S10mini series.

PLC: An abbreviation of Programmable Logic Controller.
This is an industrial electronic device to exert sequence control, having an incorporated program.
The S10α and S10mini series come under this PLC.

<Note for storage capacity calculations>

- Memory capacities and requirements, file size 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) = 1024 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) = 1000 bytes
  1 MB (megabyte) = 1000^2 bytes
  1 GB (gigabyte) = 1000^3 bytes

CONTENTS

1 BEFORE USE 1
1.1 System Overview 2
1.2 Hardware and Software Requirements 2
1.3 Precautions 3
1.3.1 Precautions to be observed during the use of the NX/Tools-S10 system 3
1.3.2 HI-FLOW system replacement 4
1.3.3 Compatibility of the new HI-FLOW system with the earlier versions 6

2 INSTALLATION 7
2.1 Installing the System 8
2.2 Uninstalling the System 9
2.3 Starting Up the System 10
2.4 Terminating the System 11

3 S10TOOLS SHEETS 13
3.1 Relationships to DOS Version Files (.PSE, etc.) 14
3.2 Windows® Version Files (PSE Files) 14
3.3 S10Tools Sheets 14
3.4 Ladder Sheets 15
3.5 HI-FLOW Process Sheets 16
3.6 HI-FLOW Sheets 17

4 LADDER SHEET FUNCTIONS AND THEIR USE 19
4.1 Creating Ladder Sheets 20
4.2 Ladder Sheet File Functions 22
4.2.1 Circuit diagram with the ladder cross reference 24
4.3 Ladder Sheet Edit Functions 30
4.3.1 Pasting ladder symbols 32
4.4 Ladder Sheet Display Functions 34
4.5 Ladder Sheet Build Functions 35
4.5.1 Ladder chart four-line simultaneous monitoring function 38
4.6 Ladder Sheet RunEdit Functions 41
4.7 Ladder Sheet Utility Functions 43
4.7.1 Ladder chart comparing function 45
4.7.2 Ladder watchdog timer (WDT) timeout value setting function 49

4.7.3 Setting the analog and pulse counter modules 52
4.7.4 Remote operation function 66
4.8 Ladder Sheet Window Functions 70
4.9 Ladder Sheet Comment Functions 71

5 HI-FLOW PROCESS SHEET AND HI-FLOW SHEET FUNCTIONS AND THEIR USE 73
5.1 Creating HI-FLOW Process Sheets 74
5.2 HI-FLOW Process Sheet File Functions 76
5.3 HI-FLOW Process Sheet Edit Functions 77
5.4 HI-FLOW Process Sheet Display Functions 78
5.5 HI-FLOW Process Sheet Build Functions 79
5.6 HI-FLOW Process Sheet Mode Functions 80
5.6.1 HI-FLOW four-line simultaneous monitoring function 82
5.7 HI-FLOW Process Sheet Utility Functions 85
5.8 HI-FLOW Process Sheet Window Functions 87
5.9 Creating HI-FLOW Sheets 88
5.9.1 Pasting HI-FLOW symbols 89
5.10 HI-FLOW Sheet File Functions 91
5.11 HI-FLOW Sheet Edit Functions 92
5.12 HI-FLOW Sheet Display Functions 94
5.13 HI-FLOW Sheet Build Functions 95
5.14 HI-FLOW Sheet Mode Functions 96
5.14.1 Overview of a rewrite during a run 97
5.14.2 Process execution after a run-time rewrite 105
5.15 HI-FLOW Sheet Utility Functions 107
5.16 HI-FLOW Sheet Window Functions 109

THIS PAGE INTENTIONALLY LEFT BLANK.

1 BEFORE USE

This manual is intended for users who want to program a personal computer under the Windows®.

1.1 System Overview

S10Tools For Windows® (hereinafter referred to as the S10Tools system) is used to create, correct, monitor, and debug ladder diagrams and HI-FLOW application programs for the 2α series and S10mini series. The S10Tools system can be operated in the same way as ordinary Windows® applications are operated.

1.2 Hardware and Software Requirements

Using each system requires the following hardware and software.

<Personal Computers (hereafter abbreviated as PC)>

OS / Item	Windows® 95 (*1) Windows® 98 (*1)	Windows® 2000 (*1)	Windows® XP (*1) (*2)
CPU	Pentium 133 MHz or more	Pentium 300 MHz or more	
Memory (RAM)	32 MB or more	64 MB or more	128 MB or more
Free hard disk capacity (*3)	20 MB or more/system (However, 10 MB or more/system for OS loading and option module support software)		
Floppy disk drive	1 unit or more (required to install software by FD)		
CD-ROM drive	1 unit or more (required to install software by CD-ROM)		
Ethernet (10BASE-T)	1 port or more (required to connect a PC with the ET.NET module)		
Serial (D-sub 9-pin)	1 port or more (required to connect the PCs with a PC by RS-232C or set an IP address for the ET.NET module)		
PC card (conforming to the PC Card Standard (JEITA V4.2) TYPE II or TYPE III)	1 slot or more (required to connect a PC with the parallel interface module (LWZ400). At this time, the following GP-IB card is also required.) GP-IB card: PCMCIA-GPIB (Model: 777438-02) (manufactured by National Instruments Corporation)		
Display	Resolution of 800 × 600 pixels or more		
Microsoft® Internet Explorer	Version 4.01 or later		

(*1) For the OS service pack, refer to the attached reference materials for software.

(*2) No.10 and No.28 in <Table of Systems Supported by Windows® 2000 and Windows® XP> in "PREFACE" are excepted.

(*3) This is a capacity required to install each system. A free capacity to save user programs is also required.

<Hardware other than PC>

- CPU for HITACHI-S10α series (2α) or S10mini series
- Power supply for HITACHI-S10α series or S10mini series
- Backboard for HITACHI-S10α series or S10mini series
- Connection cable between the personal computer and PCs
- Remote I/O stations, other power supplies and backboards, cards, and wiring as required

1.3 Precautions

1.3.1 Precautions to be observed during the use of the NX/Tools-S10 system

The NX/HOST-S10 programs transferred to the PCs by the NX/Tools-S10 system use the following areas depending on the type. When you use the NX/Tools-S10 system in conjunction with HI-FLOW, perform the following loading procedures to avoid an area overlap.

<Areas used by NX/HOST-S10>

TYPE1: /120000 to /15D800
TYPE2: /120000 to /163000
TYPE3: /120000 to /180000
TYPE4: /120000 to /164000
TYPE5: /120000 to /16E800
TYPE6: /120000 to /195800

(1) Loading HI-FLOW when the NX/HOST-S10 system is already loaded in the PCs

① Stop the PCs.
② First, load only the HI-FLOW system program into the PCs.
(Operation: Select [Utility] – [PCs] – [Delete process of PCs], and [Exchange all process and system] in sequence.)
③ After completion of system program loading, use the system edition function to define the user area so that it does not overlap with the above NX/HOST-S10 area.
(Operation: Select [Utility] – [PCs], and [System edition] in sequence.)
④ Transfer the HI-FLOW programs (processes) to the PCs.

(2) Loading NX/HOST-S10 when HI-FLOW is already loaded in the PCs

① Stop the PCs.

② Receive all the HI-FLOW programs (processes) from the PCs and saves them on the personal computer you are operating.

③ Use the system edition function to define the user area so that it does not overlap with the above NX/HOST-S10 area.

④ Transmit the saved HI-FLOW programs back to the PCs.

⑤ Transmit the NX/HOST-S10 system to the PCs.

(Performing Steps ④ and ⑤ in reverse order will cause no problem.)

1.3.2 HI-FLOW system replacement

The message below appears on the display when the HI-FLOW system establishes an on-line condition with the PCs. Then, be sure to replace the HI-FLOW system on the PCs (CPU unit side).

Replacing the system deletes all the existing HI-FLOW programs (processes) on the PCs side. Therefore, be sure to save the programs to the personal computer before making a system replacement.

(1) Replacing the HI-FLOW system

① Stop the PCs.

② Select [Utility] – [PCs] – [Delete process of PCs], and [Exchange all process and system] in sequence.

③ When the system is replaced, all the processes are deleted from the PCs. Therefore, retransmit all the HI-FLOW programs (processes) to the PCs.

NOTICE

Users of this product require knowledge of the Windows® environment and user interfaces. The S10Tools system conforms to the Windows® standard. This manual is intended for users who have mastered the basic usage of Windows®.

CAUTION

- This product can be used to rewrite programs or the content of internal registers while the PCs are running. However, if they are rewritten without sufficient care, a serious accident such as damage to a facility may occur. Check the condition of the facility before rewriting programs or the content of internal registers.
- When you use a personal computer with the suspend function, disable the function. The personal computer may malfunction if the suspend function remains enabled during execution of the S10Tools system.
- If RAM runs short during execution of an application program, an application error may result. When this happens, check the free memory capacity and, if the RAM needs to be extended, do it.

1.3.3 Compatibility of the new HI-FLOW system with the earlier versions

The HI-FLOW V7 and later version (P.P. version 07-00 and later) included in the S10Tools system is featured with new functions. To use these functions, the earlier version in the PCs (machines) must be updated (See the "1.3.2 HI-FLOW system replacement" for updating procedures).

If it is not updated in the machine, the HI-FLOW systems installed in the machine and personal computer operate are inconsistent and they operate as stated in the table below when they transmit/receive information. For the above reason, the HI-FLOW systems of the PCs (machines) must be updated with the latest version.

		Personal computer (HI-FLOW system for Windows®)	
		Prior to V6	V7 and later version
PCs (machines)	Prior to V6	Operates normally.	Reception and process monitoring functions are available, however, transmission function does not work. The message requesting for a replacement (update) stated in the "1.3.2 HI-FLOW system replacement" appears every time information is transmitted or received.
	V7 and later version	Transmission/reception and process monitoring functions are not available. Do not use them.	Operates normally.

2 INSTALLATION

2.1 Installing the System (*)

First, check if your CD is correct.

To install each system, double-click the Setup.exe file saved in the DISK1 folder of the system CD. After installing it, an installed program window is not displayed.

To install each system, install Microsoft® Internet Explorer 4.01 or later. If it is not installed, install each system after installing it.

NOTE

- To operate each system, install Microsoft® Internet Explorer 4.01 or later. If it is not installed, each system does not operate normally.
- Before installing each system, be sure to terminate such a program residing in the memory as virus monitoring software. If each system is installed without terminating the program, an error may occur. In this case, uninstall the system by referring to “2.2 Uninstalling the System” and terminate all Windows® programs. Then, install each system once again.
- To install and uninstall each system by using Windows® 2000, set “Administrator” or “Member of Administrators” as the user account to be logged on.
- To install and uninstall each system by using Windows® XP, set “Computer administrator” as the user account to be logged on. If “Account with limitations” is set, each system does not operate normally.

(*) No.10 and No.28 in <Table of Systems Supported by Windows® 2000 and Windows® XP> in “PREFACE” are excepted.

2.2 Uninstalling the System (*)

To uninstall each system for version-up, observe the following procedure.

(1) Uninstalling from Windows® 95 or Windows® 98

Open [Settings] in the [Start] menu – [Control Panel]. Double-click [Add/Remove Programs], select "Each System" by the [Install/Uninstall] tab, and click the [Change/Remove] button. When the [Confirm File Deletion] window is displayed, click the [Yes] button.

(2) Uninstalling from Windows® 2000

Open [Settings] in the [Start] menu – [Control Panel]. Double-click [Add/Remove Programs], click [Change or Remove Programs], select "Each System," and click the [Change/Remove] button. When the [Confirm File Deletion] window is displayed, click the [Yes] button.

(3) Uninstalling from Windows® XP

Open ([Settings] –) [Control Panel] in the [Start] menu. Double-click [Add or Remove Programs], click [Change or Remove Programs], select "Each System," and click the [Change/Remove] button. When the [Confirm File Deletion] window is displayed, click the [Yes] button.

When a shortcut of each system executable file has been created on the desktop, etc. delete this shortcut.

NOTE

- When the [Remove Shared File?] window is displayed while each system is uninstalled on Windows®, click [No] not to delete the shared file.
- To install and uninstall each system by using Windows® 2000, set "Administrator" or "Member of Administrators" as the user account to be logged on.
- To install and uninstall each system by using Windows® XP, set "Computer administrator" as the user account to be logged on.
- If the [Add/Remove Programs] window is locked (inoperable) when each system is uninstalled by using Windows® 2000, log off from [Shut Down] in the [Start] menu of Windows®, and then log on again on the [Log On to Windows] window.

(*) No.10 and No.28 in <Table of Systems Supported by Windows® 2000 and Windows® XP> in "PREFACE" are excepted.

2.3 Starting Up the System (*)

(1) The system to be installed by each system is automatically registered in the [Start] menu of Windows®. From this [Start] menu, select [Programs (All Programs)] – [Hitachi S10] – "Each System" to start the system.
If the logged-on user name in installing each system is different from the user name in starting each system, each system is not displayed in the [Start] menu. In this case, create a shortcut of the executable file (extension .exe) for each system shown below and then double-click this shortcut to start each system.

<Executable File Storage Directory Table>

No.	System name	Type	Executable file storage directory (*1)	Executable file name
1	S10Tools SYSTEM	S-7890-01	C:\Hitachi\S10	S10Ladder.exe
				S10Tool.exe
2	LADDER CHART SYSTEM	S-7890-02	C:\Hitachi\S10\2ALDC	S10Ladder.exe
3	HI-FLOW SYSTEM	S-7890-03	C:\Hitachi\S10\HF	S10Tool.exe
4	CPMS LOADING SYSTEM	S-7890-04	C:\Hitachi\S10\CPMS	Cpms.exe
5	CPMSE LOADING SYSTEM	S-7890-05	C:\Hitachi\S10\CPMSE	Cpmse.exe
6	CPMS DEBUGGER SYSTEM	S-7890-06	C:\Hitachi\S10\DEBUG	Debugger.exe
7	CPMSE DEBUGGER SYSTEM	S-7890-07	C:\Hitachi\S10\DEBUGE	DebuggerE.exe
8	GP-IB LOADING SYSTEM	S-7890-08	C:\Hitachi\S10\GPIB	Gpib.exe
9	BACKUP RESTORE SYSTEM	S-7890-09	C:\Hitachi\S10\BACKUP	SysAllSaveLoad.exe
10	NX/Tools-S10 SYSTEM	S-7890-13	C:\Hitachi\S10\NX	NXTool.exe
11	4α LADDER CHART SYSTEM	S-7890-17	C:\Hitachi\S10\4ALDC	S10Ladder_4A.exe
12	4αH LADDER CHART SYSTEM	S-7890-18	C:\Hitachi\S10\4AHLDC	S10Ladder_4AH.exe
13	LADDER COMMENT CONVERTER SYS	S-7890-19	C:\Hitachi\S10\CFCONV	Cfconv.exe
14	HIGH SPEED REMOTE I/O SYSTEM	S-7890-21	C:\Hitachi\S10\HISRIO	HiSpeedRIO.exe
15	CPU LINK SYSTEM	S-7890-22	C:\Hitachi\S10\CPULINK	CpuLink.exe
16	4ch ANALOG PULSE COUNTER SYS	S-7890-23	C:\Hitachi\S10\ANALOG	AnalogPuls.exe
17	EXTERNAL SERIAL LINK SYSTEM	S-7890-24	C:\Hitachi\S10\EXLINK	ExLink.exe
18	S10ET LINK SYSTEM	S-7890-25	C:\Hitachi\S10\ETLINK	EtherNet.exe
19	J.NET SYSTEM	S-7890-27	C:\Hitachi\S10\JNET	JNet.exe
20	OD.RING/SD.LINK SYSTEM	S-7890-28	C:\Hitachi\S10\ODRING-SDLINK	ODRing.exe
21	ET.NET SYSTEM	S-7890-29	C:\Hitachi\S10\ETNET	Et_Net.exe
22	FL.NET SYSTEM	S-7890-30	C:\Hitachi\S10\FLNET	FLnet.exe
23	D.NET SYSTEM	S-7890-31	C:\Hitachi\S10\DNET	DNet.exe
24	LADDER CHART MONITOR SYSTEM	S-7890-34	C:\Hitachi\S10\2ALDCM	S10LadderM.exe
25	HI-FLOW MONITOR SYSTEM	S-7890-35	C:\Hitachi\S10\HFM	S10ToolM.exe
26	IR.LINK SYSTEM	S-7890-36	C:\Hitachi\S10\IRLINK	IrLink.exe

(*1) Directory name when "C" is the drive name of installing destination.

(*) No.10 and No.28 in <Table of Systems Supported by Windows® 2000 and Windows® XP> in "PREFACE" are excepted.

2.4 Terminating the System

To terminate the ladder diagram system and HI-FLOW system, select the [Application termination] from the [File] menu. When the system terminates, the Windows® screen appears again.

THIS PAGE INTENTIONALLY LEFT BLANK.

3 S10TOOLS SHEETS

Application programs in the S10Tools system have a structure different from that of their DOS versions. Programs on the PCs are handled in the same way as in both the S10Tools system and DOS system. In the S10Tools system, however, application programs are handled as sheets on a personal computer.

3.1 Relationships to DOS Version Files (.PSE, etc.)

DOS version ladder files are handled as separate files with their extensions variously determined according to the functionality. Ladder Chart is capable of loading DOS version files. It can also load WLD files for Ladder Chart Versions 5.0 and earlier.

3.2 Windows® Version Files (PSE Files)

The Windows® version of Ladder Chart saves files having the same extension (.pse) as those for the DOS version. The user can change the target for such file save operations.

- Sequence (management area, SQET, TUC setting, ladder program, and user mathematical/logical function)
- Sequence + data (sequence + DW register)
- Sequence + fence (sequence + DW register + ladder program free space)
- Sequence + work (sequence + DW register + ladder program free space + FW/BI register)
- All areas (sequence + DW register + ladder program free space + FW/BI register + registers enumerated below)

(Registers saved when all areas are selected: X, Y, J, Q, G, R, M, K, T, U, C, N, P, V, E, Z, and S, of which T, U, and C are contacts.)

To save any type of file not listed above, use the FD function of the ladder diagram system for Windows®.

3.3 S10Tools Sheets

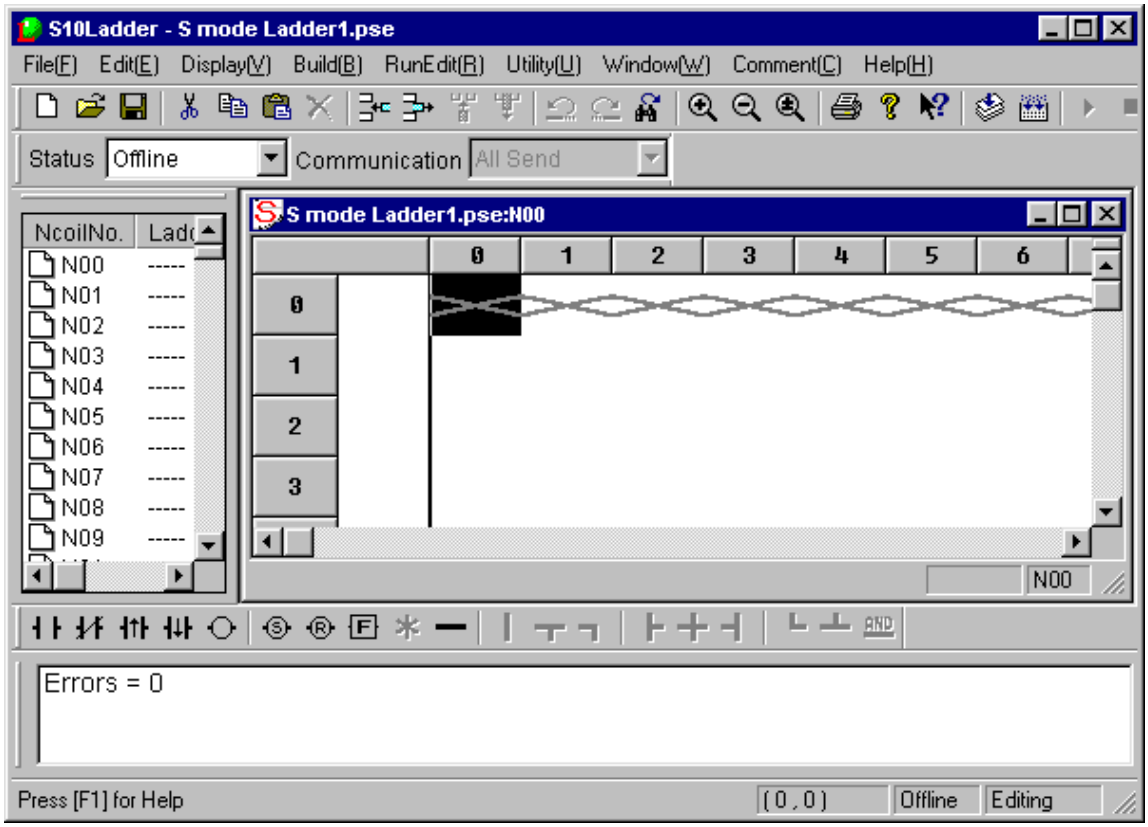
The S10Tools system manages the following types of sheets.

- Ladder sheet
- HI-FLOW process sheet
- HI-FLOW sheet

One of these types is specified when creating a new sheet or opening an existing sheet.

3.4 Ladder Sheets

As with their DOS versions, ladder sheets in the S10Tools system are managed as N-coils. The user can create up to 256 N-coils numbered from N000 to N0FF, where 000 and 00F are in hexadecimal. To select an N-coil to be edited, use the N-coil switching function. The user cannot edit more than one sheet simultaneously.



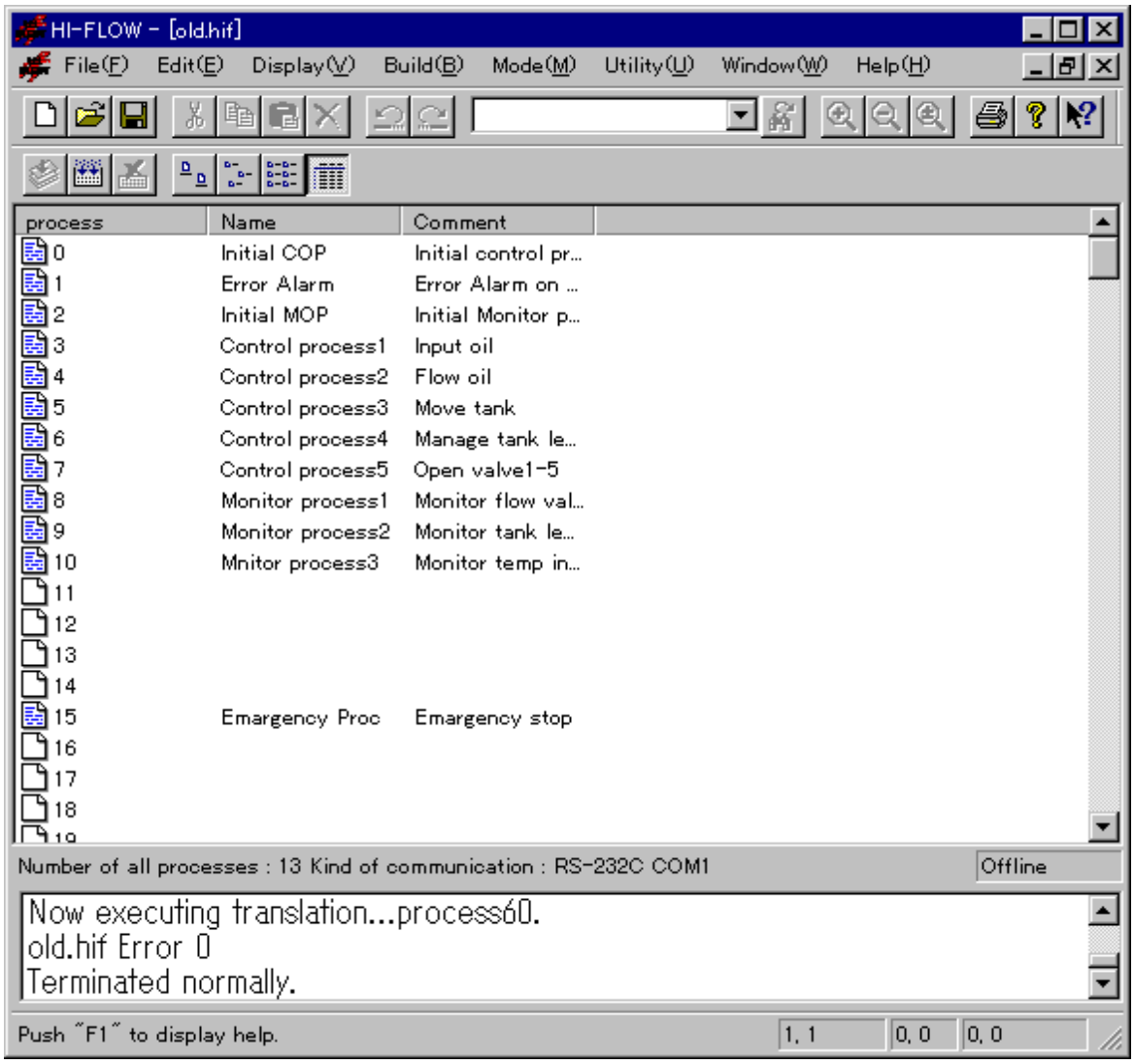
A ladder program can be created by entering ladder symbols. Paste registered ladder symbols from the symbol bar into a ladder program by using drag-and-drop or other operations.

<Ladder symbol bar>

3.5 HI-FLOW Process Sheets

The S10Tools system visually manages HI-FLOW programs for each process. HI-FLOW process sheets provide all necessary information for visual management of multiple processes.

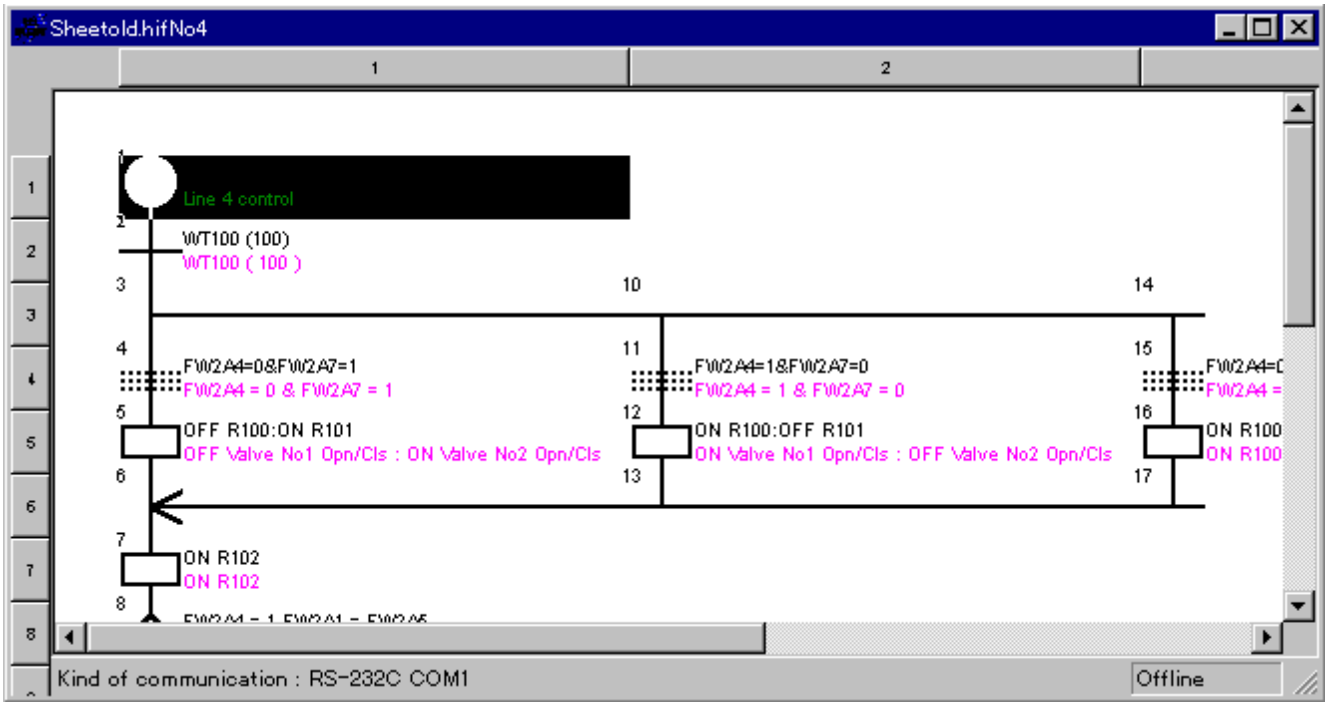
A HI-FLOW process sheet is an equivalent of the process list screen in the DOS version.



Clicking a process icon on the process sheet opens a HI-FLOW sheet.

3.6 HI-FLOW Sheets

HI-FLOW sheets contain HI-FLOW programs that are managed on HI-FLOW process sheets. Up to 256 HI-FLOW sheets can be created, and on each such sheet can up to 256 lines, or up to 999 steps, be coded (in the same language as used in the DOS version).



A HI-FLOW program can be created by entering HI-FLOW symbols. Paste registered HI-FLOW symbols from the symbol bar into the program by using drag-and-drop or other operations.

<HI-FLOW symbol bar>

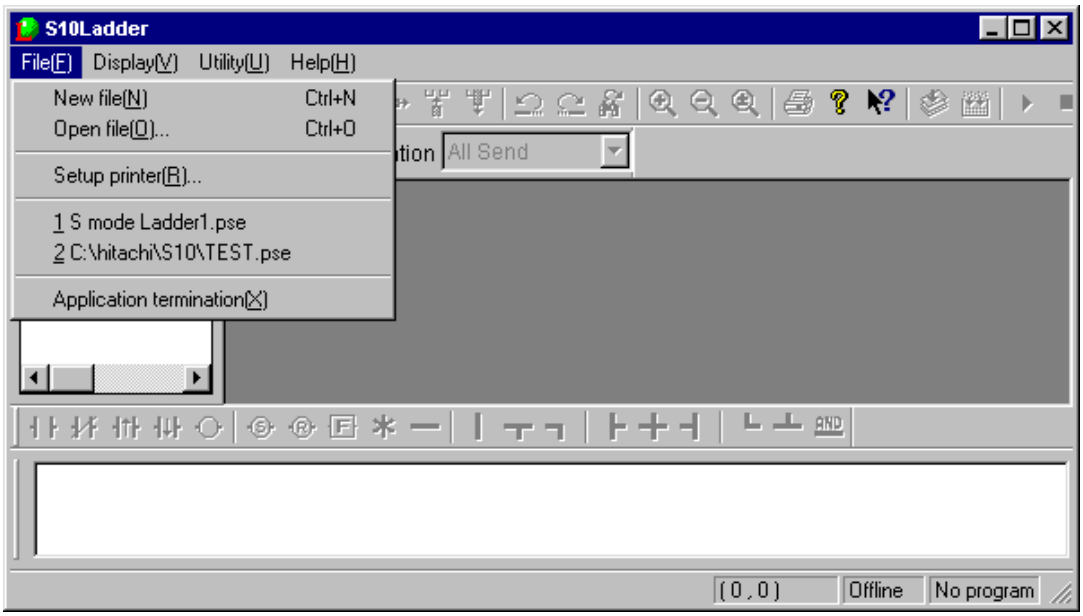
THIS PAGE INTENTIONALLY LEFT BLANK.

4 LADDER SHEET FUNCTIONS AND THEIR USE

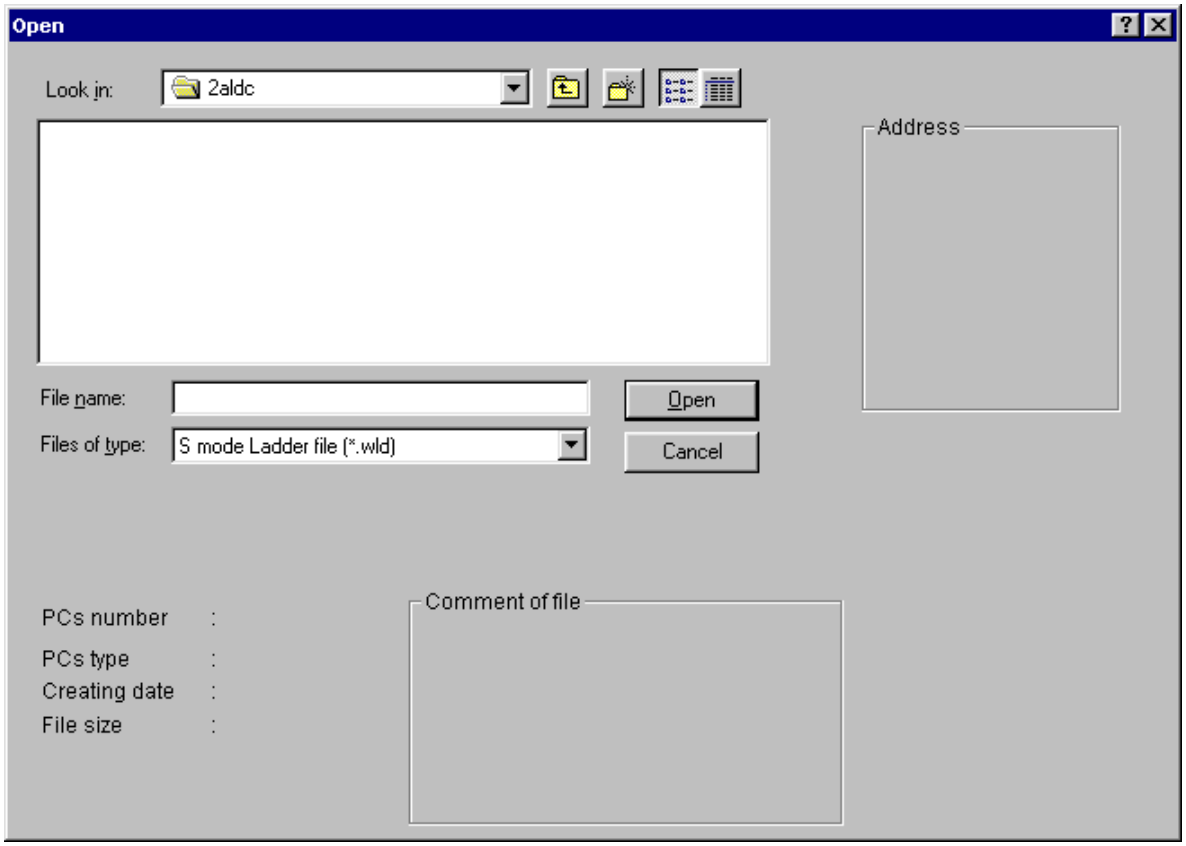
This chapter outlines ladder sheet functions and how to use them. For details, refer to help for the ladder chart system. Use the [Help] menu for online help guide.

4.1 Creating Ladder Sheets

To create a ladder sheet, select [File] menu – [New file].

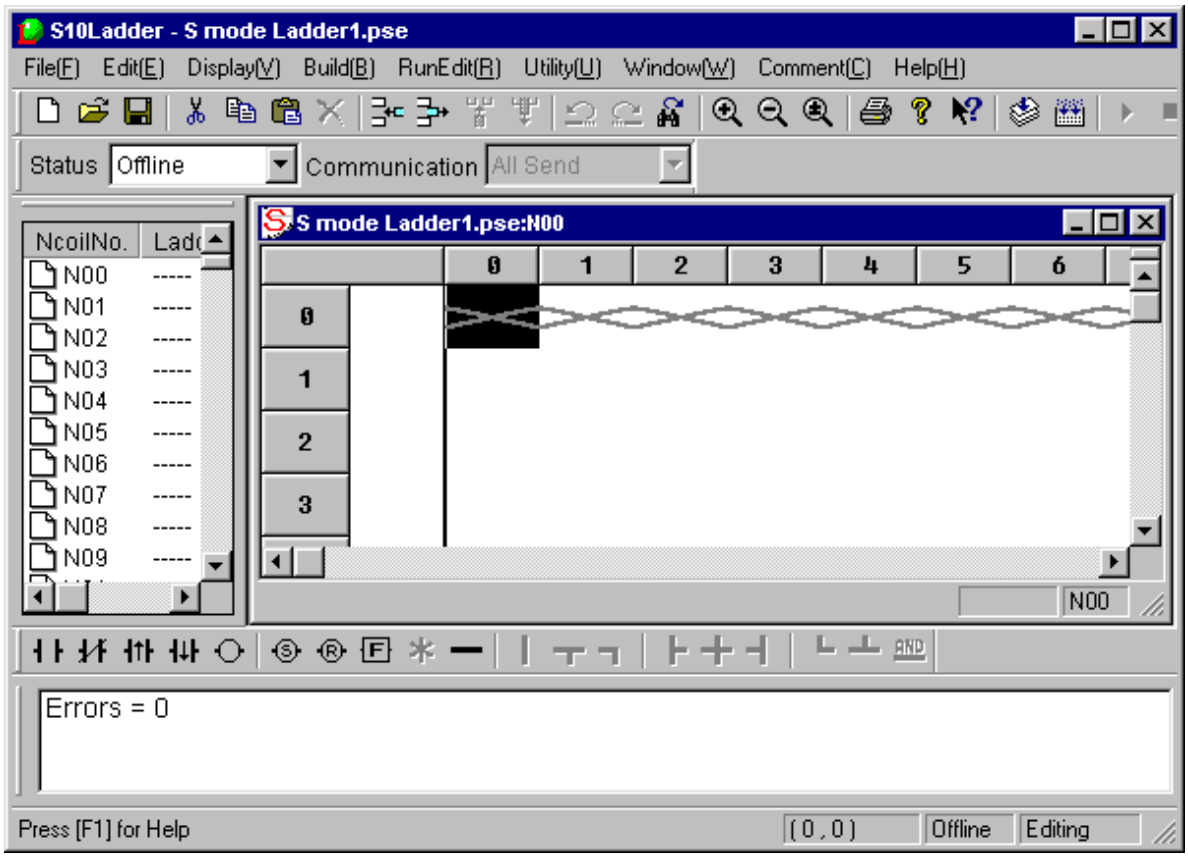


To open an existing ladder sheet, select [File] menu – [Open file].



When a new ladder sheet is created or an existing ladder sheet is opened, the ladder sheet numbered N000 appears as the first one. One ladder sheet is available for each N-coil. To change it to another, select [Window] menu – [Change N coil]. The user can create N-coils numbered from N000 to N0FF.

<Ladder sheet>



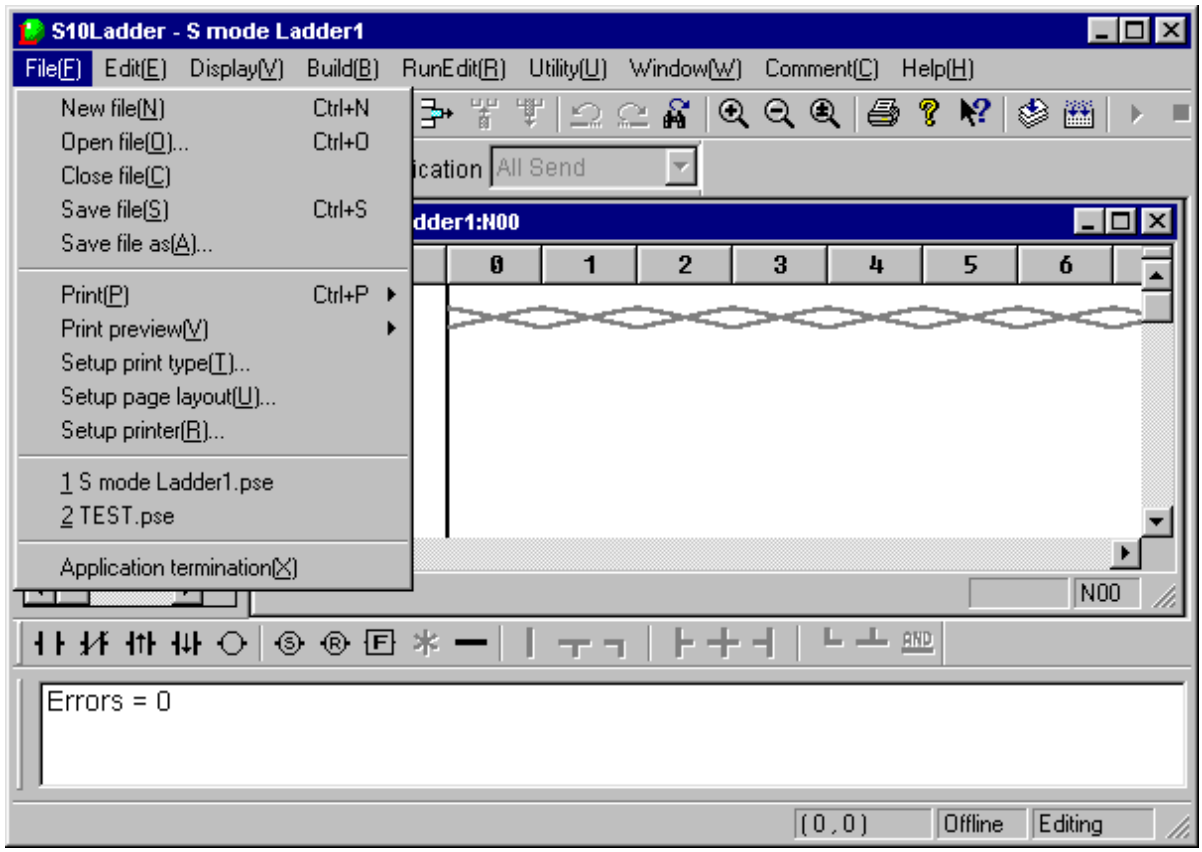
A ladder sheet has the following nine main menus (pull-down menus).

File: Provides file-related functions including saving, reading, and printing ladder sheets.
Edit: Provides edit functions for editing elements displayed in ladder circuits.
Display: Provides functions related to display formats of ladder circuits.
Build: Provides functions related to transmission and reception between the PCs and ladder programs.
RunEdit: Enables ladder circuits to be rewritten during running.
Utility: Provides utility functions.
Window: Provides functions for operations on ladder sheet windows.
Comment: Provides PI/O comments.
Help: Provides help.

The toolbar also contains the same functions as these menus.

4.2 Ladder Sheet File Functions

The ladder sheet file functions are available from a pull-down menu.



The file functions are described below.

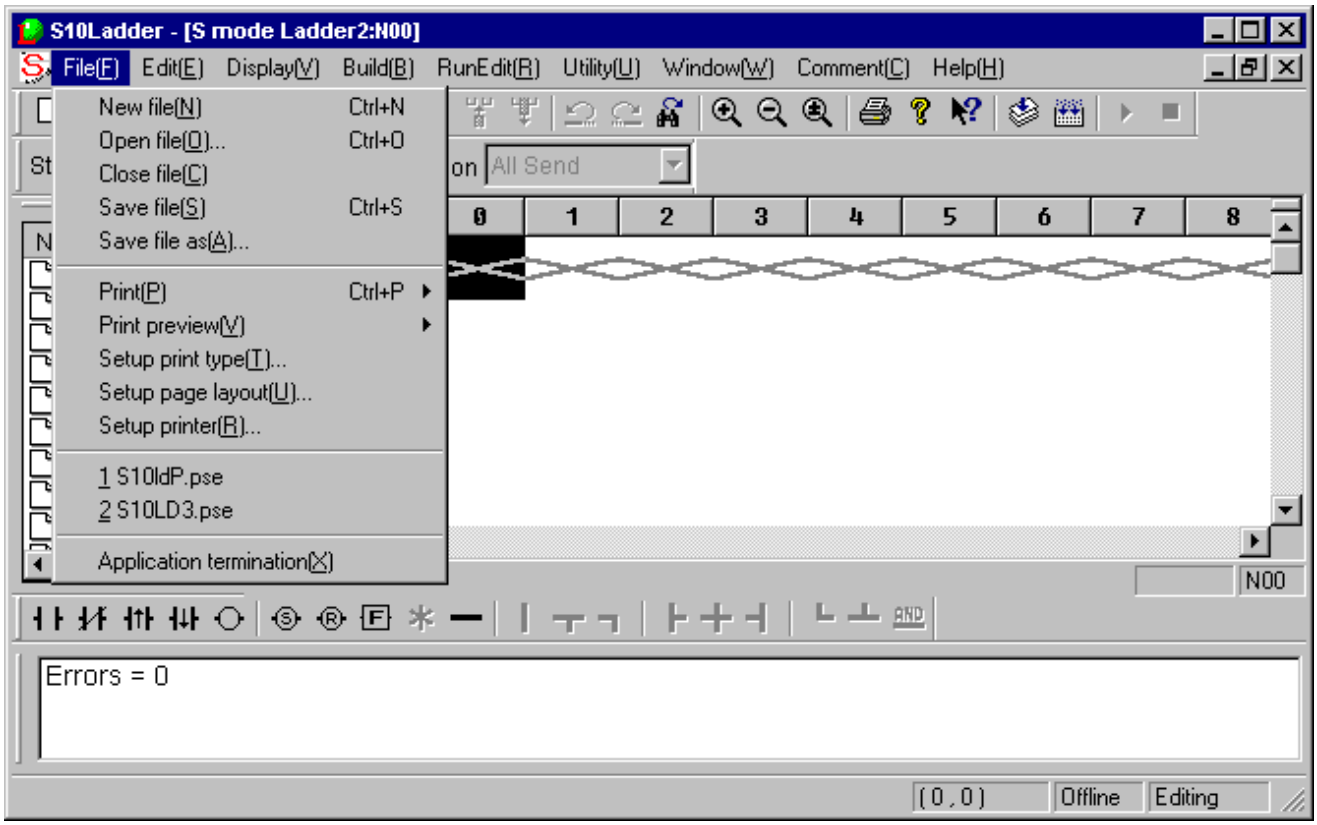
No.	Level 1	Level 2	Level 3	Description
1	File	New file		Opens a window to create a new program.
2		Open file		Reads a specified program file.
3		Close file		Closes the window currently active.
4		Save file		Saves data in the window currently active (editing can be continued).
5		Save file as		Saves all data for the window currently active as a different name (editing can be continued).
6		Print	Circuit	Prints a circuit diagram.
7			Memory status	Prints capacities.
8			LPET	Prints an LPET.
9			TUC	Prints TUC settings.
10			Devices in use	Prints the devices in use.
11			Cross reference	Prints a cross-reference list.
12			Coil reference	Prints a coil reference list.
13			UFET	Prints an UFET.
14			I/O comment	Prints I/O comments.

No.	Level 1	Level 2	Level 3	Description
15	File (continued from the previous page)	Print preview	Circuit	Displays a print image of a circuit diagram.
16			Memory status	Displays a print image of a system capacity.
17			LPET	Displays a print image of an LPET.
18			TUC	Displays a print image of TUC settings.
19			Device usage	Displays a print image of the devices in use.
20			Cross reference	Displays a print image of a cross reference list.
21			Coil reference	Displays a print image of a coil reference list.
22			UFET	Displays a print image of a UFET.
23			I/O comment	Displays a print image of I/O comments.
24		Setup print type		Sets details for a print job.
25		Setup page layout		Sets a page layout.
26		Setup printer		Sets up a printer.
27		File names 1, 2, ...		Displays the names of files used previously.
28		Application termination		Terminates the application involved.

LPET: Ladder program entry table
TUC: Timer one-shot counter
UFET: User function entry table

4.2.1 Circuit diagram with the ladder cross reference

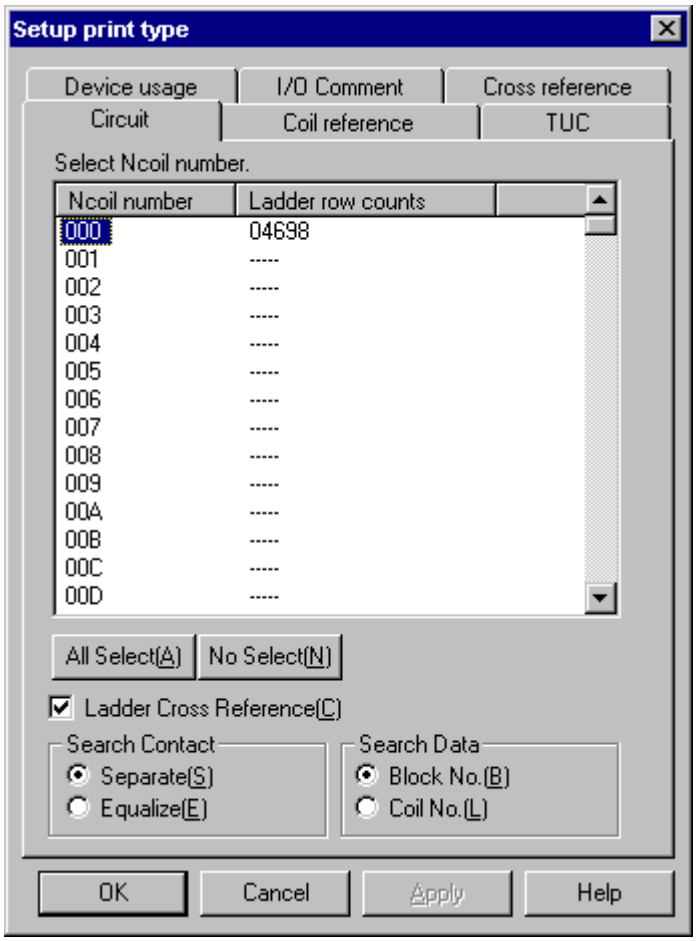
To print a circuit diagram with the ladder cross-reference, select [Setup print type] from the pull-down menu of the [File] in the ladder sheet and select “Ladder Cross Reference” and that enables the output to the printer. Select [File] menu – [Print] then [Circuit] to send the diagram to the printer. It can also be displayed on-screen by selecting [File] menu – [Print preview] and then [Circuit].



(1) Setting up printing details for a circuit diagram ladder cross-reference (Setup print type)

To set the output specification for printing a circuit diagram with the ladder cross reference, select [Circuit] tab in the [Setup print type] dialog box and click the “Ladder Cross Reference.” (The N coil to be printed is selected from the N coil list in this window.)

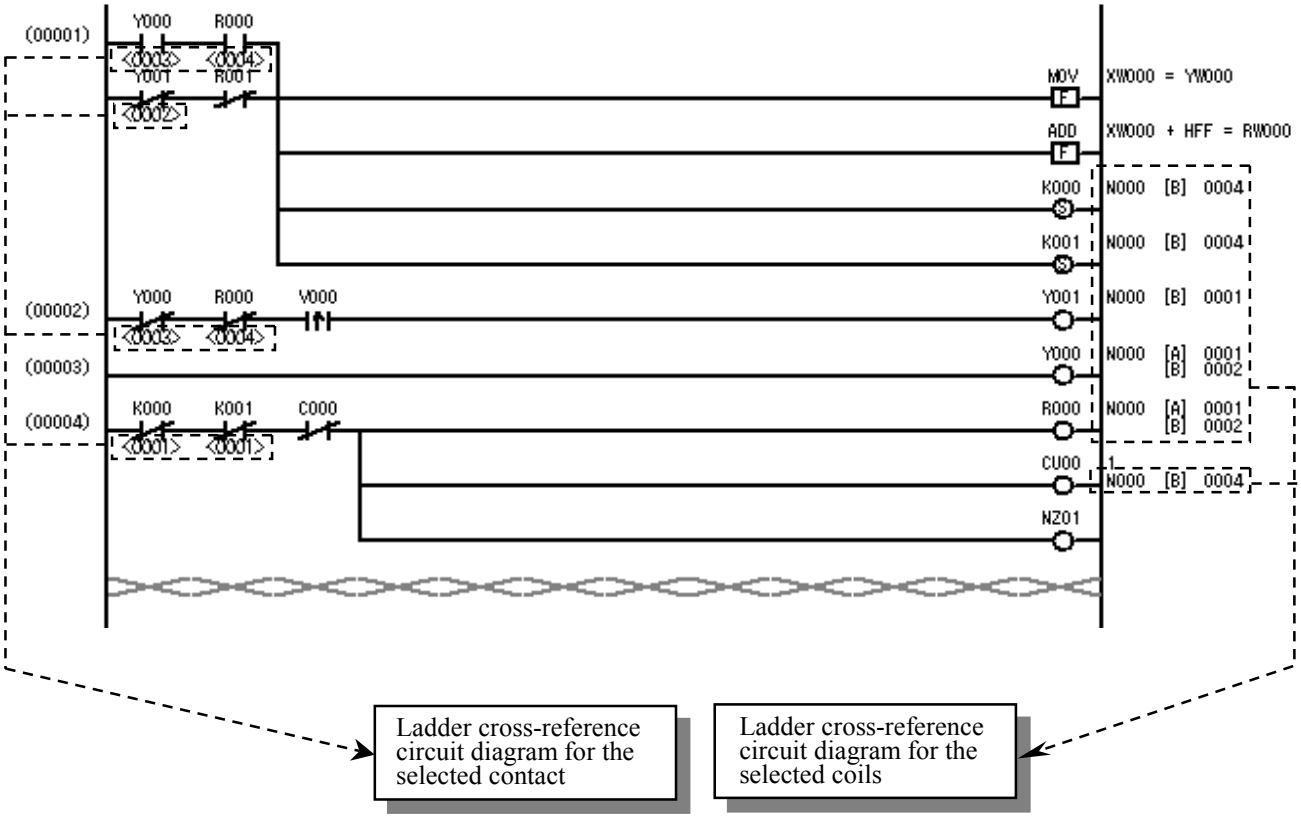
<[Setup print type] dialog box>



- [All Select] button
  Click this button to highlight all the N coils in which the ladder sheets exist in the list (displays line counts). A specific N coil(s) to be printed can be also selected by simply clicking them.
- [No Select] button
  Click this button to select no N coil in the list.
- "Ladder Cross Reference" check box
  Click this check box to send a cross-reference circuit diagram to the printer and enable to designate the specification of the output format ("Search Contact" and "Search Data").
- Search Contact
  Print format of search contacts to be printed with the ladder cross-reference can be specified in this field.
  Select either "Separate" (separating contacts for printing) or "Equalize" (separateing no contact for printing). The default format is "Separate."

- Search Data
  This field specifies an outputting method of search results.
  Select either “Block No.” (outputting in block numbers) or “Coil No.” (outputting in coil numbers). The default output method is “Block No.”

(2) Circuit diagram with Cross-reference
Select “Ladder Cross Reference” in the [Setup print type] dialog box. Select [File] menu – [Print] and then [Circuit]. A cross-reference circuit diagram shown below is output to the printer.



(Note 1) Cross-reference items to be printed (printing to contact/coil)

Cross-references to be output to the circuit diagram are corresponding to the output coils in the ladder program as listed below.

<Cross-reference items to be printed>

Symbol	Printed or Not printed
—(R)— : Keep Relay Reset coil	Printed
—(S)— : Keep Relay Set coil	Printed
—◯— : Output coil (*1)	Printed
—[F]— : Arithmetic function	Not printed

(*1)
Output coils to be printed
- Y: External output
- R: Internal register
- M: Extended 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

(Note 2) Cross-reference printable items (printing to coil)

A table below is a list of cross-reference printable items when printing a circuit diagram.

No.	Item	Print format	Remarks
1	Nesting numbers using a coil register	N*** ***: 3 digits in hexadecimal	
2	Type of symbols using a coil register	[A]: Contact A [C]: Coil (*2) [B]: Contact B	Arithmetic functions are not printed.
3	Block numbers using a coil register	****: 4 digits in decimal	
4	Name of the output coil block using a coil register	Name of the output coil (print a register that is used in a coil and register in the following format) printed in the format below Example: —◯— R050	Arithmetic functions are not printed.

(*2) Printed out when a double coil is used between the nesting (A double coil can be used in nesting).

(Note 3) Cross-reference printable items (printing to contact)

The following table is a list of cross-reference printable items when printing a circuit diagram.

No.	Item	Print format	Remarks
1	Block number (circuit number) that uses the same register as that used by contact as a coil.	<****>: 4 digits in decimal	Only the coil used by the same nesting is to be printed. (*3)

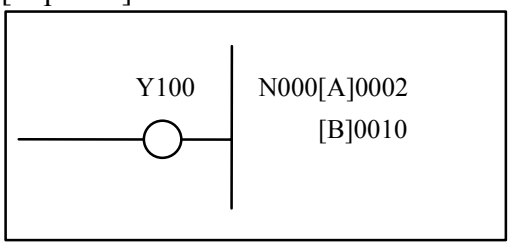
(*3) For the block number of the target coil to be displayed under the contact, the coil used by the same nesting is to be printed and the coil used by another nesting is not printed.

(Note 4) Printing format for cross-references (printing to coil)

You can specify any of the following printing formats for cross-reference printing (using the [Setup print type] dialog box).

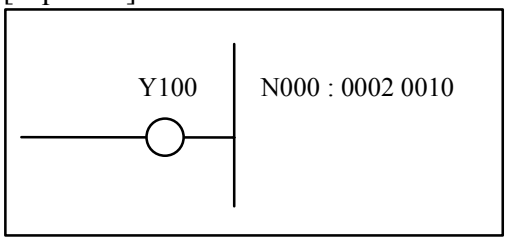
- Search contact print format
  - This function specifies a print format of search contacts to be printed with the ladder cross-reference.
  - Select either “Separate” (separating contacts to print) or “Equalize” (separating no contact to print).

[Separate]



Contacts [A] and [B] of Y100 are separately printed.

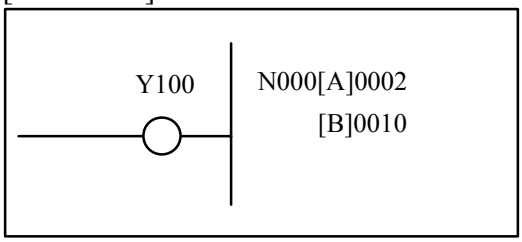
[Equalize]



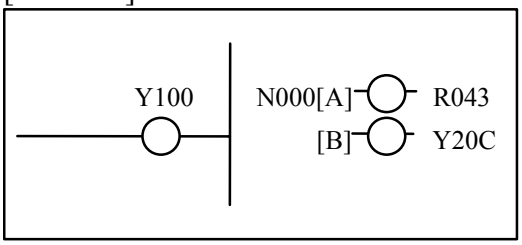
Contacts [A] and [B] of Y100 are printed as a whole.

- Search Data
  - This field specifies an outputting method of search results.
  - Select either “Block No.” (outputting with block numbers) or “Coil No.” (outputting with coil numbers). The default output method is “Block No.”

[Block No.]



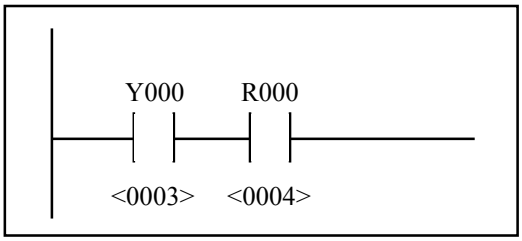
[Coil No.]



All the output coil names of the blocks with the contact points searched will be printed.

(Note 5) Printing format for cross-reference (printing to contact)

The printing format is fixed as shown below. The block number (circuit number) that uses the same register as that used by the specified contact as a coil is printed in < > under the contact (contact A or contact B).



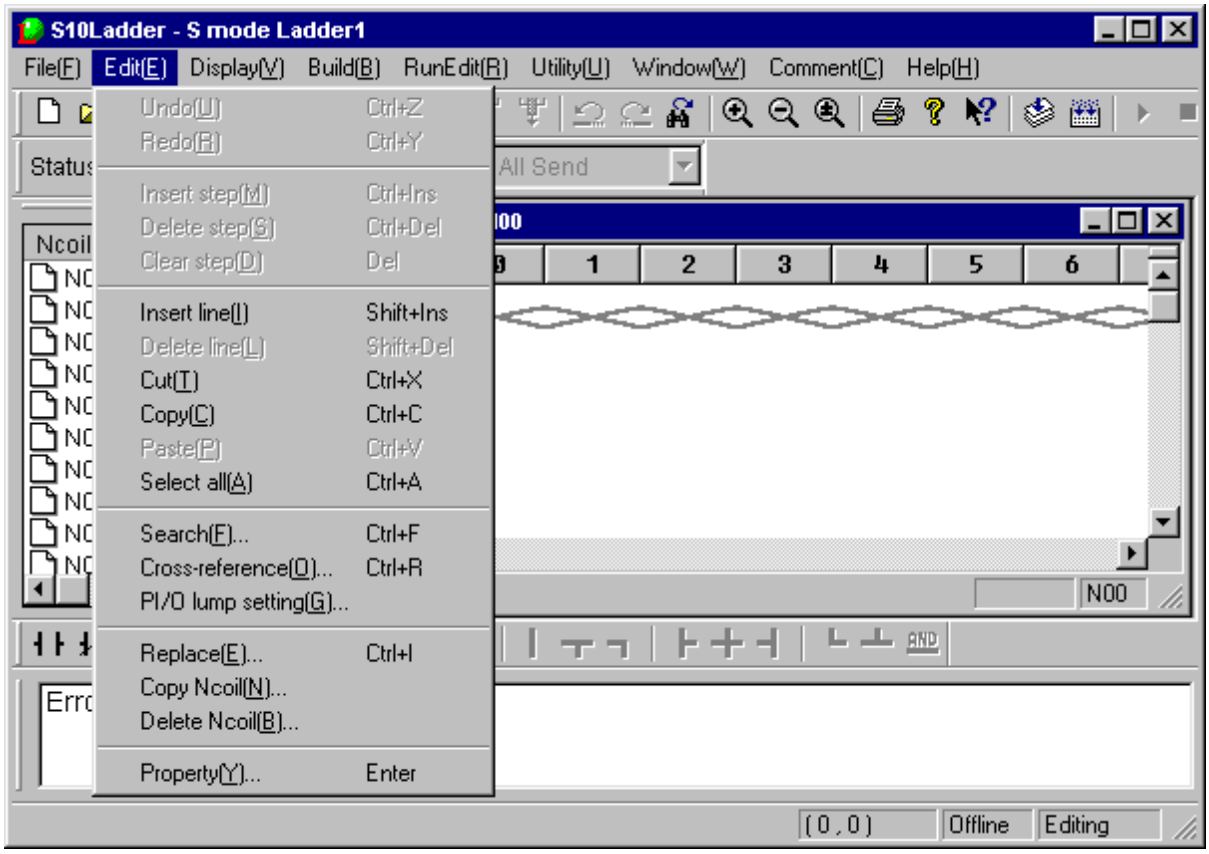
4.3 Ladder Sheet Edit Functions

The ladder sheet edit functions are selectable from the symbol bar and a pull-down menu. The basic procedure required for using these functions is:

(1) Select a ladder symbol (such as contact A) and paste it in the desired position on a ladder sheet.

(2) Set parameters for the pasted ladder symbol.

(3) Perform editing by repeating Steps (1) and (2) or by specifying a line or a range of lines in the sheet.



The symbol bar containing symbols for use in editing is shown below.

<Ladder symbol bar>

The ladder symbol bar contains the following symbols, which are listed as arranged on the bar from left to right:

- A contact
- B contact
- Rising edge contact
- Falling edge contact
- Coil
- Set coil
- Reset coil
- Operation function
- Loop back

Others (branch symbols)

The edit functions are described below.

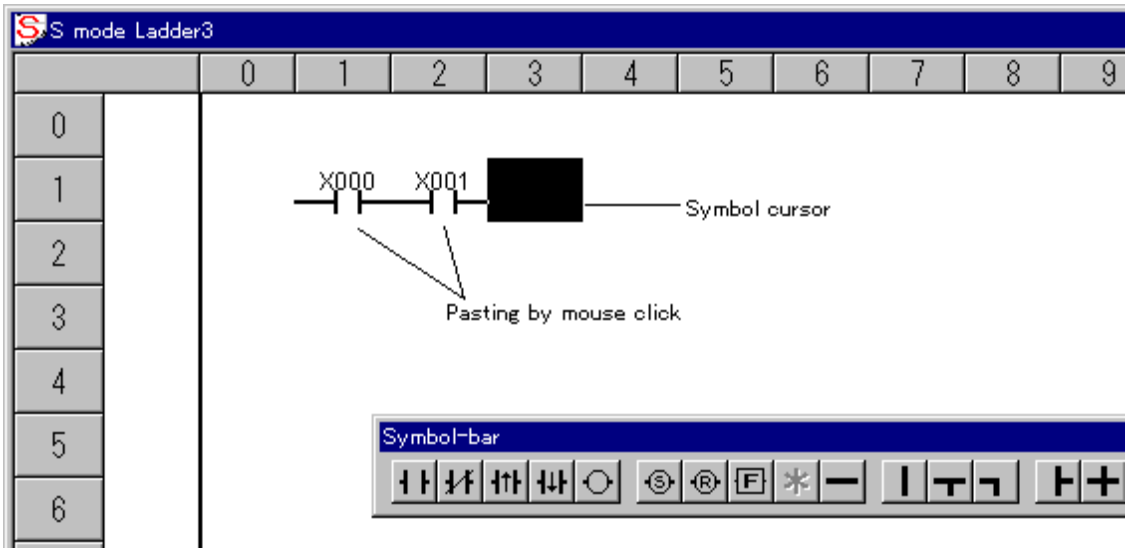
No.	Level 1	Level 2	Level 3	Description
1	Edit	Undo		Reverses the last action.
2		Redo		Reexecutes the action canceled by “Undo.”
3		Insert step		Inserts a null step at a specified position.
4		Delete step		Deletes a specified step and moves the subsequent steps one step to the left.
5		Clear step		Clears a specified step.
6		Insert line		Inserts one line above a specified position.
7		Delete line		Deletes a specified line.
8		Cut		Removes the selected area and copies it to the clipboard.
9		Copy		Copies the selected area to the clipboard.
10		Paste		Pastes the line copied to the clipboard to a specified position.
11		Select all		Selects all displayed circuits.
12		Search		Searches for the symbols specified for the currently open N-coil.
13		Cross-reference		Searches for the symbols specified for all existing N-coils.
14		PI/O lump setting		Simultaneously changes the registers allocated to symbols.
15		Replace		Replaces the character strings specified for all existing N-coils.
16		Copy N coil		Copies a specified N-coil.
17		Delete N coil		Deletes a specified N-coil.
18		Property		Sets properties.

4.3.1 Pasting ladder symbols

There are several methods of pasting ladder symbols to sheets. Select the desired method.

(1) Pasting at the input cursor position with the mouse

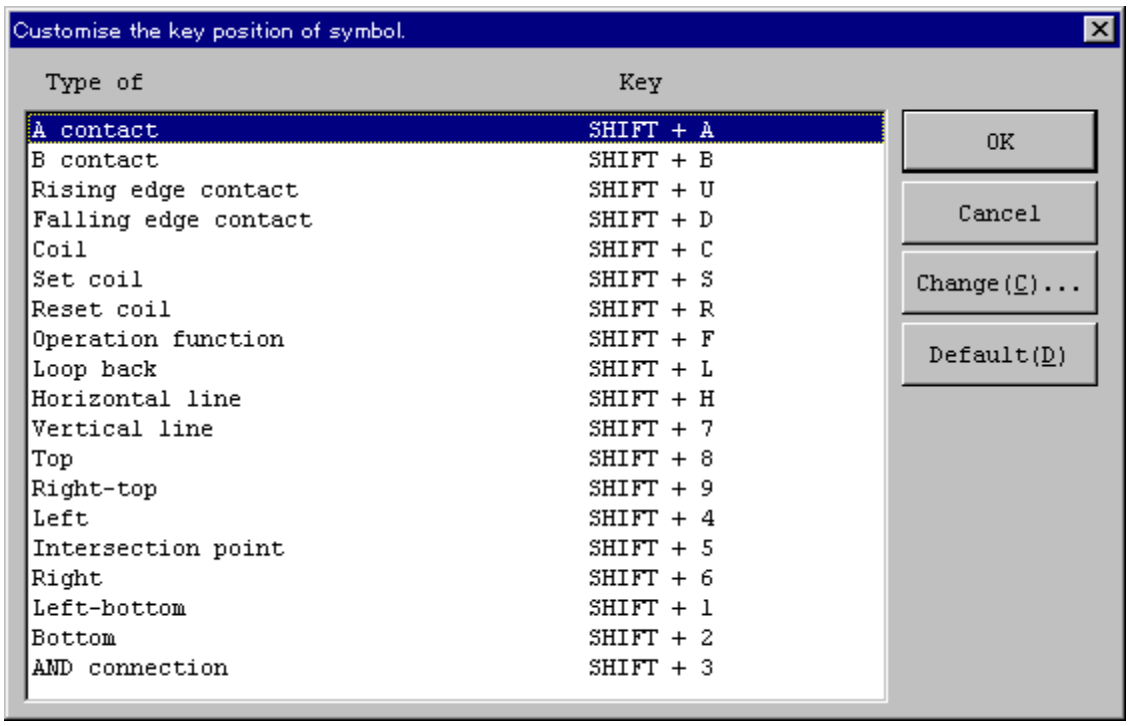
Click the desired symbol on the symbol bar. The symbol will then be pasted at the symbol cursor position.



(2) Pasting with keys

A symbol can be pasted by a specified combination of key strokes at the symbol cursor position on the sheet. To move the symbol cursor, use the [←], [→], [↑], and [↓] arrow keys. Key strokes can be customized by selecting [Utility] menu – [Keyboard].

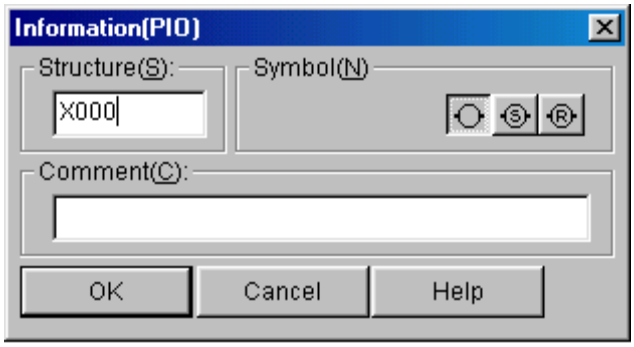
<[Customize the key position of symbol.] window>



(3) Displaying the input box

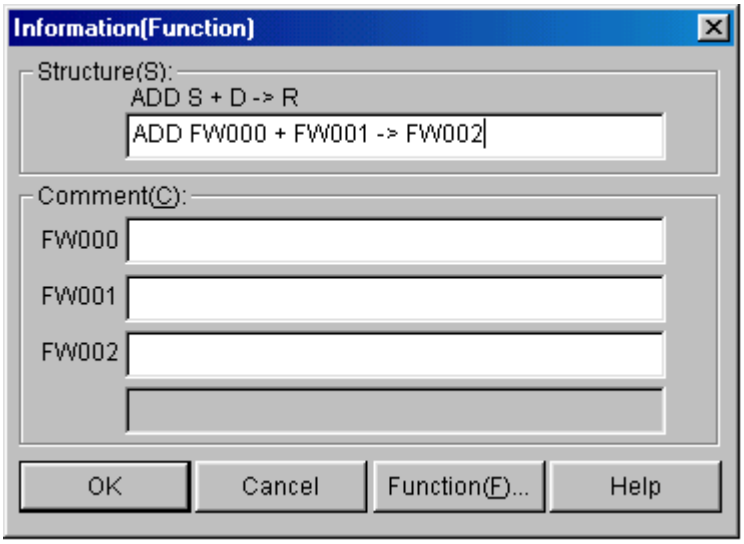
When a symbol is pasted, a parameter input box automatically is displayed. To open an existing parameter input box, double-click the symbol. Alternatively, move the symbol cursor and press the [Enter] key.

<Parameter input box (for contacts)>



In this input box, the user can enter a "Structure" and a "Comment." The input box contains three symbols: coil, set coil, and reset coil. The user can also change these symbols.

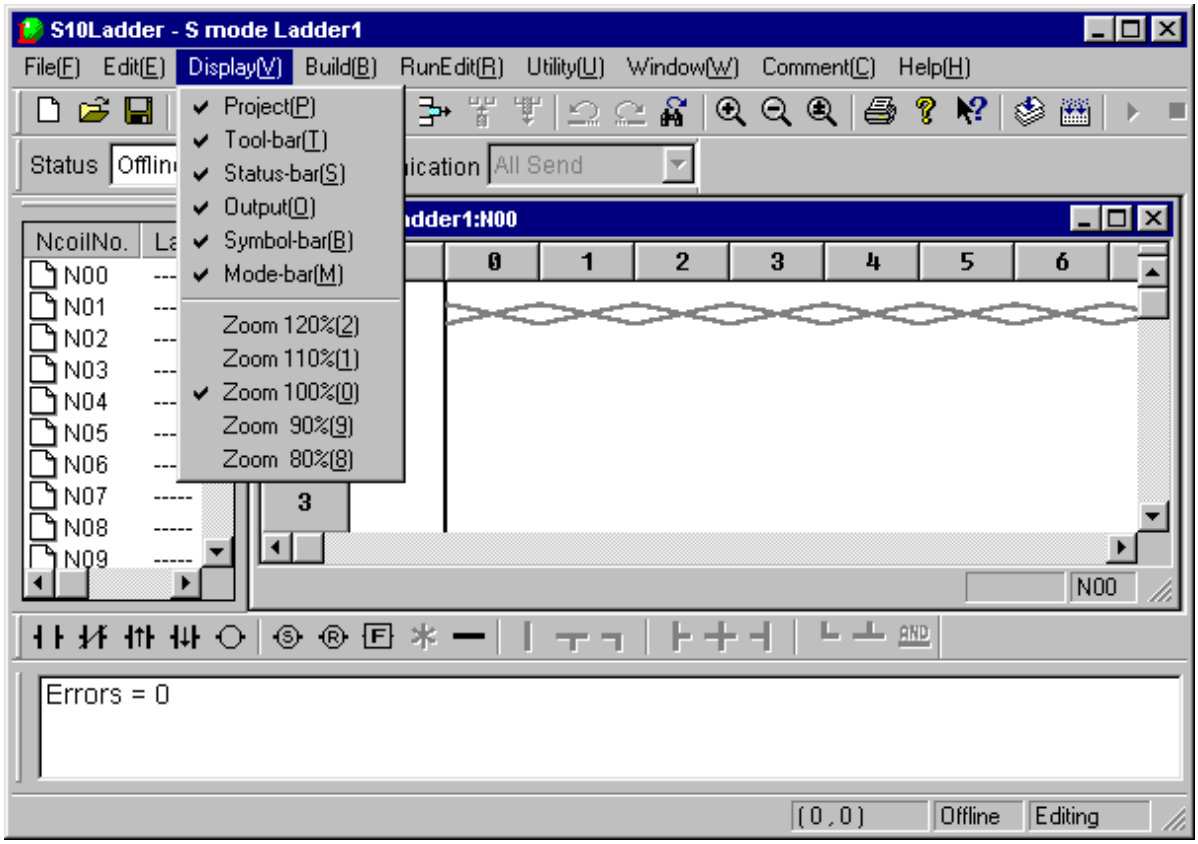
<Parameter input box (arithmetic function case)>



In this input box, the user can enter "Structure" of arithmetic function and a "Comment" of each parameter. To input "Structure," follow an input format displayed when inputting function name. (Between symbols is delimited by space. "=" is also available in stead of "->" for assignment.)

4.4 Ladder Sheet Display Functions

The ladder sheet display functions are selectable from a pull-down menu and the standard toolbar.

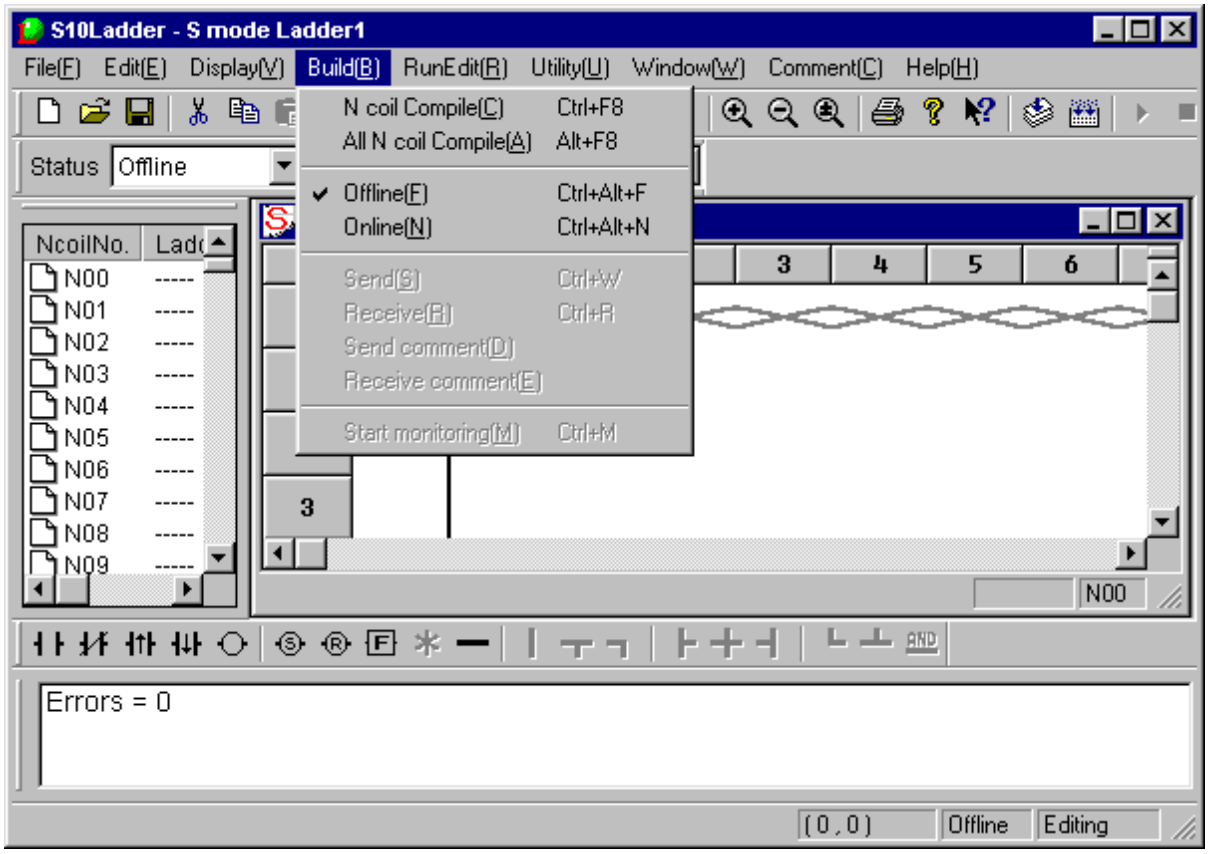


The display functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Display	Project		Shows or hides the N coil list.
2		Tool-bar		Displays or hides the toolbar.
3		Status-bar		Displays or hides the status bar.
4		Output		Displays the area in which compilation results are displayed.
5		Symbol-bar		Displays or hides the symbol bar.
6		Mode-bar		Displays or hides the mode bar.
7		Zoom 120%		Sets 120% of actual size.
8		Zoom 110%		Sets 110% of actual size.
9		Zoom 100%		Sets actual size (100%).
10		Zoom 90%		Sets 90% of actual size.
11		Zoom 80%		Sets 80% of actual size.

4.5 Ladder Sheet Build Functions

The ladder sheet build functions are selectable from a pull-down menu.



In the DOS version, machine language is generated when symbols are entered. By comparison, the S10Tools system compiles an edited program all at once. The system also checks inputs for validity at compilation time.

The target to be edited and available functions vary, depending on which mode, offline or online, is currently enabled.

- Offline mode
  Memory content in the personal computer or a file is edited.

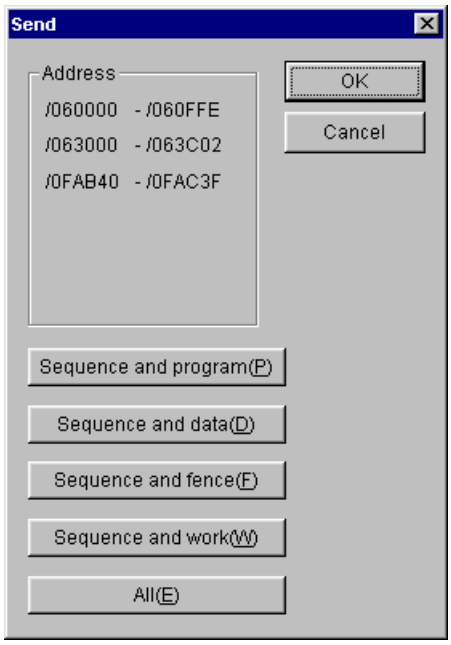
- Online mode
  Memory content in the personal computer or the file which matches that in the PCs is edited.
  To switch to online mode, make a match with the PCs through transmission or reception.

When the ladder diagram system is started, it always enters offline mode. Use a pull-down menu to switch to online mode, if necessary.

The build functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Build	N coil Compile		Compiles the currently open N-coil.
2		All N coil Compile		Compiles all existing N-coils.
3		Offline		Switches to offline mode.
4		Online		Switches to online mode.
5		Send		Sends a process to the PCs.
6		Receive		Receives a process from the PCs.
7		Send comment		Transmits a comment file to the PCs.
8		Receive comment		Receives a comment file from the PCs.
9		Start monitoring/ Stop monitoring		Starts or stops monitoring.

When you select [Send] or [Receive], the following dialog box opens (the example below applies to cases where [Send] is selected).



From the [Send] dialog box, select the area to be transmitted or received, and then click the OK button. Transmission or reception then takes place.
The contents of the areas to be transmitted/received are shown below:

- Sequence (ladder program, ladder management area, SQET, TUC setting, and user mathematical/logical function)
- Sequence + data (sequence + DW register)
- Sequence + fence (sequence + DW register + ladder program free space)
- Sequence + work (sequence + DW register + ladder program free space + FW/BI register)
- All areas (sequence + DW register + ladder program free space + FW/BI register + registers enumerated below)
  (Registers transmitted/received when all areas are selected: X, Y, J, Q, G, R, M, K, T, U, C, N, P, V, E, Z, and S, of which T, U, and C are contacts.)

Any ladder chart system on a network has a lock function compatible with that network. This is to prevent multiple such ladder diagram systems from accessing the same PC simultaneously. When online mode is specified, the connected PCs are locked. The locked PCs are unlocked when offline mode is specified.

Online mode may be specified for the PCs that are already locked by the ladder diagram system on another personal computer. When this happens, an error message is displayed and the specified online mode is invalidated.

4.5.1 Ladder chart four-line simultaneous monitoring function

Ladder chart system versions 7 and later (system floppy disk versions 07-00 and later) support the four-line simultaneous monitoring function that is exercised via an Ethernet. This function enables four personal computers to conduct simultaneous ladder chart monitoring operations with respect to one CPU unit. For the use of this function, the monitoring ladder chart system (program product type: S-7890-34) is required in addition to the ladder chart system.

The requirements for the use of the four-line simultaneous monitoring function are indicated below with a typical configuration.

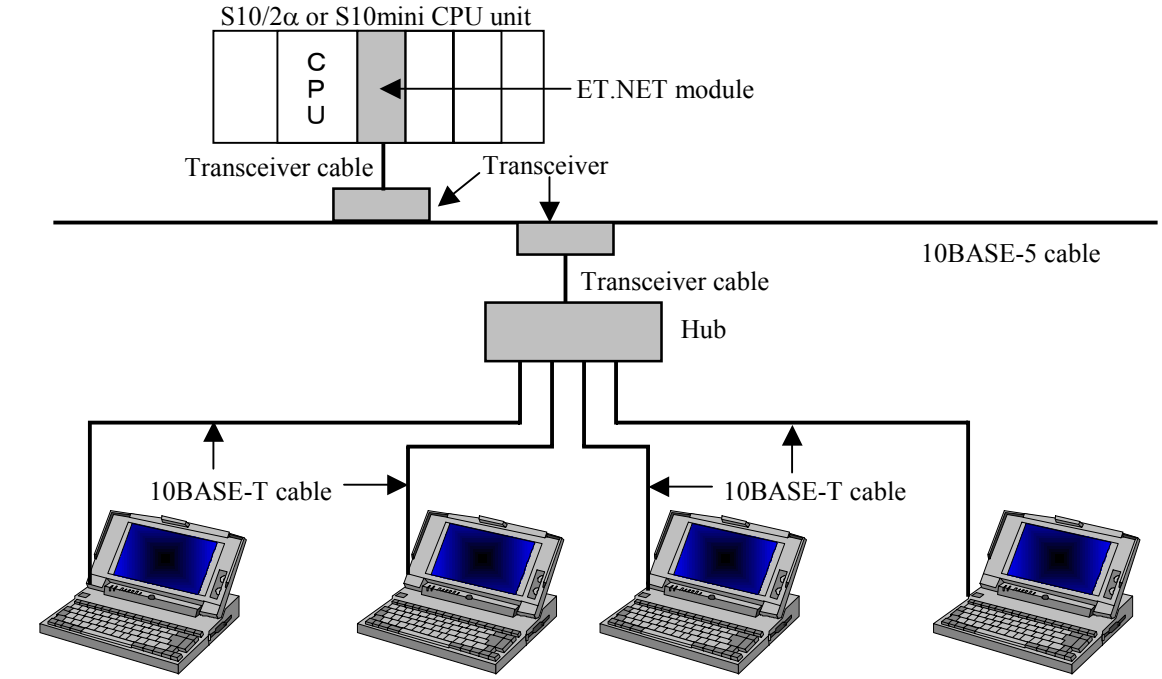
(1) Requirements

- The version of the employed ET.NET module must be as indicated below:
  LWE550: Version 4, Revision 1 or later (2α series)
  LQE020: Version 3, Revision 1 or later (S10mini series)
- The PCs must be connected to personal computers via Ethernet (the function supporting this is not available if the RS-232C or GP-IB interface is used).
- The PCs must be connected to personal computers via a LAN (the function supporting this is not available through the use of a one-to-one direct connection).
- Up to four personal computers can be simultaneously connected to the PCs. However, only one ladder chart editing personal computer (regular ladder chart system) must be used. The other personal computers must be dedicated to monitoring (up to three monitoring ladder chart system machines can be used).

(2) Limitations

Even when two ET.NET modules (main module and submodule) are connected to one CPU unit, up to four personal computers can be connected to that CPU unit.

(3) Typical configuration



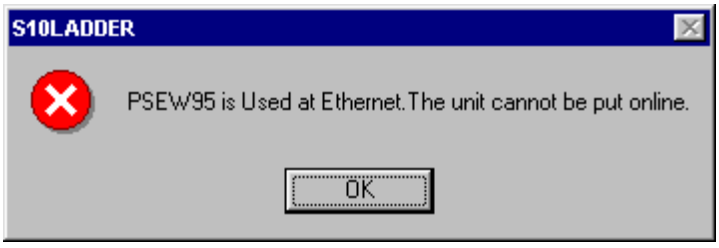
NOTE

- Use of the four-line simultaneous monitoring function requires the following version of ET.NET module:

  LWE550: Version 4, Revision 1 or later (2α series)

  LQE020: Version 3, Revision 1 or later (S10mini series)

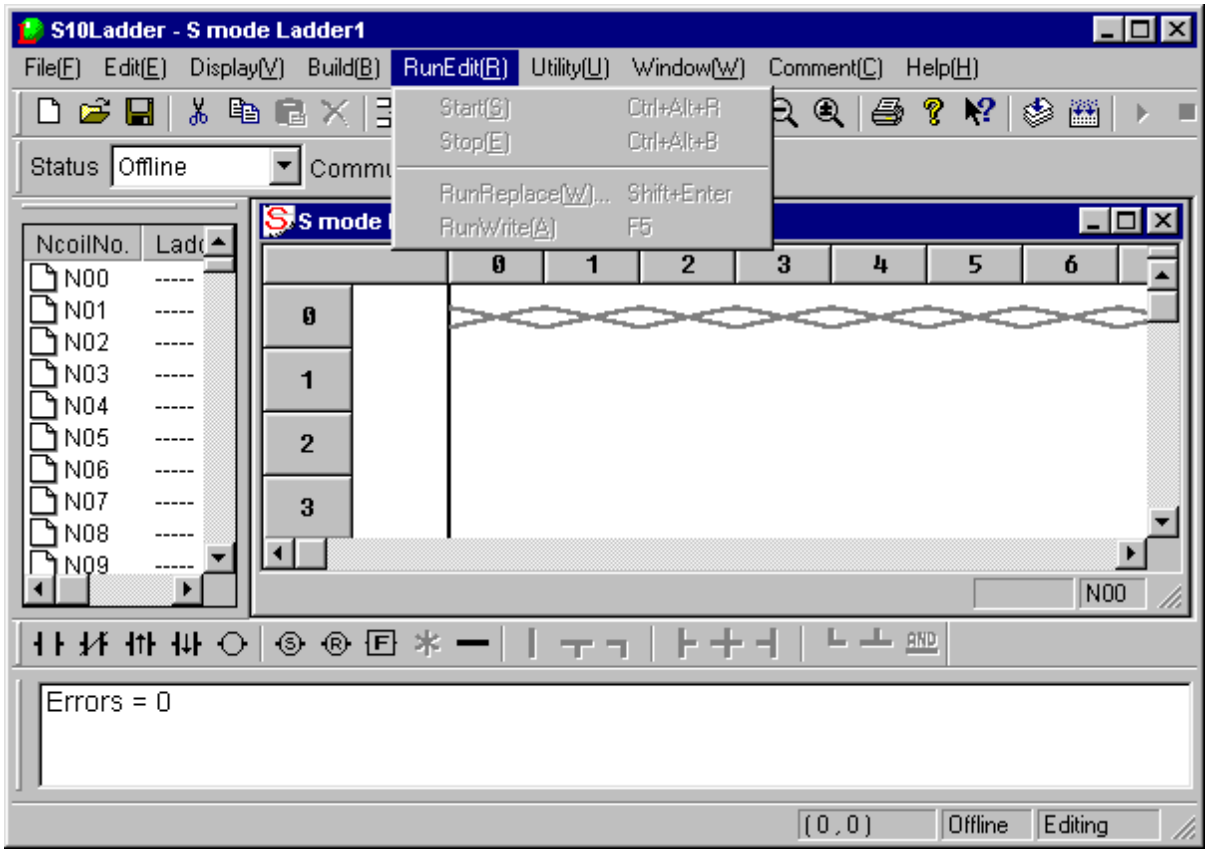
  If an attempt is made to connect one CPU unit with two or more personal computers and the version of the ET.NET module employed is earlier than shown above, the following error message appears on the display to indicate that it cannot enter an on-line condition with the personal computers.



- HI-FLOW system versions 7 and later also support the four-line simultaneous monitoring function. However, the number of personal computers that can be connected with one PCs unit is limited to four including the ladder chart system (the unit dedicated to monitoring is also included) and HI-FLOW system (the unit dedicated to monitoring is also included). Even when two ET.NET modules (main module and submodule) are mounted in one PCs unit, the maximum number of connectable personal computers is 4.

4.6 Ladder Sheet RunEdit Functions

The ladder sheet RunEdit functions are selectable from a pull-down menu.



The RunEdit functions are described below.

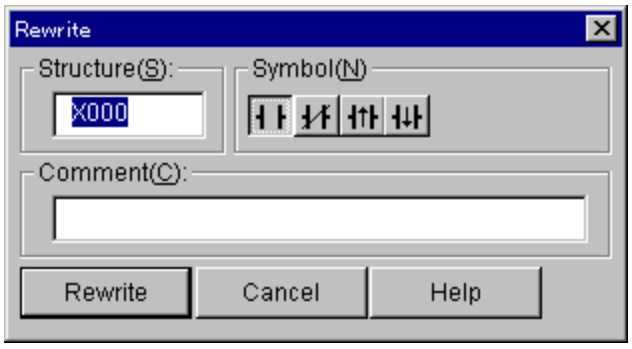
No.	Level 1	Level 2	Level 3	Description
1	RunEdit	Start		Sets RunEdit mode.
2		Stop		Cancels RunEdit mode.
3		RunReplace		Sets RunReplace to rewrite the symbol.
4		RunWrite		Carries out addition or deletion during running.

The [RunReplace] and [RunWrite] submenus are described below.

RunReplace: Existing symbols (contacts and coils) are rewritten without having to stop the PCs. Branch instructions cannot be changed. Also, circuits cannot be deleted or added. To change branch instructions or add or delete circuits, use the [RunWrite] submenu.

Move the cursor to the symbol the user wants to rewrite, and select the [RunReplace] option from the pulldown menu. The input box to modify a symbol will then is displayed. After modifying the symbol, click the Rewrite button in the input box and thereby transmit the modified information to the PCs.

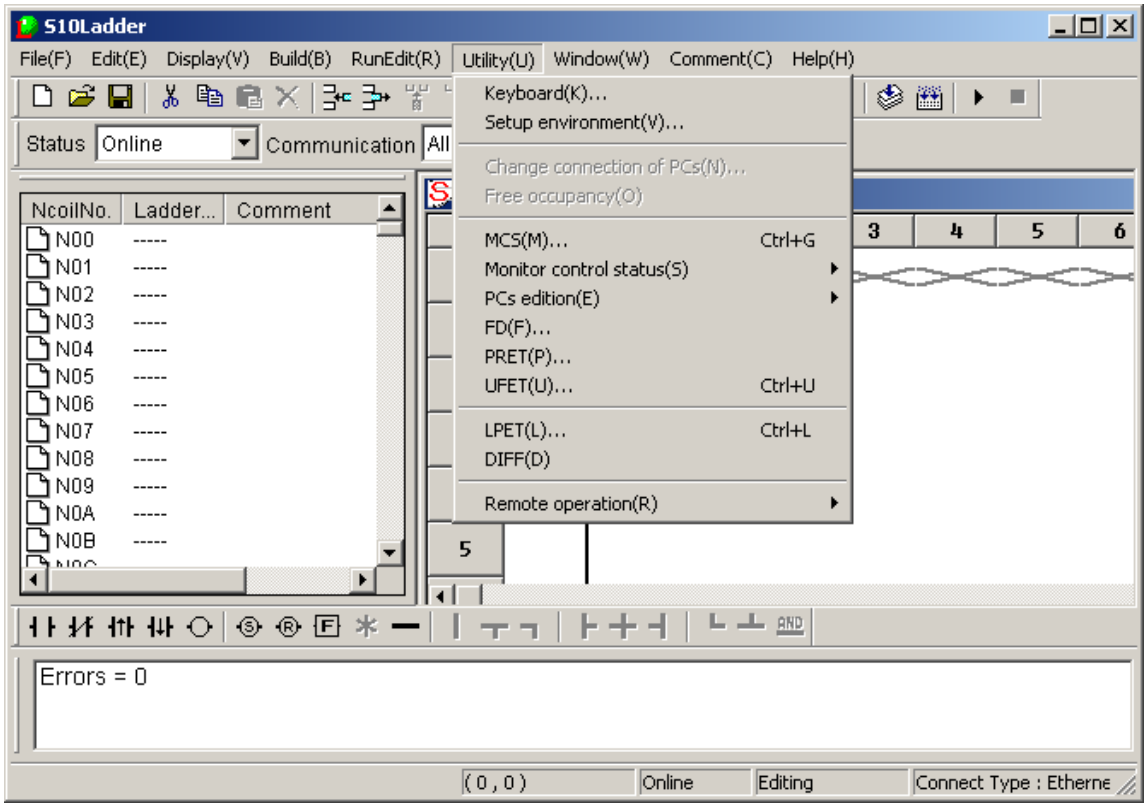
<Input box for rewriting during running>



RunWrite: Existing circuits are rewritten. Branch instructions can be changed. Circuits can also be deleted or added. After modifying a circuit, select the [RunWrite] option from the pulldown menu. The modified information will then be transmitted to the PCs. In the 2αH, 2αHf, and S10mini series, circuits are rewritten without having to stop the PCs. In the 2α, 2αE, and 4α series, the PCs are stopped while the modified information is being transmitted.

4.7 Ladder Sheet Utility Functions

The ladder sheet utility functions are selectable from a pull-down menu.



The utility functions are described below.

No.	Level 1	Level 2	Level 3	Description	4α
1	Utility	Keyboard		Sets a shortcut for a combination of keystrokes to enter a symbol.	√
2		Setup environment		Sets the colors in which the window for each state is displayed.	√
3		Change connection of PCs		Sets a type of communication with the PCs.	√
4		Free occupancy		Forcibly unlocks the PCs.	ns
5		MCS		Reads or writes memory in the PCs.	√
6		Monitor control status	Time chart monitor	Displays a timing chart monitoring window.	√
7			Matrix monitor	Displays the matrix monitor.	√
8			Register monitor	Displays a numeric-value monitoring window.	√
9		PCs edition	Change capacity	Sets conditions and an environment required for execution on the PCs.	√
10			Analog counter	Registers or deletes data that controls an analog counter or pulse counter.	√
11			Initiate PCs memory	Restores memory in the PCs to its initial condition.	√

√: Supported ns: Not supported

No.	Level 1	Level 2	Level 3	Description	4α
12	Utility (continued from the previous page)	FD		Reads or writes a file to the floppy disk.	√
13		PRET		Registers or deletes a PRET.	ns
14		UFET		Registers or deletes a UFET.	√
15		LPET		Displays the contents of an LPET.	√
16		DIFF		Compares ladder chart circuits and displays its result.	√
17		Remote operation	PCs status	Displays the status of PCs.	ns
18			Operation history	Displays the history of remote operations.	ns
19			RUN	Executes a ladder program.	ns
20			STOP	Stops a ladder program.	ns
21			RESET	Resets and restarts the PCs.	ns

√: Supported ns: Not supported

Free occupancy is related to the network-compatible function described in "4.5 Ladder Sheet Build Functions." If the ladder chart system becomes disconnected for some reason from the PCs being locked by it, the PCs may be left locked and, as a result, may no longer be connected to any personal computer. In such a case, use the free occupancy function to forcibly release the PCs from the locked state.

NOTE

- The free occupancy function can be executed even when another user is keeping the PCs locked. If it is executed in such a situation, the other user who has been keeping the PCs locked is not notified of the fact. This may cause multiple simultaneous accesses to the same PC in some operation. To prevent this, check for any warning message indicating that another user is keeping the PCs locked, before using the free occupancy function.
- If a ladder program created in the off-line state is transmitted to the PCs after the [Change capacity] or [Analog counter] setting is changed from [Utility] – [PCs edition] with the on-line state maintained with respect to the PCs, the setting entered during the off-line state overwrites the previous one. The reason is that the ladder program contains the settings for the PCs edition. If the setting is overwritten in the above manner, correct the setting in the on-line state.

4.7.1 Ladder chart comparing function

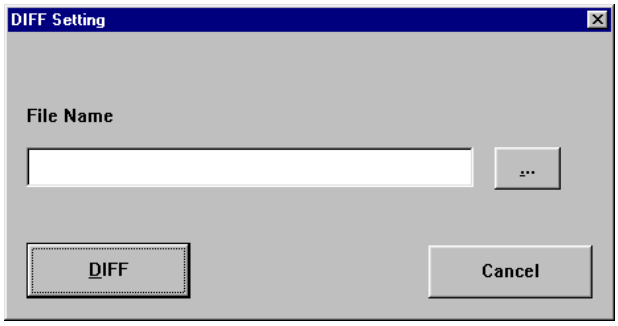
The ladder chart comparing function compares two ladder charts and displays a difference between them visually. When a ladder chart has been changed, this function permits checking different points from the previous ladder chart.

The ladder chart comparing function is on the assumption that a ladder sheet is already displayed. For the display method, see "4.1 Creating Ladder Sheets" and "4.2 Ladder Sheet File Functions."

The ladder sheet that is already opened is a comparison source at comparison.

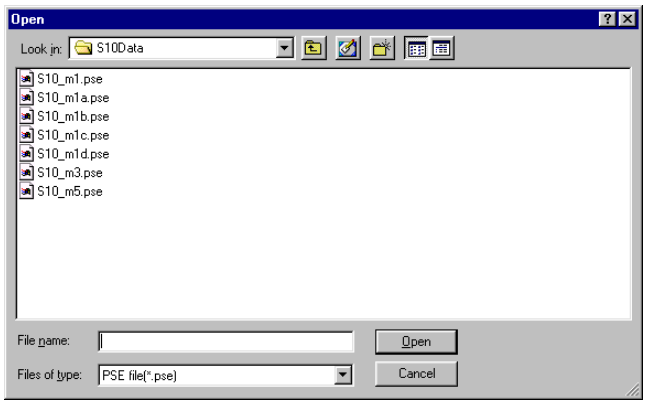
(1) Usage

To specify a file to be compared by the ladder chart comparing function, open the ladder sheet that already exists. Select [DIFF] in the [Utility] menu, and the [DIFF Setting] dialog box to open a target file to be compared will be displayed.



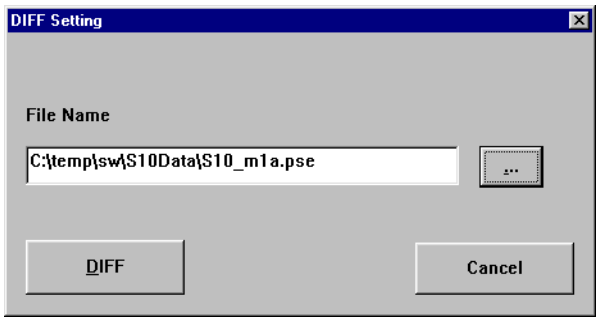
On the [DIFF Setting] dialog box, click the [...] button provided at the central right part of the window.

The [Open] dialog box is displayed.

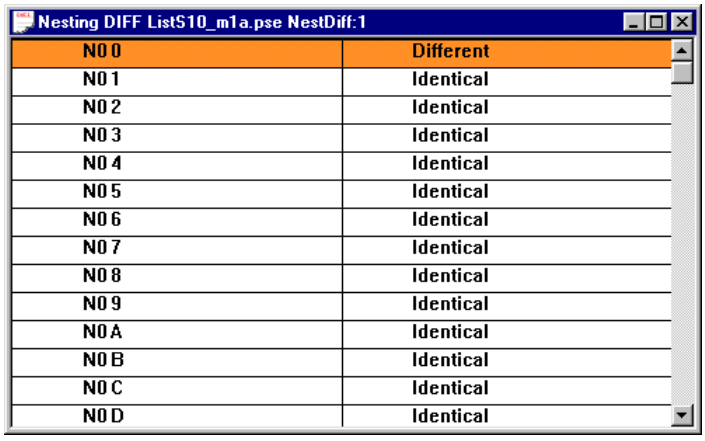


Select a target file to be compared and click the [Open] button.

The selected file is displayed in the [File Name] field of the [DIFF Setting] dialog box.



Click the Cancel button, and the dialog box will be closed automatically.
Select the DIFF button, and the dialog box will be closed and [Nesting DIFF List] will be displayed.

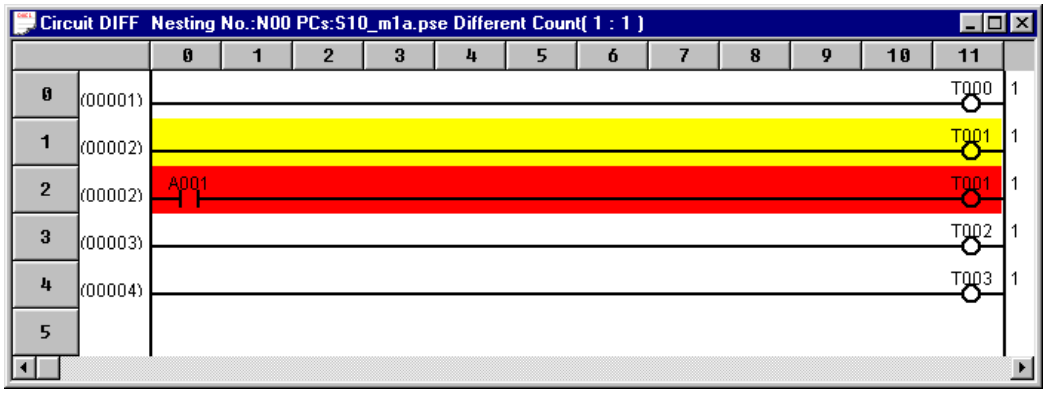


[Nesting DIFF List] displays whether any DIFF exists or not as a result of comparison for every nesting. If there is any difference for each nesting, “Different” is displayed. If not, “Identical” is displayed.
To quit [Nesting DIFF List], click the × button provided at the upper right part of the window.

In the title of [Nesting DIFF List], the file name to be compared and the total number of different nestings are displayed.
The following operations permit saving the nesting DIFF list in a text-format file.

① When [Nesting DIFF List] is displayed, select [Save file] from the [File] menu, select [Save file as] from the [File] menu, or press the [Ctrl] + [S] keys.
② The [Save file as] dialog box is displayed.
③ Specify the file and save it.

Double-clicking [Different] in [Nesting DIFF List] displays the [Circuit DIFF] window.



In the window title, the selected Nesting No., file name of comparison destination, and Different Count (comparison source: comparison target) are displayed.
The number displayed at the leftmost of the window is a ladder sheet circuit number or a target file circuit number and has one of the following meanings depending on the corresponding color.

No.	Comparison result	Display color	Circuit No. to be displayed
1	The same circuit	White	Comparison target circuit No.
2	A circuit exists for the ladder sheet.	Yellow	Ladder sheet circuit No.
3	A circuit exists for the comparison target.	Red	Comparison target circuit No.

To quit the [Circuit DIFF] window, click the [×] button provided in the upper right part of the window.
After quitting it, you can also possible to select another nesting in [Nesting DIFF List] to display the [Circuit DIFF] window.

(2) Limitations

While a ladder sheet is edited, this function is not available. Be sure to compile the ladder sheet and then use the ladder chart comparing function.

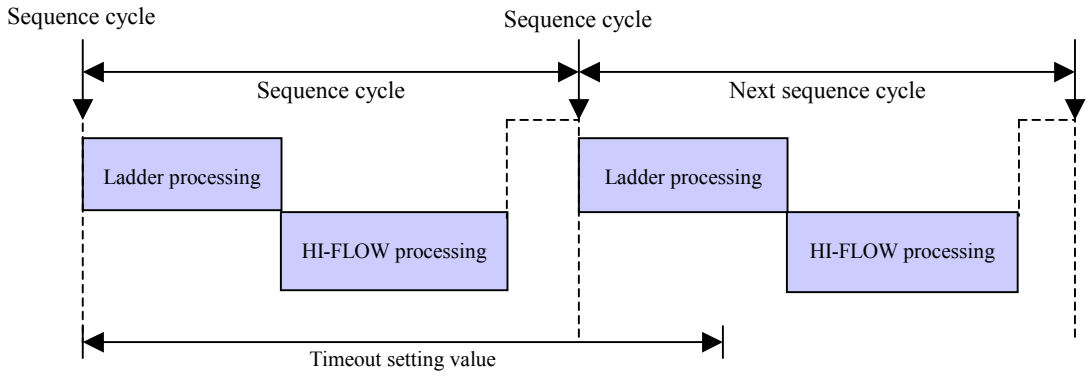
4.7.2 Ladder watchdog timer (WDT) timeout value setting function

The WDT is intended to monitor whether the HI-FLOW processing has been terminated within the time corresponding to the set timeout value. If the processing has not been terminated within the time of the set timeout value, this results in a WDT timeout error and the following operations are performed.

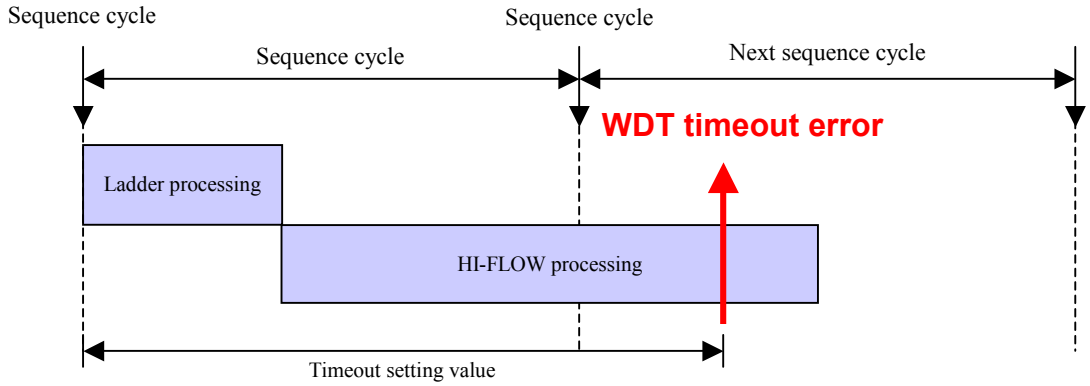
- "WDT ERR" or "CPU DOWN" is displayed as an error on the CPU indicator and the CPU stops.
- All operations such as ladder, HI-FLOW, C mode task, and remote I/O communication are stopped.
- The PCs OK signal is turned off.

(1) Ladder WDT timeout operation flow

<Usual operation>



<Timeout detecting operation>



(2) Packages supporting the ladder WDT timeout value setting function

The packages that support the ladder WDT timeout value setting function are as follows.

<Table of packages that support the ladder WDT timeout value setting function>

No.	Package name	Type	Ladder WDT	Version	Remarks
1	S10Tools SYSTEM	S-7890-01	√	07-05 or later	OS of PCs should be supporting Ladder WDT.
2	LADDER CHART SYSTEM	S-7890-02	√	07-05 or later	OS of PCs should be supporting Ladder WDT.
3	CPMS LOADING SYSTEM	S-7890-04	√	07-02 or later	
4	CPMSE LOADING SYSTEM	S-7890-05	√	07-02 or later	
5	4α LADDER CHART SYSTEM	S-7890-17	ns	—	
6	4αH LADDER CHART SYSTEM	S-7890-18	ns	—	
7	LADDER CHART MONITOR SYSTEM	S-7890-34	△	07-04 or later	The ladder WDT timeout value is only referenced. (Setting is disabled.)

√: Supported ns: Not supported △: Supported with restriction

(3) Ladder WDT supporting OS

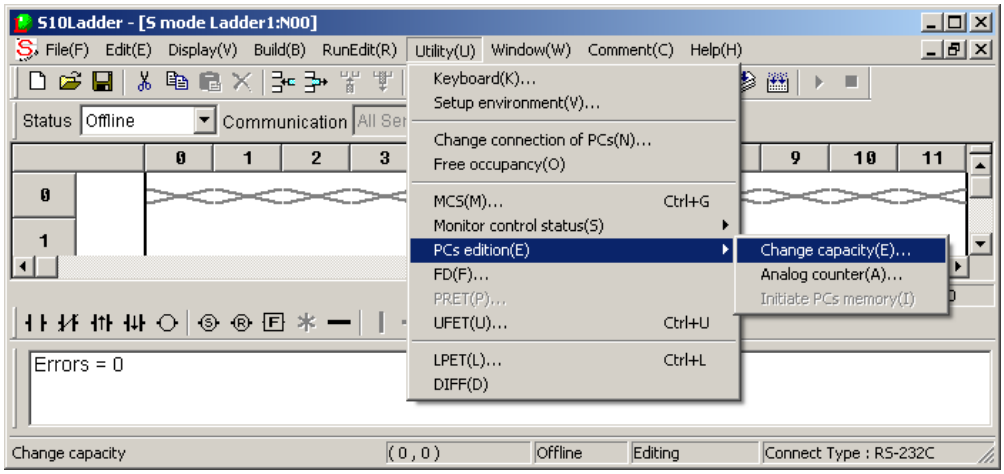
The ladder WDT supporting OS is as follows.

<Ladder WDT supporting OS table>

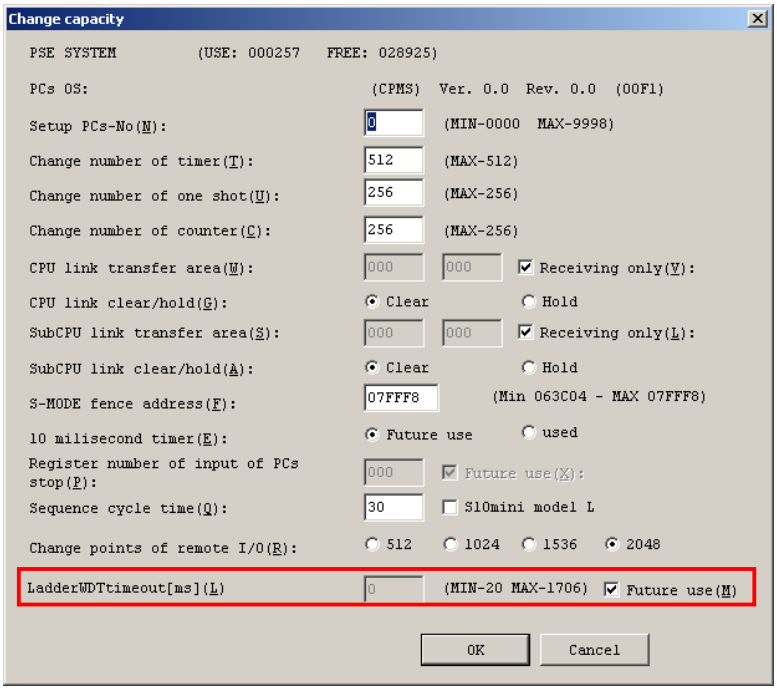
PCs	OS version	LED indication
S10/2α	Ver.4, Rev.8 or later (CPMS loading system 07-02 or later)	CPMS 4.8 (for Ver.4, Rev.8)
S10/2αE, 2αH, 2αHf	Ver.2, Rev.8 or later (CPMSE loading system 07-02 or later)	CPMS E28 (for Ver.1, Rev.3)
S10mini CPU-D	Ver. 1, Rev.3 or later	CPMS D13 (for Ver.1, Rev.3)
S10mini CPU-S, H, F	Ver 1, Rev.4 or later	CPMS M14 (for Ver.1, Rev.4)
S10mini CPU-L	Not supported	—
S10/4α, 4αF	Not supported	—
S10/4αH	Not supported	—

(4) Detailed contents
Display [Change capacity] by the following procedure and set the ladder WDT timeout value.

(a) Start the Ladder Chart System and select [Utility] – [PCs edition] – [Change capacity].



(b) On the [Change capacity] window, enter "LadderWDTtimeout [ms]" and click the OK button.



LadderWDTtimeout [ms]
Input range: 20 to 1706 (in ms) * Any value out of the input range cannot be entered.
Free: When the ladder WDT timeout function is not used, click the check box to put a check mark.
In the offline mode or when the OS of the PCs does not support the WDT, a check mark is put.

<Precautions>
To change the timeout value setting, set a 50 ms more value than the actually required value in consideration of the ladder and HI-FLOW processing time. The ladder WDT timeout function is effective only in the online mode.

4.7.3 Setting the analog and pulse counter modules

In some cases when a remote I/O uses a 4-ch analog I/O module, pulse counter module, or 8-ch analog input module (for the S10mini series only), you must implement a setting in the [Analog counter] window of the Ladder Chart System. (May be unnecessary, depending on the mode setting.) When information is registered in the [Analog counter] window, the system sets analog values obtained from external inputs in the EW area of PIO memory and writes the content of the EW area in external outputs.

(1) Mode setting

(a) 4-ch analog I/O module

To use a 4-ch analog I/O module in the MODE2 setting, you must register it in the [Analog counter] window of the Ladder Chart System. Conversely, to use the 4-ch analog I/O module in the MODE1 setting, you must not register it in the [Analog counter] window. For more information about the mode setting and 4-ch analog I/O module, see the manuals below.

S10/2α series and S10/4α series:	HARDWARE MANUAL I/O 4 CHANNEL ANALOG/PULSE COUNTER (manual number SAE-2-201)
S10mini series:	S10mini HARDWARE MANUAL I/O MODULE (manual number SME-1-114)

(b) Pulse counter module

To use a pulse counter module, you must register it in the [Analog counter] window of the Ladder Chart System. For more information about the pulse counter module, see the manuals below.

S10/2α series and S10/4α series:	HARDWARE MANUAL I/O 4 CHANNEL ANALOG/PULSE COUNTER (manual number SAE-2-201)
S10mini series:	S10mini HARDWARE MANUAL I/O MODULE (manual number SME-1-114)

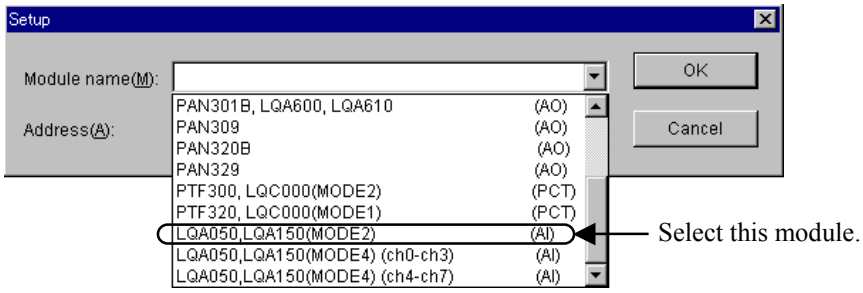
(c) Scanning-type analog input module

To use a scanning-type analog input module, you must register it in the [Analog counter] window of the Ladder Chart System. For more information about the scanning-type analog input module, see “HARDWARE MANUAL I/O MODULE (manual number SME-1-114).”

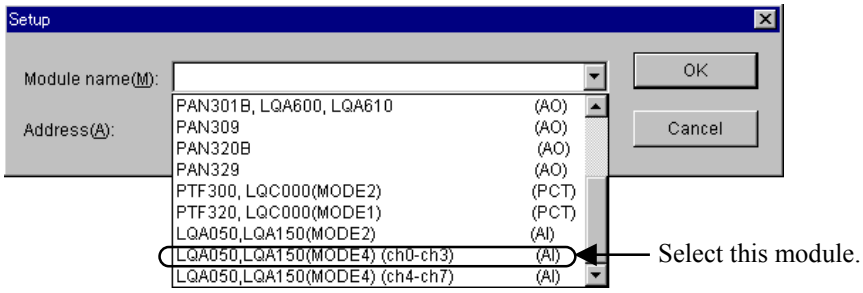
(d) 8-ch analog input module

To use an 8-ch analog input module in the MODE2 or MODE4 setting, you must register it in the [Analog counter] window of the Ladder Chart System.
When setting MODE2 or MODE4, select and set a module shown below in the [Analog counter] window.

<When using the module in the MODE2 setting>

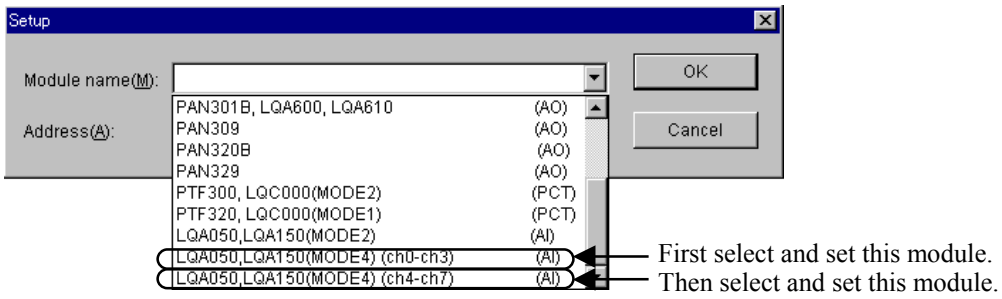


<When using Channels 0 to 3 in the MODE4 setting>



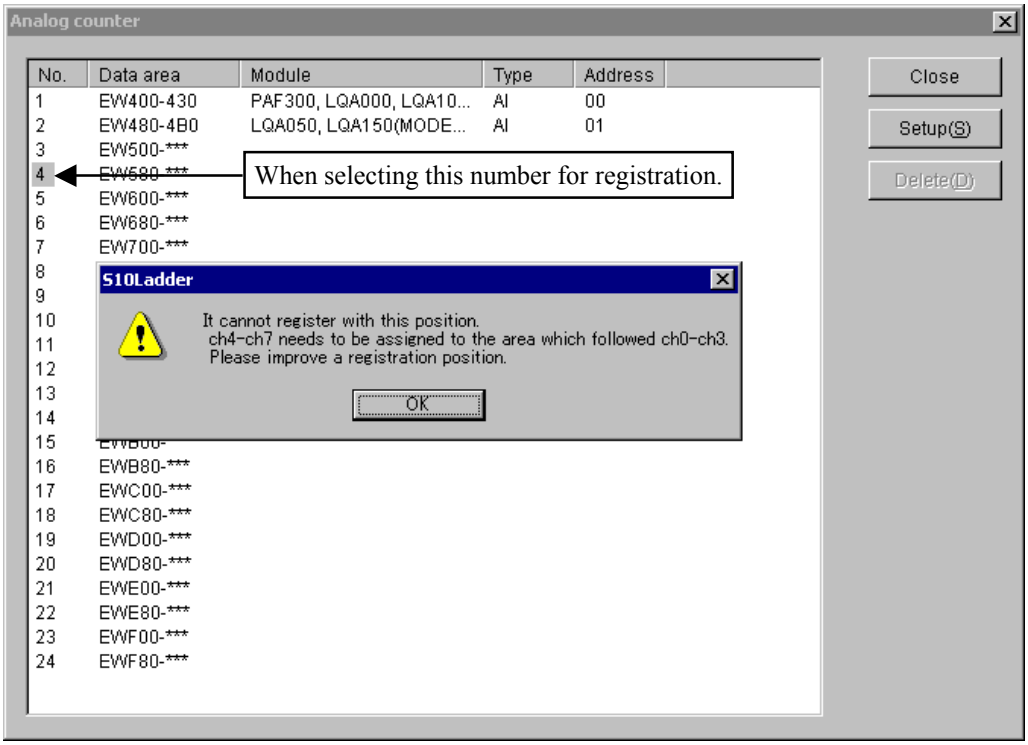
Note: You cannot set to use Channels 4 to 7 without using Channels 0 to 3.

<When using Channels 0 to 7 in the MODE4 setting>



First select “LQA050, LQA150 (MODE4) (ch0 - ch3) (AI)” from the Module Name list box and set it. Then select “LQA050, LQA150 (MODE4) (ch4 - ch7) (AI)” from the Module Name list box and set it. Set “LQA050, LQA150 (MODE4) (ch4 - ch7) (AI)” immediately after the registration number of “LQA050, LQA150 (MODE4) (ch0 - ch3) (AI).”

When “LQA050, LQA150 (MODE4) (ch4 - ch7)AI” is set for a registration number that does not immediately follow a registration number in use [for example, setting “LQA050, LQA150 (MODE4) (ch4 - ch7) (AI)” for No.4 instead of No.3 before which “LQA050, LQA150 (MODE4) (ch0 - ch3) (AI)” has been registered], the following error message dialog box appears.



For the MODE1 or MODE3 setting, you must not implement the registration in the [Analog counter] window. For more information about the mode setting, see “HARDWARE MANUAL I/O MODULE (manual number SME-1-114).”

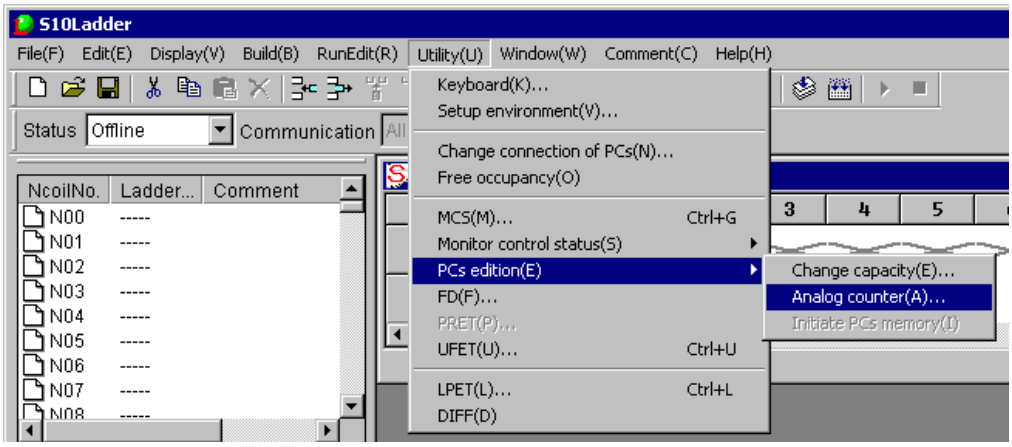
Note: This function is not available for the S10/2α series and the S10/4α series. Unlike the conventional 8-ch analog input modules (LWA000, LWA001, LWA002, LWA003, LWA020, LWA021, and LWA022), these 8-ch analog input modules (LQA050 and LQA150) can be registered in the EW area.

(2) Analog pulse counter setting

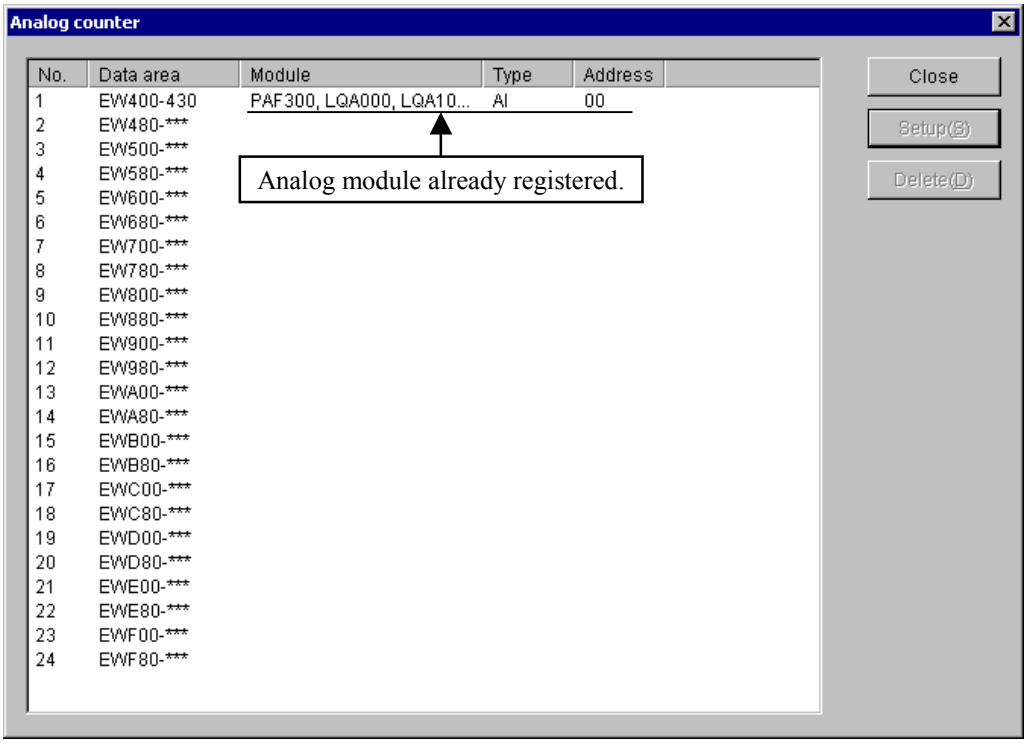
There are two analog pulse counter settings: Offline and Online.

(a) Offline setting

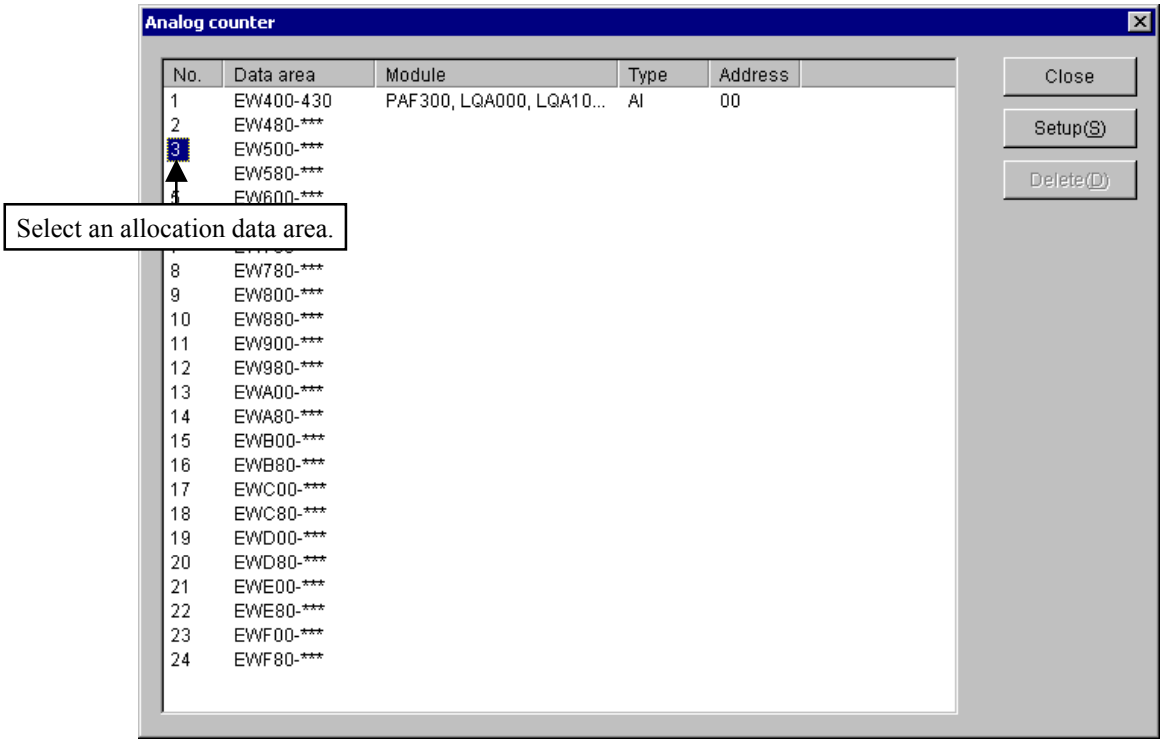
① From the [Utility] menu, select [PCs edition] – [Analog counter].



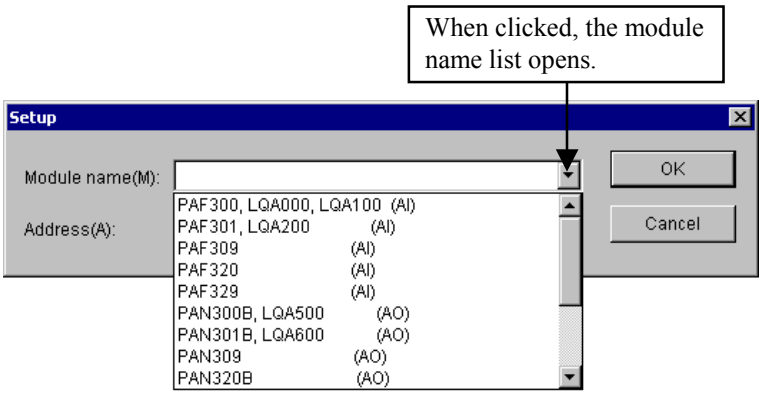
② The [Analog counter] window opens. When a module is already assigned in offline status, the module's name, type and address are displayed.



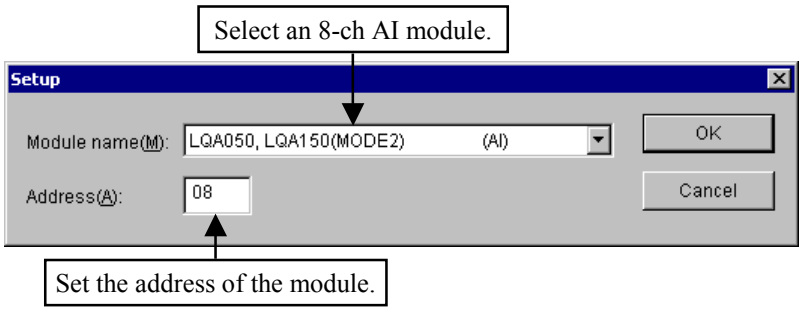
③ Select the registration number of an allocation data area in the [Analog counter] window, then click the Setup button.



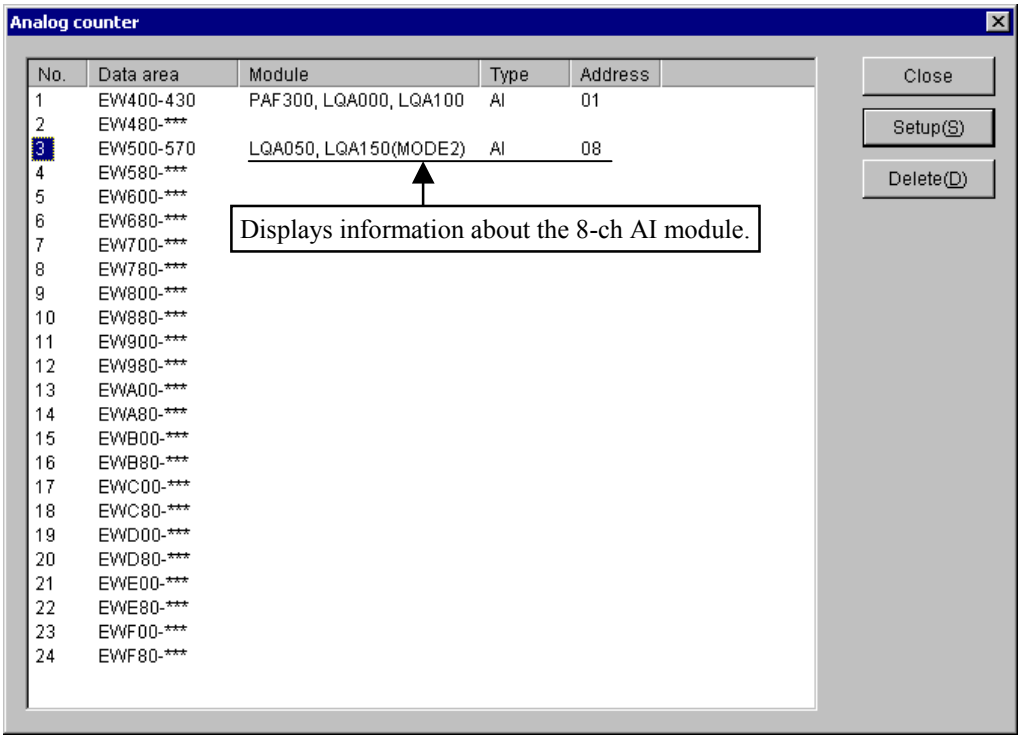
④ The [Setup] window opens. Select the name of a module that you want to allocate from the Module name list box. When you select an 8-ch analog input module as the module name, the allocation data range changes from 4-ch to 8-ch. The default allocation data area is 4-ch.



After selecting a module name, set its address. For details of the address setting, see "(c) Address setting."



⑤ Click the OK button. The data set in the [Setup] window is displayed in the [Analog counter] window (on the line of the registration number selected in step ③).

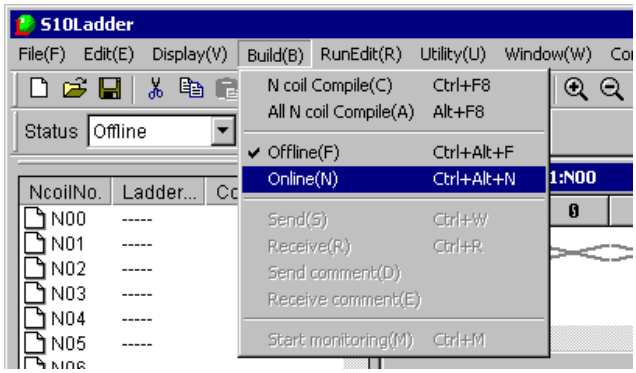


This completes offline registration. Repeat steps ③ to ⑤ above to allocate another module.

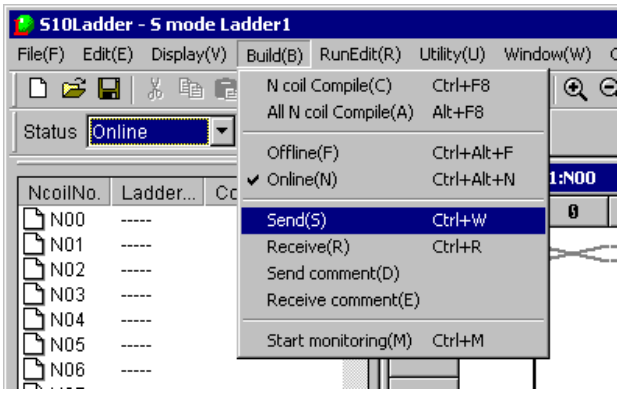
When you click the Cancel button, the data set in the [Setup] window is discarded and not displayed in the [Analog counter] window.

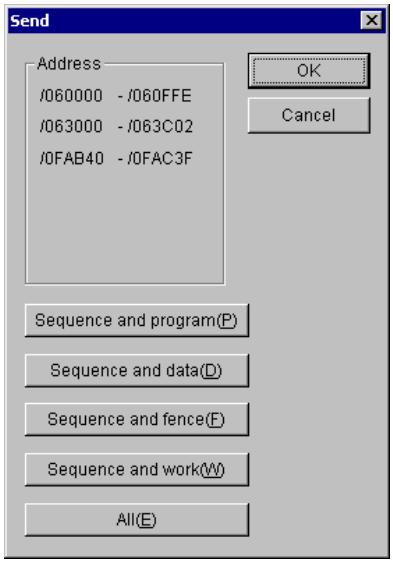
⑥ When you click the Close button in the [Analog counter] window, the [Analog counter] window closes.

⑦ Select [Online] from the [Build] menu in order to change the communication status to "Online."

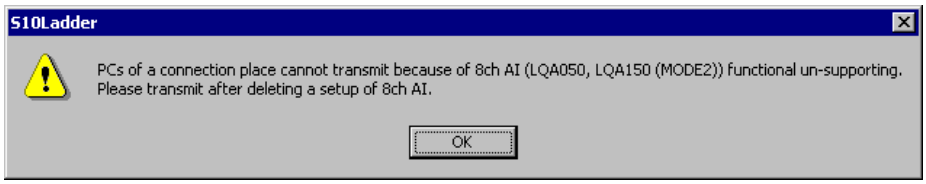


⑧ After changing the communication status to "Online," select [Send] from the [Build] menu. The [Send] window appears.





⑨ Click the OK button. The ladder program and information set in the [Analog counter] window are sent to the PCs. If the "LQA050, LQA150 (MODE2)" module has been registered in the [Analog counter] window, the system checks whether the connected PCs support operation of the 8-ch AI module in MODE2. If the PCs do not support this operation, the system outputs the error message dialog box below and does not send the ladder program. To send the ladder program, delete "LQA050, LQA150 (MODE2)" from the [Analog counter] window or change the target PCs to those that support operation of the 8-ch AI module in MODE2, then send the ladder program again. (Operations in steps ⑧ and ⑨)

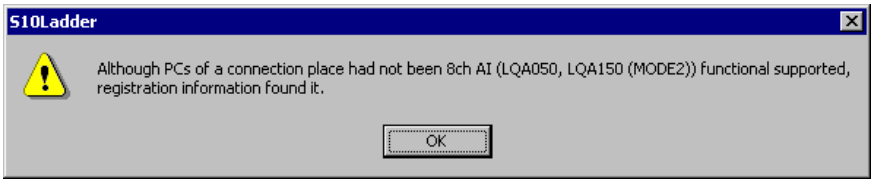


This completes offline registration.

(b) Online setting

① From the [Build] menu, select [Online]. (See ⑦ of "(a) Offline setting.") Skip this step when the system is already in online status.)

② Perform steps ① to ④ of "(a) Offline setting."
When the [Analog counter] window opens, "LQA050, LQA150 (MODE2)" is registered for its analog counter table, and concurrently the message dialog box below appears if the connected PCs do not support operation of an 8-ch AI module in MODE2.



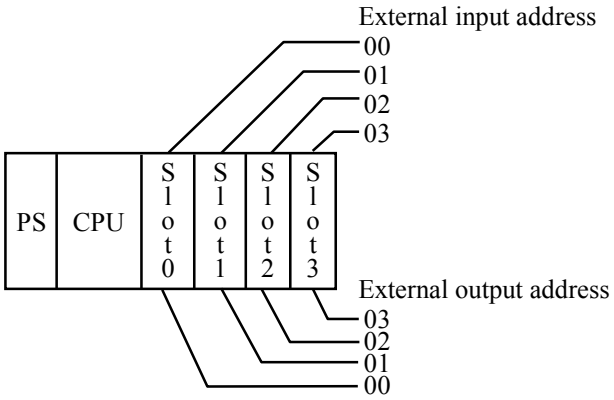
③ When you click the OK button in the [Setup] window, the data set in the [Setup] window is displayed in the [Analog counter] window and registered for the PCs. See Note. Repeat steps ② to ③ above to allocate another module.
When you click the Cancel button, the data set in step ② is not registered for the PCs.

Note: When "LQA050, LQA150 (MODE2)" is selected in the [Setup] window and the connected PCs do not support operation of an 8-ch AI module in MODE2, the error message dialog box below appears and the "LQA050, LQA150 (MODE2)" module is not registered. Change the target PCs to those that support operation of the 8-ch AI module.

This completes the online setting.

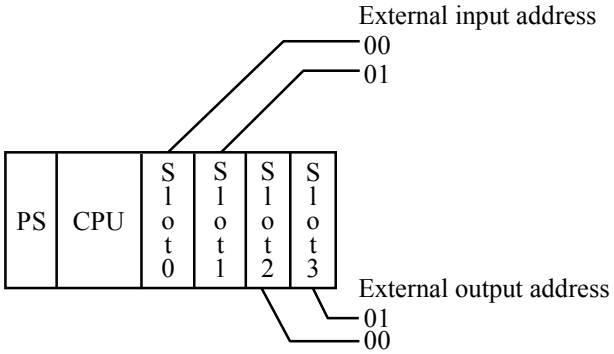
(c) Address setting

Addresses to be specified in the [Setup] window are those of external I/O (X, Y) corresponding to respective I/O slots. (See the figure below.)



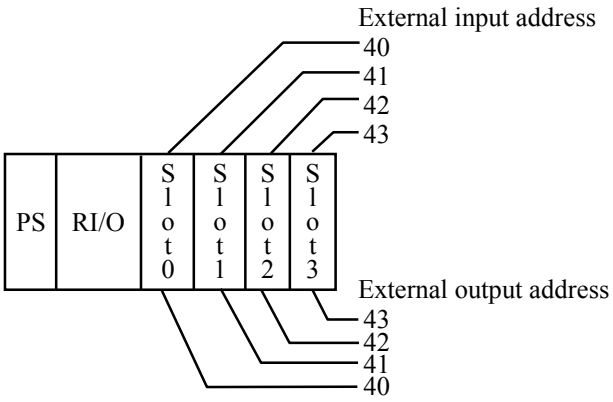
Setting conditions
Station number: 000 (fixed)
Partition setting: FREE
No. of I/O slots: 16

4-slot CPU mount base (FREE setting)



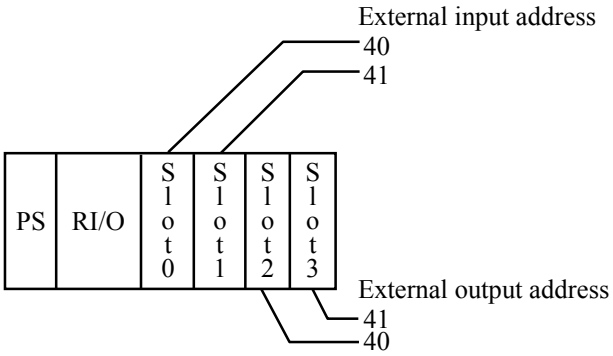
Setting conditions
Station number: 000 (fixed)
Partition setting: FIX
No. of I/O slots: 16

4-slot CPU mount base (FIX setting)



Setting conditions
Station number: 040 (Variable)
Partition setting: FREE
No. of I/O slots: 16

4-slot I/O mount base (FREE setting)



Setting conditions
Station number: 040 (Variable)
Partition setting: FIX
No. of I/O slots: 16

4-slot I/O mount base (FIX setting)

The external I/O addresses are not respectively fixed to each I/O slot, but are dependent on the RI/O station numbers, I/O point settings, and partition settings (FREE or FIX). For details, see “S10mini HARDWARE MANUAL CPU (manual number SME-1-100).”

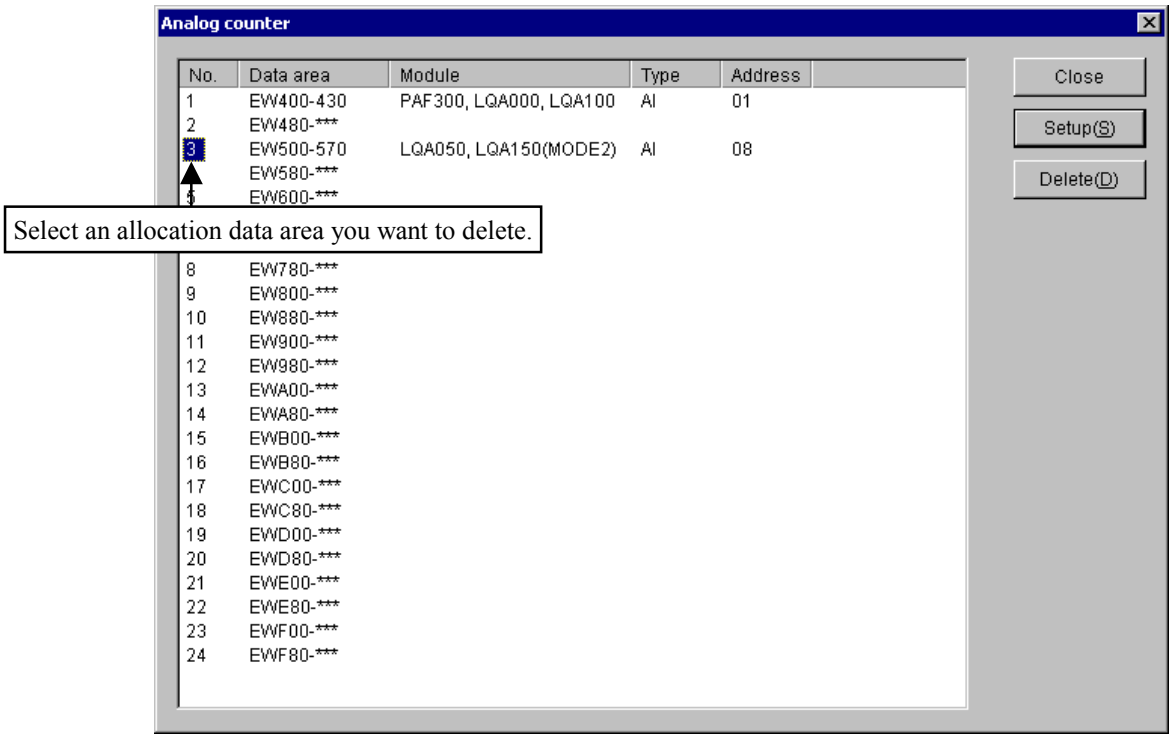
(3) Deleting an analog pulse counter

(a) Deletion in Offline mode

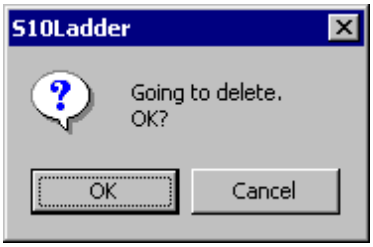
① From the [Utility] menu, select [PCs edition] – [Analog counter]. (See (a)-① of "(2) Analog pulse counter setting.")

② The [Analog counter] window opens. When modules are already assigned in offline status, their names, types, and addresses are displayed.

③ Select the registration number of a module whose registration you want to cancel, then click the Delete button.



④ The "Going to delete. OK?" message dialog box appears for confirmation.



Clicking the OK button deletes the setting of the module selected in step ③ from the [Analog counter] window. (Offline deletion)

Clicking the Cancel button leaves the module setting unchanged.

⑤ When you click the Close button in the [Analog counter] window, the [Analog counter] window closes.

⑥ Select [Online] from the [Build] menu in order to change the communication status to "Online." (See (a)-⑦ of "(2) Analog pulse counter setting.")

⑦ After changing the communication status to "Online," select [Send] from the [Build] menu. The [Send] window appears. (See (a)-⑧ of "(2) Analog pulse counter setting.")

⑧ Click the OK button. The ladder program and deletion information created in the [Analog counter] window are sent to the PCs.

This completes deletion of a registered module in Offline mode.

(b) Deletion in Online mode

① From the [Build] menu, select [Online]. Skip this step when the system is already in online status.

② The [Analog counter] window opens. When modules are already assigned in offline status, their names, types, and addresses are displayed.

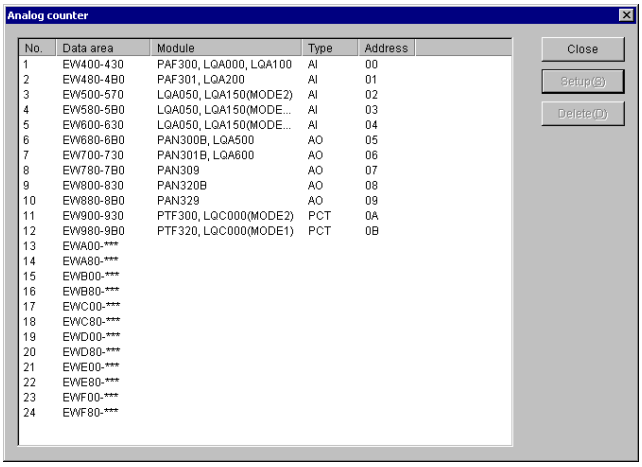
③ Select the registration number of a module whose registration you want to delete, then click the Delete button.

④ The "Going to delete. OK?" message dialog box appears for confirmation. Clicking the OK button deletes the setting of the module selected in step ③ from the [Analog counter] window and associated PCs.
Clicking the Cancel button leaves the module setting unchanged.

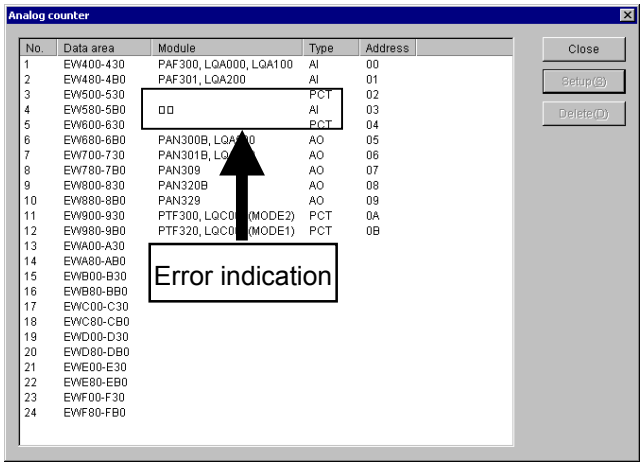
This completes deletion of a registered module in Online mode.

(4) Notes on the analog pulse counter

An error indication appears as shown below when you try to browse a ladder program file or PCs which have an 8-ch AI module (LQA050 or LQA150) registered in the [Analog counter] window of the old Ladder Chart System (VER-REV number 07-05 and before) which does not support registration of an 8-ch AI module (LQA050 or LQA150) in the [Analog counter] window.



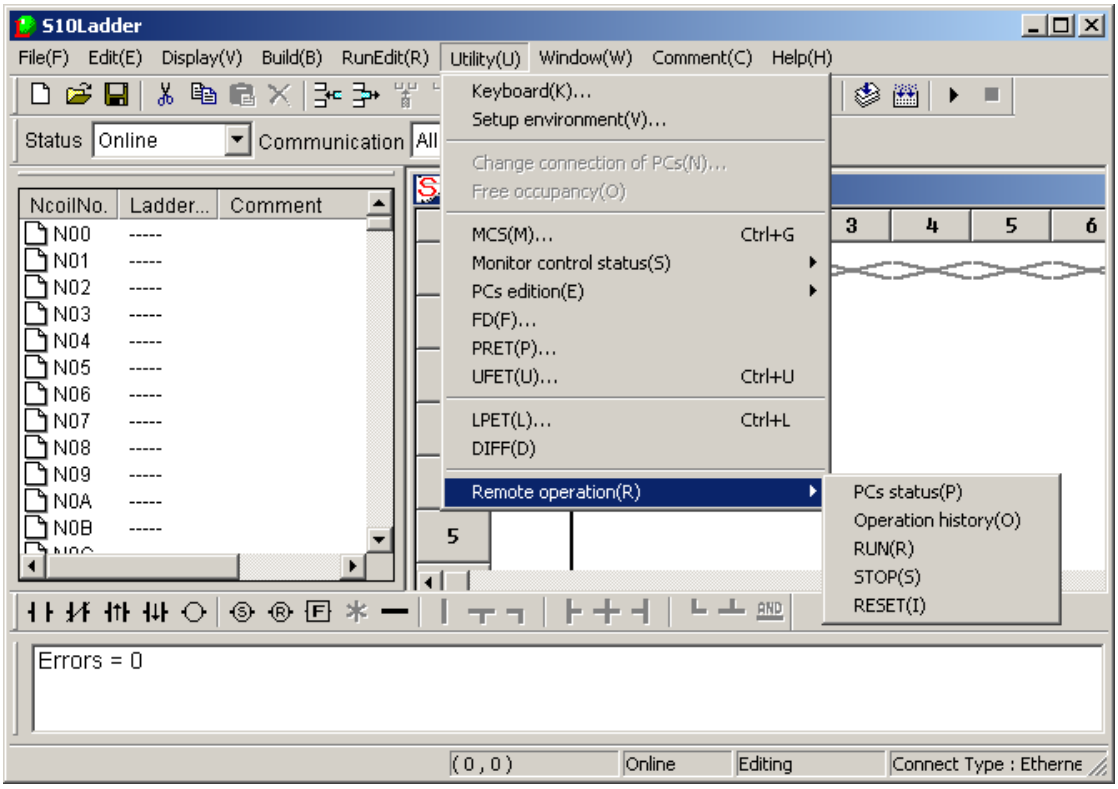
Registration of 8-ch AI modules (LQA050 and LQA150) is supported.



Registration of 8-ch AI modules (LQA050 and LQA150) is not supported.

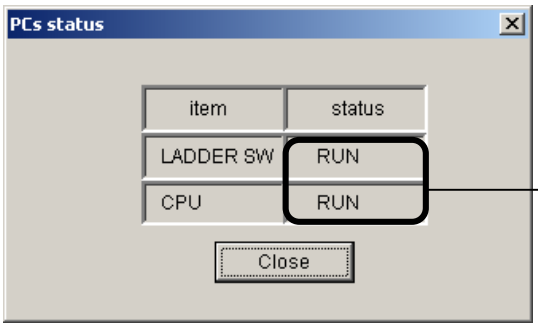
4.7.4 Remote operation function

The Remote Operation function connects the system to S10mini via Ethernet and run, stop, and reset the S10mini module. Select [Remote] from the [Utility] menu to use the Remote Operation function. This function has the five sub-functions below.



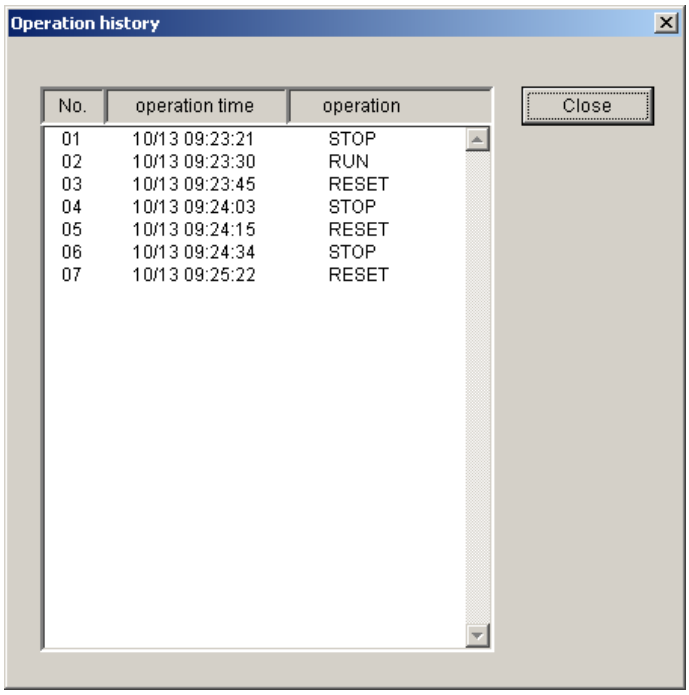
(1) PCs status

Selecting this function opens the [PCs status] dialog box. This dialog box shows the S10mini LADDER switch status (RUN or STOP) and CPU status (RUN or STOP).



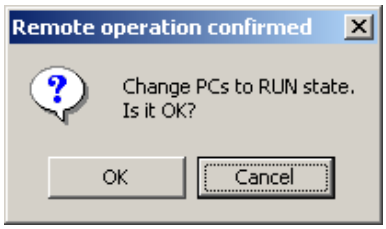
(2) Operation History

This function shows the history of remote operation requests (up to 42 of the latest) received by the ET.NET module. A history example is shown below.



(3) RUN

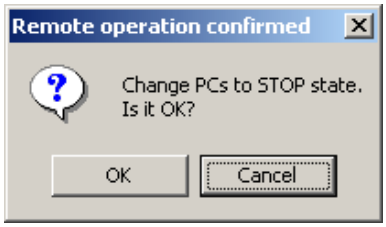
Selecting this function opens the dialog box below.



Click the OK button to bring the CPU into RUN status from STOP status. When the CPU enters RUN status, the dialog box below appears.

(4) STOP

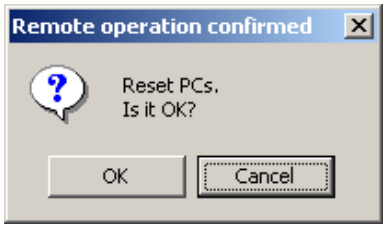
Selecting this function opens the dialog box below.



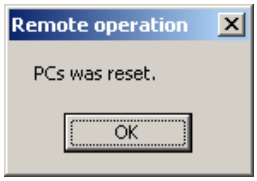
Click the OK button to bring the CPU to STOP status from RUN status. When the CPU enters STOP status, the dialog box below appears.

(5) RESET

Selecting this function opens the dialog box below.



Click the OK button to reset the CPU. When the CPU is reset, the dialog box below appears.

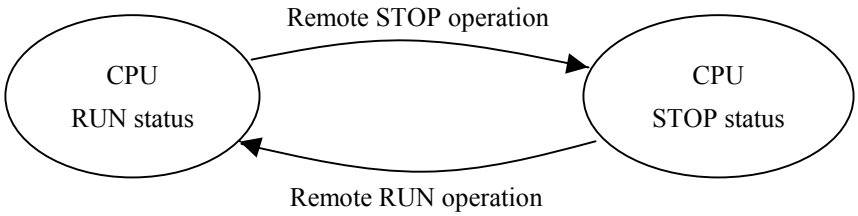


The following explains the relationship among LADDER switch status, CPU status (RUN/STOP), and remote operations of S10mini.

■ Remote RUN and Remote STOP operations

The CPU status can only be controlled as shown below when the LADDER switch is set to the RUN position.

If you try to control the CPU status with the LADDER switch set to the STOP position, an error dialog box appears.



■ Remote RESET operation

The remote RESET operation is always enabled independently of the LADDER switch position and CPU status.

<Notes on using the Remote Operation function>

Note the following when using the Remote Operation function:

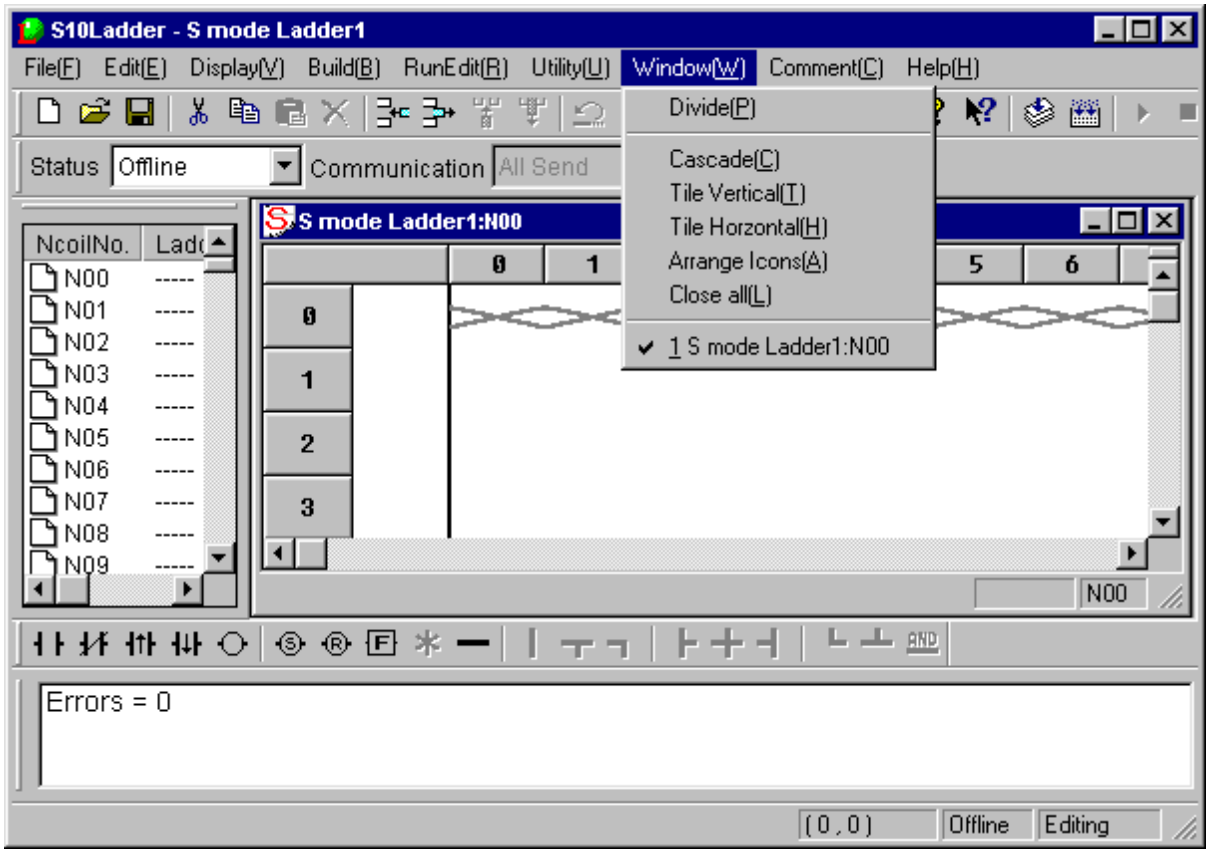
- The Remote Operation menu is displayed only on the Ladder Chart System of the 2α and S10mini series. This menu is not displayed on the 4α and 4αH Ladder Chart Systems.
- Select “Ethernet” as the type of PC communication.
- To use the Remote Operation function, set “ONLINE” and confirm that Ethernet communication is normal.
- Do not set the MODE No. switch of the ET.NET module to “5” (setting of tool communication by 10BASE-T as a submodule) to use the Remote Operation function.
- The Remote Operation function is available only when using the Ethernet modules below for connection. When other Ethernet modules are used, the respective Remote Maintenance menus are displayed as being inactive.

  LQE020: Module Rev R (micro program version 5.0) or later

  LQE520: Module Rev H (micro program version 7.0) or later
- The Ethernet modules above can be mounted on the 2α series by using an optional adapter (LWZ800), but cannot remotely operate the 2α series.

4.8 Ladder Sheet Window Functions

The ladder sheet window functions are selectable from a pull-down menu.

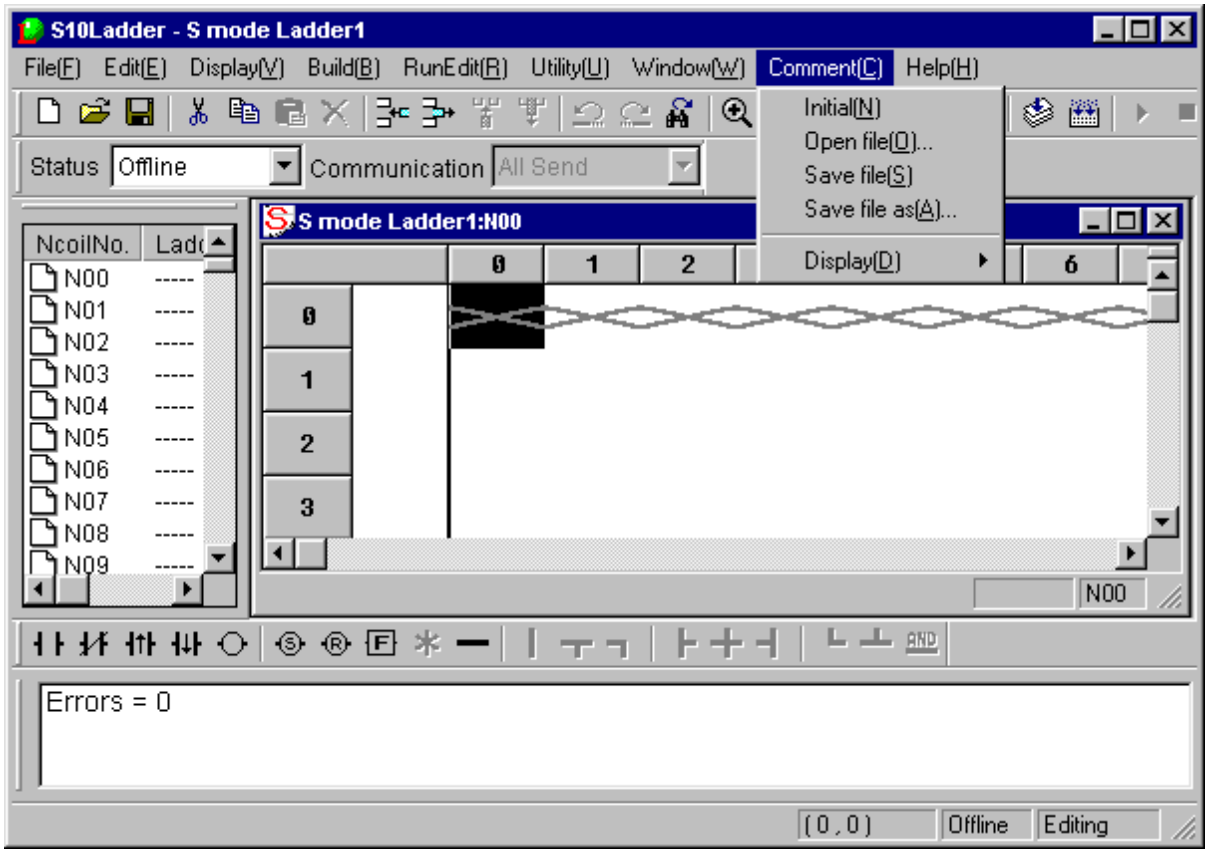


The window functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Window	Divide		Divides a window.
2		Cascade		Cascades two or more N coil windows.
3		Tile vertical		Tiles two or more N coil windows vertically.
4		Tile Horizontal		Tiles two or more N coil windows horizontally.
5		Arrange Icons		Arranges icons.
6		Close all		Closes all open N coil windows.
7		Window list 1, …		Displays a list of currently open windows.

4.9 Ladder Sheet Comment Functions

The ladder sheet comment functions are selectable from a pull-down menu.



The comment functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Comment	Initial		Initializes comment information.
2		Open file		Opens an existing comment file.
3		Save file		Saves the comment file being processed.
4		Save file as		Saves the comment file being processed as a different name.
5		Display	Nothing	Hides comments.
6			16 Strings	Displays a comment in 16-character mode.
7			32 Strings	Displays a comment in 32-character mode.

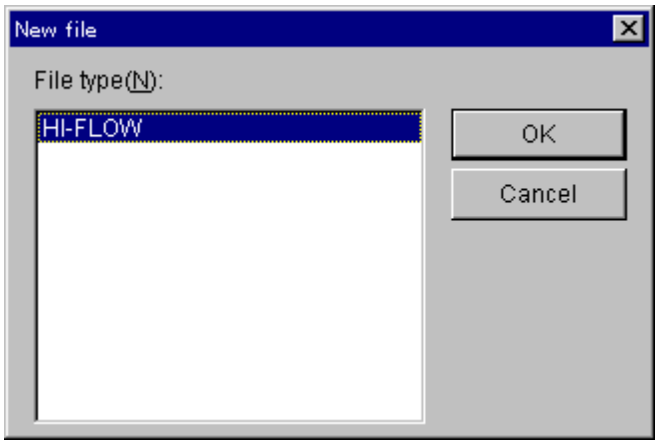
THIS PAGE INTENTIONALLY LEFT BLANK.

5 HI-FLOW PROCESS SHEET AND HI-FLOW SHEET FUNCTIONS AND THEIR USE

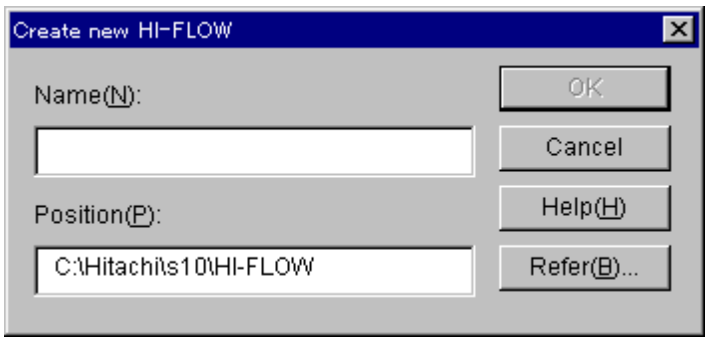
This chapter outlines the functions of HI-FLOW process sheets and HI-FLOW sheets as well as the method of using these two types of sheet. For details, refer to the help for the S10Tools system. Use the [Help] menu for online help guide.

5.1 Creating HI-FLOW Process Sheets

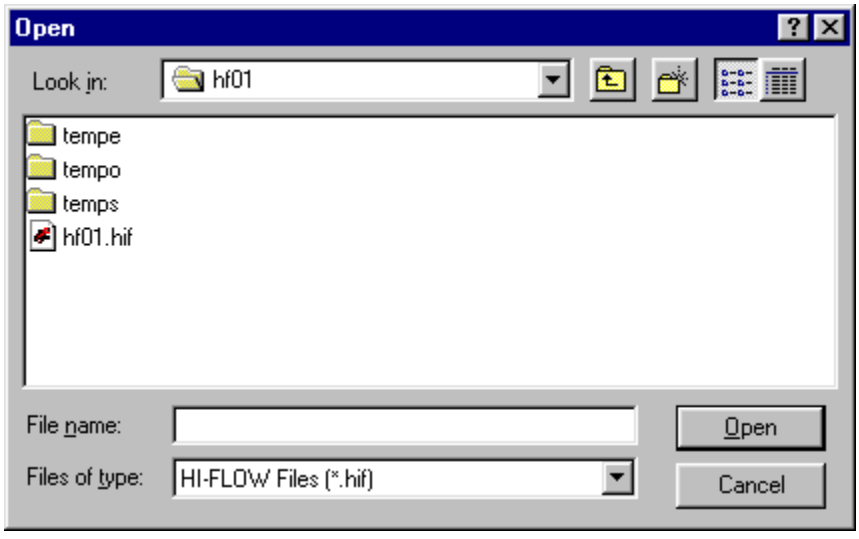
HI-FLOW process sheets are used to visually manage existing HI-FLOW sheets for each process. To create a HI-FLOW process sheet, select [File] menu – [New file].



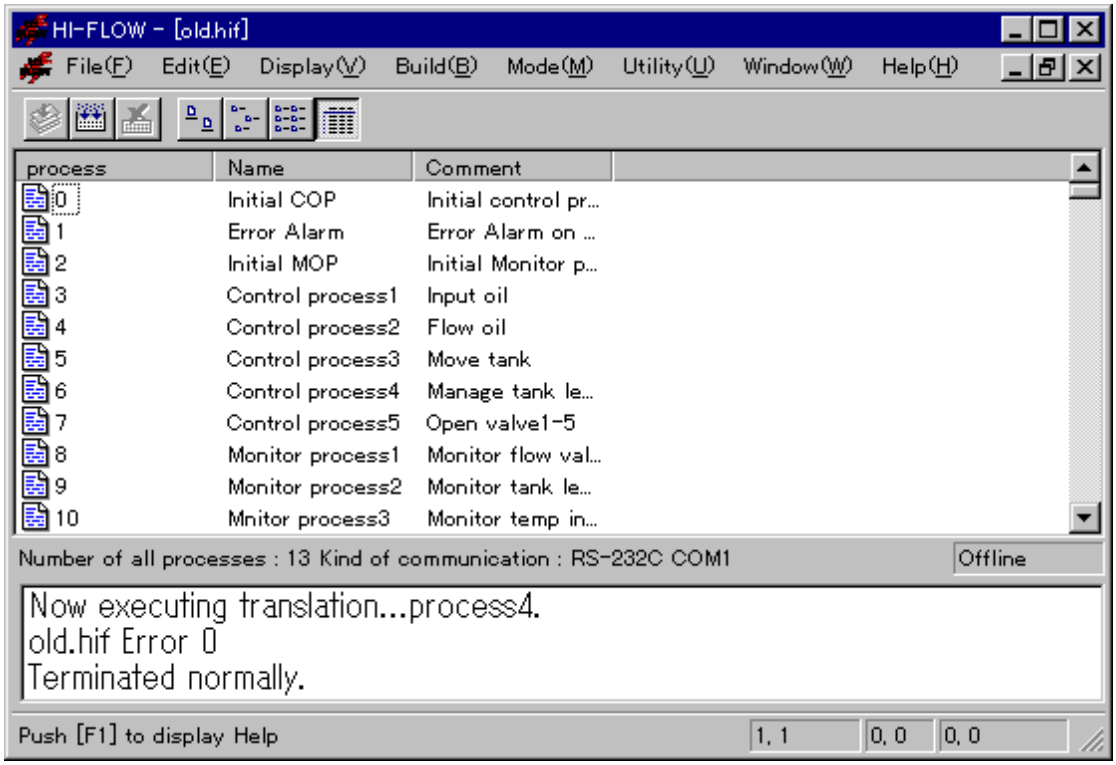
Click the OK button and set the name of a new sheet on the following window.



To open an existing HI-FLOW process sheet, select [File] menu – [Open file].



When a new HI-FLOW process sheet is created, it is opened with no program provided. Any existing HI-FLOW process sheet, when opened by selecting [Open], inherits the state that existed when that process sheet was closed previously.



Only one HI-FLOW process sheet can be opened at a time. When opening a HI-FLOW program from the HI-FLOW process sheet, double-click the HI-FLOW sheet icon on the HI-FLOW process sheet.

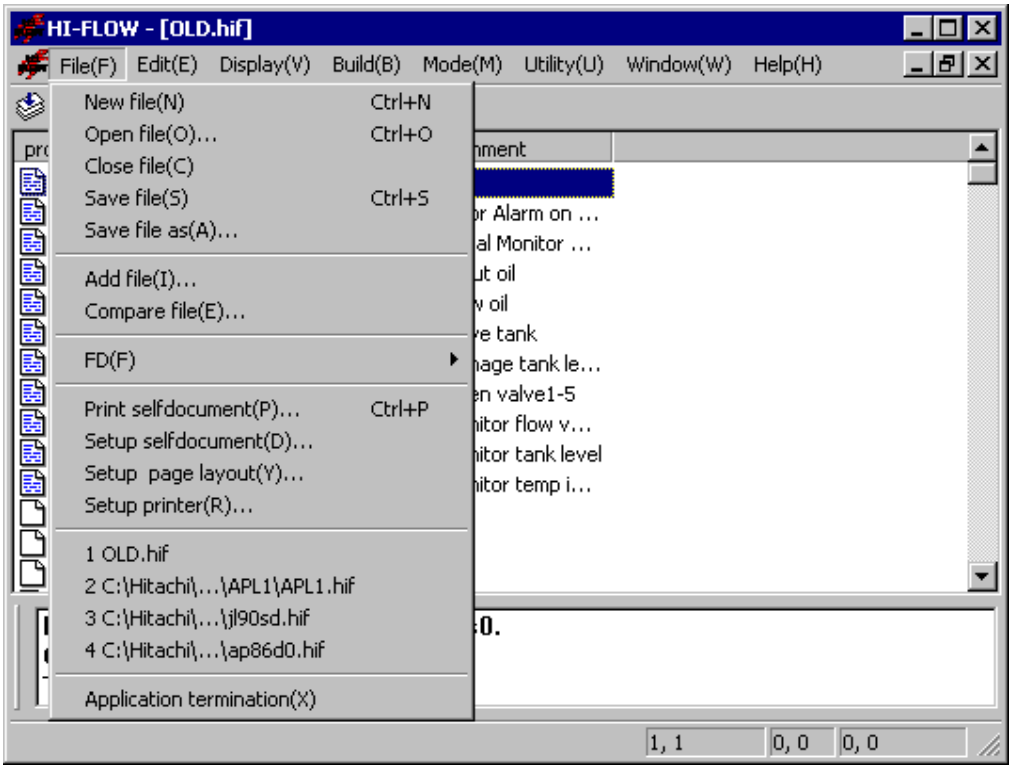
A HI-FLOW process sheet has the following eight main menus.

File: Provides file-related functions, such as saving, reading, and printing HI-FLOW process sheets.
Edit: Provides edit functions for editing HI-FLOW process sheets.
Display: Provides functions related to display formats in the HI-FLOW system.
Build: Provides functions related to compilation of HI-FLOW programs.
Mode: Provides functions related to transmission and reception between the PCs and HI-FLOW programs.
Utility: Provides utility functions.
Window: Provides functions for operations on ladder sheet windows.
Help: Provides help.

Toolbars also have the same functions as these menus.

5.2 HI-FLOW Process Sheet File Functions

The file functions for HI-FLOW process sheets are selectable from a pull-down menu.

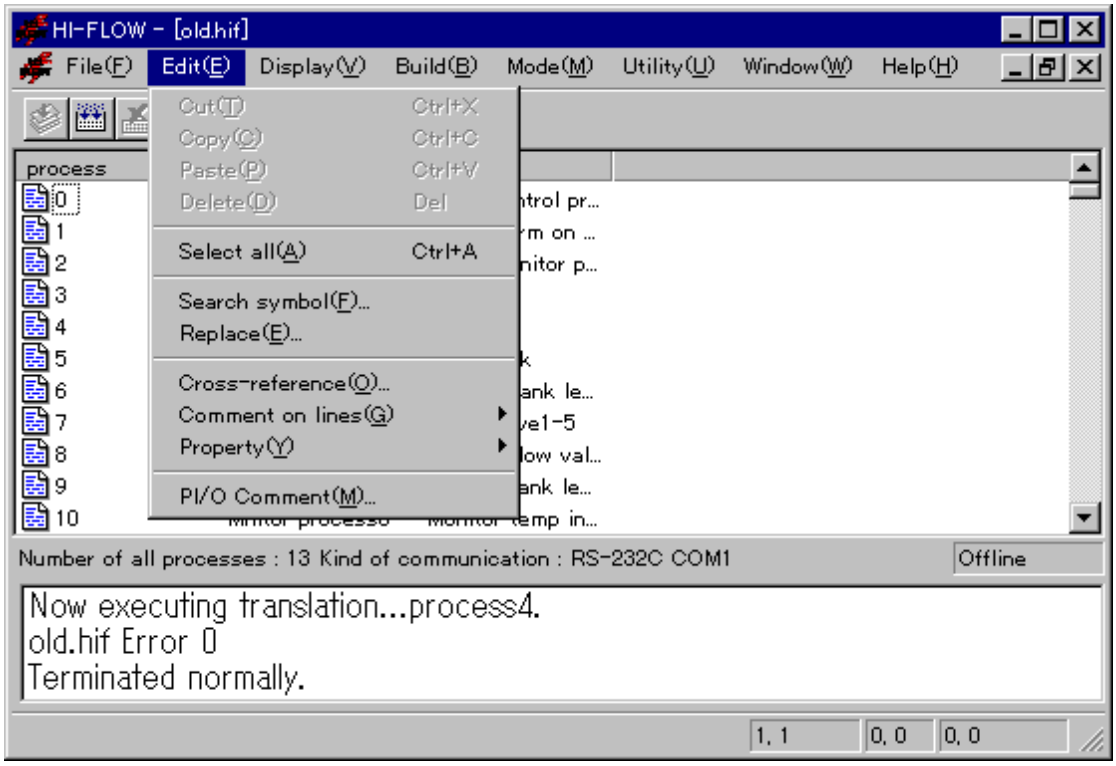


The file functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	File	New file		Opens a window to create a new program.
2		Open file		Reads a specified program file.
3		Close file		Closes the window currently active.
4		Save file		Overwrites and saves program data and comment data in the window currently active.
5		Save file as		Saves program data in the window currently active as a different name.
6		Add file		Adds a process.
7		Compare file		Compares processes on an object basis.
8		FD	Save	Saves program data in the window currently active to a floppy disk.
9			Read	Reads a program file from a floppy disk.
10		Print selfdocument		Prints a document created by self-documentation.
11		Setup selfdocument		Sets a format in which a document created by self-documentation is to be printed.
12		Setup page layout		Sets a page layout.
13		Setup printer		Selects a printer and sets a print format.
14		File names 1, 2, 3, 4, ...		Displays the names of files that were used before.
15		Application termination		Terminates the HI-FLOW system.

5.3 HI-FLOW Process Sheet Edit Functions

The HI-FLOW process sheet edit functions are selectable from a pull-down menu. The edit functions described in this section apply to HI-FLOW processes rather than HI-FLOW programs. Processes can be copied or deleted on HI-FLOW process sheets.

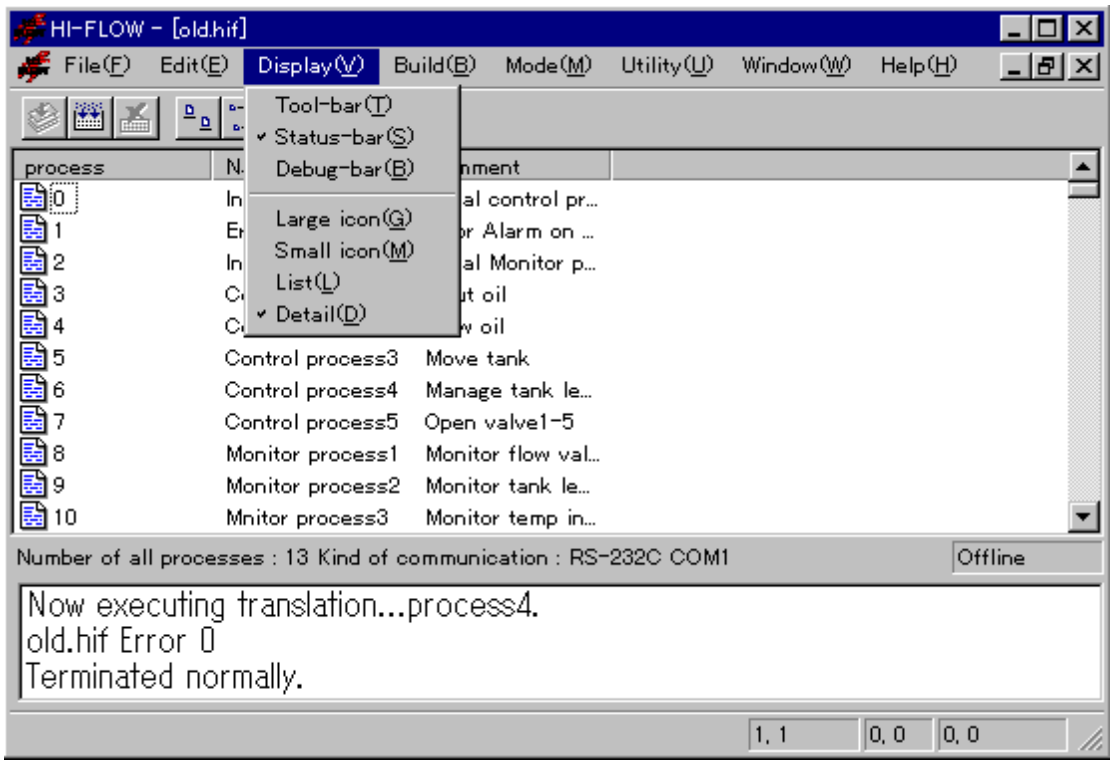


The edit functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Edit	Cut		Removes a specified part of a process and copies it to the clipboard.
2		Copy		Copies a specified part of a process to the clipboard.
3		Paste		Copies data from the clipboard to a specified position.
4		Delete		Deletes a specified part of a process.
5		Select all		Selects all process icons.
6		Search symbol		Searches for a specified symbol.
7		Replace		Replaces a specified structure.
8		Cross-reference		Searches for specified process symbol information.
9		Comment on lines	All processes	Copies the symbol structures of all processes.
10			Designated process	Copies the symbol structure of a specified process.
11		Property	Property	Sets properties for a file comment.
12			Process	Sets properties for a sheet.
13		PI/O Comment		Edits PI/O comment information.

5.4 HI-FLOW Process Sheet Display Functions

The HI-FLOW process sheet display functions are selectable from a pull-down menu.

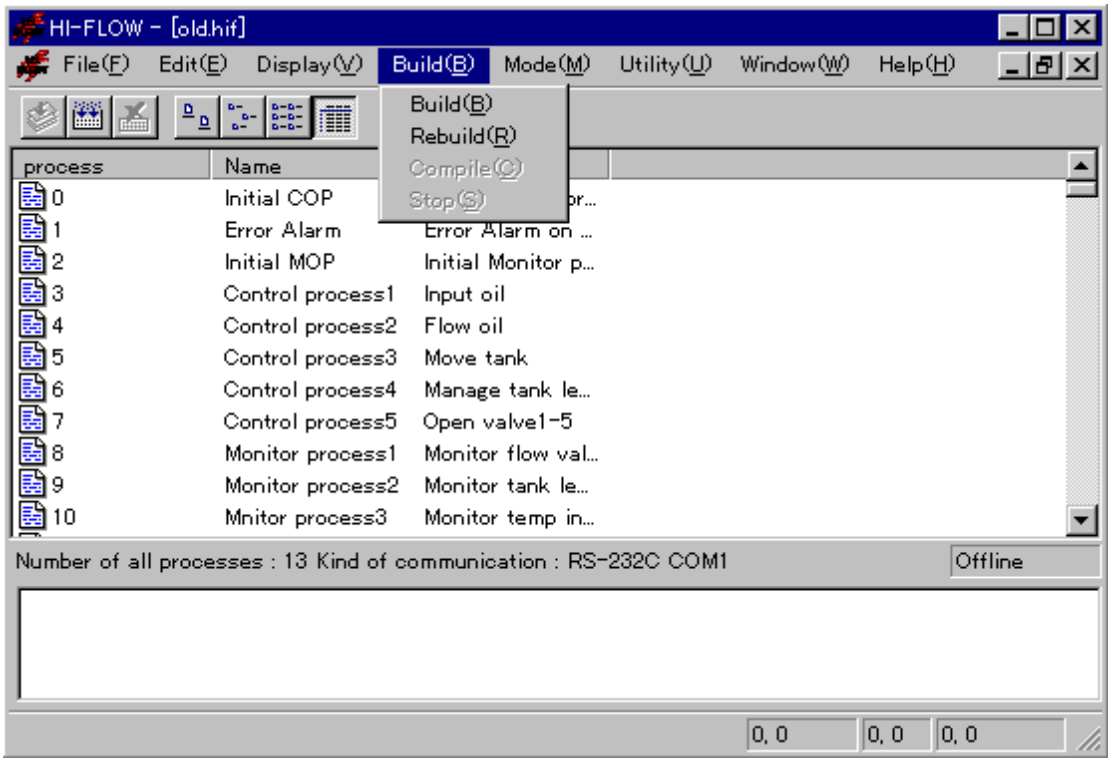


The display functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Display	Tool-bar		Displays or hides the toolbar.
2		Status-bar		Displays or hides the status bar.
3		Debug-bar		Displays or hides the debug bar.
4		Large icon		Displays a process with a large icon.
5		Small icon		Displays a process with a small icon.
6		List		Lists processes.
7		Detail		Displays a process in detail.

5.5 HI-FLOW Process Sheet Build Functions

The HI-FLOW process sheet build functions are selectable from a pull-down menu.



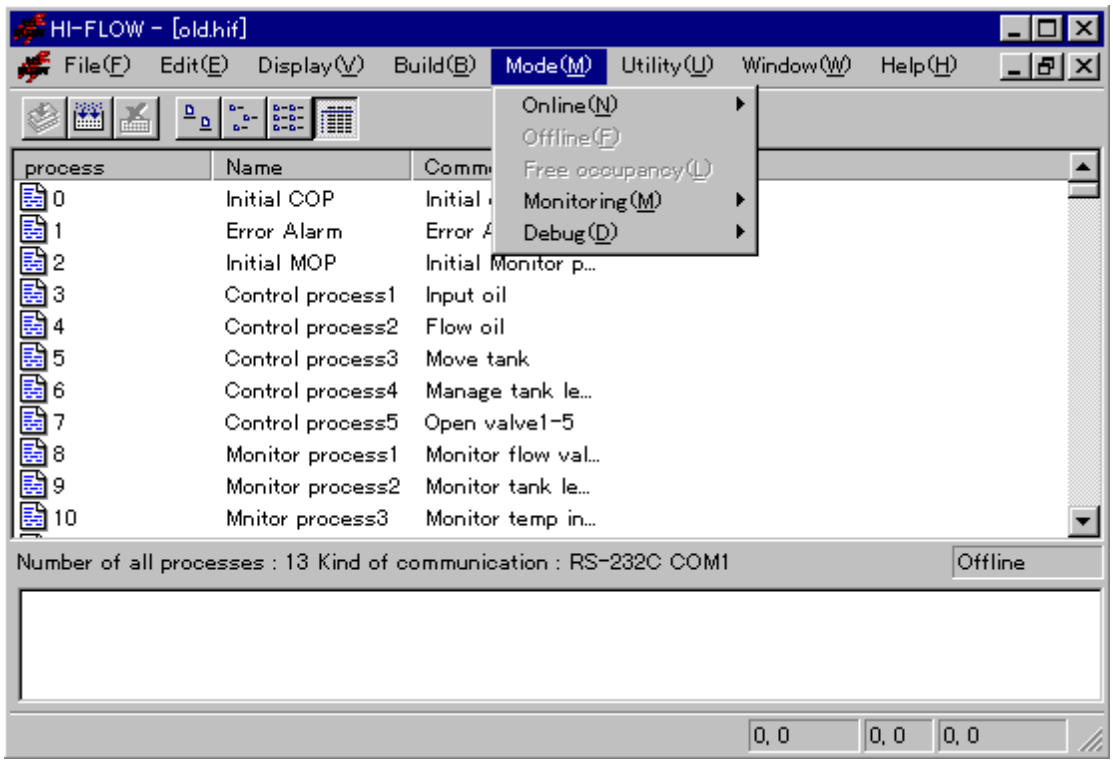
The build functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Build	Build		Compiles all processes that are not yet complied.
2		Rebuild		Compiles all processes, regardless of whether they have already been compiled.
3		Compile		Compiles a specified process.
4		Stop		Cancels compilation.

When performing compilation, make sure that at least one process has been selected. To specify multiple processes, hold down the [Shift] or [Ctrl] key and click the HI-FLOW sheet icon.

5.6 HI-FLOW Process Sheet Mode Functions

The HI-FLOW process sheet mode functions are selectable from a pull-down menu.



The target to be edited and available functions vary, depending on which mode, offline or online, is currently enabled.

- Offline mode
  Memory content in the personal computer or a file is edited.

- Online mode
  Memory content in the personal computer or the file which matches that in the PCs is edited. To switch to online mode, make a match with the PCs through transmission or reception.

When the HI-FLOW system is started, it always enters offline mode. Use a pull-down menu to switch to online mode, if necessary.

The mode functions are described below.

No.	Level 1	Level 2	Level 3		Description
1	Mode	Online	Send (PC -> S10)	All processes	Transmits all processes to the PCs and enables online mode.
2				Designated process	Transmits a specified process to the PCs and enables online mode.
3			Receive (S10 -> PC)	All processes	Receives all processes from the PCs and enables online mode.
4				Designated process	Receives a specified process from the PCs and enables online mode.
5			Unconditional		Always enables online mode.
6		Offline			Switches to offline mode.
7		Free occupancy			Releases the lock set by the local personal computer.
8		Monitoring	Start monitoring		Starts monitoring.
9			Stop monitoring		Stops monitoring.
10		Debug	Trace		Traces and displays the operation of a process, starting when a given start condition is met and ending when a given end condition is met.
11			Time monitor		Monitors time elapse from the time when a given start condition is met until when a given end condition is met.
12			Breakpoint		Sets or removes breakpoints.

Any HI-FLOW system on a network has a lock function compatible with that network. This is to prevent multiple such HI-FLOW systems from accessing the same PC simultaneously. When online mode is specified, the connected PCs are locked. The locked PCs are unlocked when the user selects the free occupancy menu.

Online mode may not be specified for the PCs that are already locked by the HI-FLOW system on another personal computer. If this happens, an error message is displayed and the specified online mode is invalidated.

5.6.1 HI-FLOW four-line simultaneous monitoring function

HI-FLOW system versions 7 and later (system floppy disk versions 07-00 and later) support the four-line simultaneous monitoring function that is exercised via an Ethernet. This function enables four personal computers to conduct simultaneous HI-FLOW monitoring operations with respect to one CPU unit. For the use of this function, the monitoring HI-FLOW system (program product type: S-7890-35) is required in addition to the HI-FLOW system.

The requirements for the use of the four-line simultaneous monitoring function are indicated below with a typical configuration.

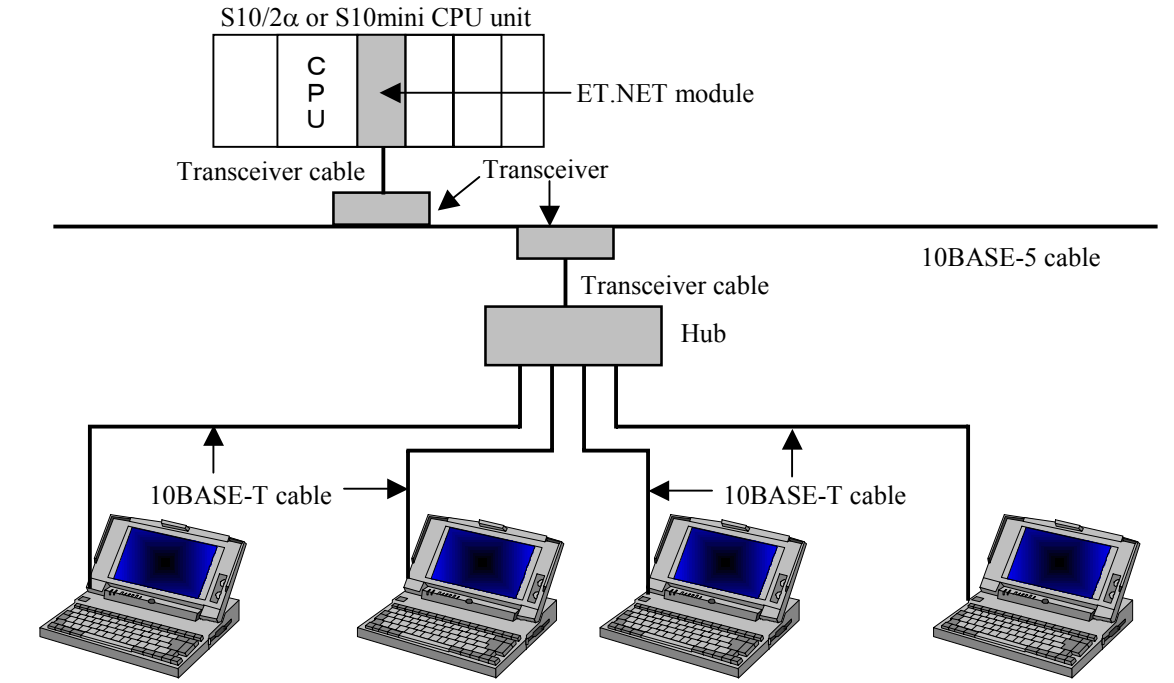
(1) Requirements

- The version of the employed ET.NET module must be as indicated below.
  LWE550: Version 4, Revision 1 or later (2α series)
  LQE020: Version 3, Revision 1 or later (S10mini series)
- The PCs must be connected to personal computers via Ethernet (the function supporting this is not available if the RS-232C or GP-IB interface is used).
- The PCs must be connected to personal computers via a LAN (the function supporting this is not available through the use of a one-to-one direct connection).
- Up to four personal computers can be simultaneously connected to the PCs. However, only one HI-FLOW editing personal computer (regular HI-FLOW system) must be used. The other personal computers must be dedicated to monitoring (up to three monitoring HI-FLOW system machines can be used).

(2) Limitations

Even when two ET.NET modules (main module and submodule) are connected to one CPU unit, up to four personal computers can be connected to that CPU unit.

(3) Typical configuration



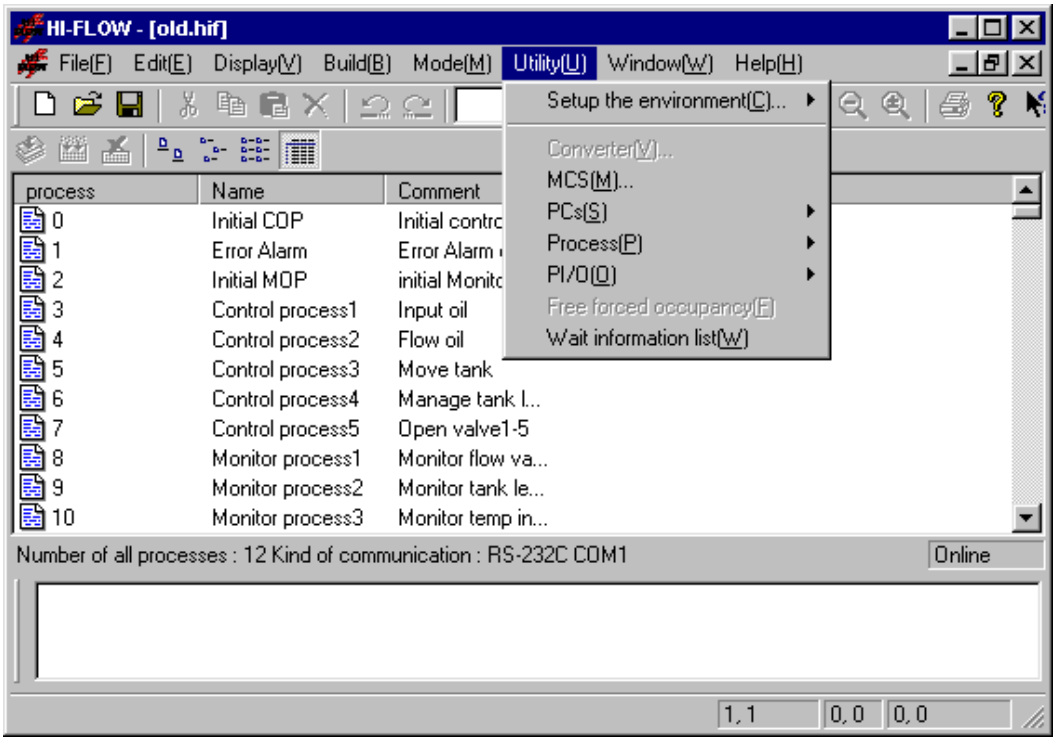
NOTE

- Use of the four-line simultaneous monitoring function requires the following version of ET.NET module:
  LWE550: Version 4, Revision 1 or later (2α series)
  LQE020: Version 3, Revision 1 or later (S10mini series)
  If an attempt is made to connect one CPU unit with two or more personal computers and the version of the ET.NET module employed is earlier than shown above, the following error message appears on the display to indicate that it cannot enter an on-line condition with the personal computers.

- Ladder chart system versions 7 and later also support the four-line simultaneous monitoring function. However, the number of personal computers that can be connected with one PCs unit is limited to four including the ladder chart system (the unit dedicated to monitoring is also included) and HI-FLOW system (the unit dedicated to monitoring is also included). Even when two ET.NET modules (main module and submodule) are mounted in one PCs unit, the maximum number of connectable personal computers is 4.

5.7 HI-FLOW Process Sheet Utility Functions

The HI-FLOW process sheet utility functions are selectable from a pull-down menu.



The utility functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Utility	Setup the environment	Setup Tool-bar	Sets buttons on the toolbar.
2			Setup Display position	Sets the positions where structures, labels, or comments are to be displayed by default.
3			Background color	Sets the background color to be used for a sheet in each mode.
4			Paste	Chooses between the “overwrite” and “insert” modes of pasting.
5		Converter		Converts the source code created by a DOS version of the HI-FLOW system.
6		MCS		Reads or writes memory.
7		PCs	Change connection of PCs	Sets a type of communication with the PCs.
8			Change PCs status	Forcibly stops the PCs or releases the PCs from their forcibly stopped state.
9			System edition	Sets conditions and an environment required for operation on the PCs.
10			Delete process of PCs	Replaces or deletes the HI-FLOW system.
11			Layout system bits	Sets a bit-type PI/O register so as to reflect the run state on the PCs.

No.	Level 1	Level 2	Level 3	Description
12	Utility (continued from the previous page)	Process	Interrelation chart of processes	Displays the correlation between processes and their names.
13			Total Process capacity	Displays the capacity of all processes.
14			Restart process	Forcibly restarts the processes on the PCs from their current states.
15			Process ACT	Starts the processes on the PCs from their current states.
16			Process RST	Resets the processes on the PCs from their current states.
17			Process STP	Stops the processes on the PCs from their current states.
18			Process CLR	Clears the processes on the PCs from their current states.
19		PI/O	Delete unused PI/O	Deletes unused PI/O registers.
20		Free forced occupancy		Forcibly unlocks the PCs.
21		Wait information list		Displays a symbolic figure, syntax, or the like for a process stop step.

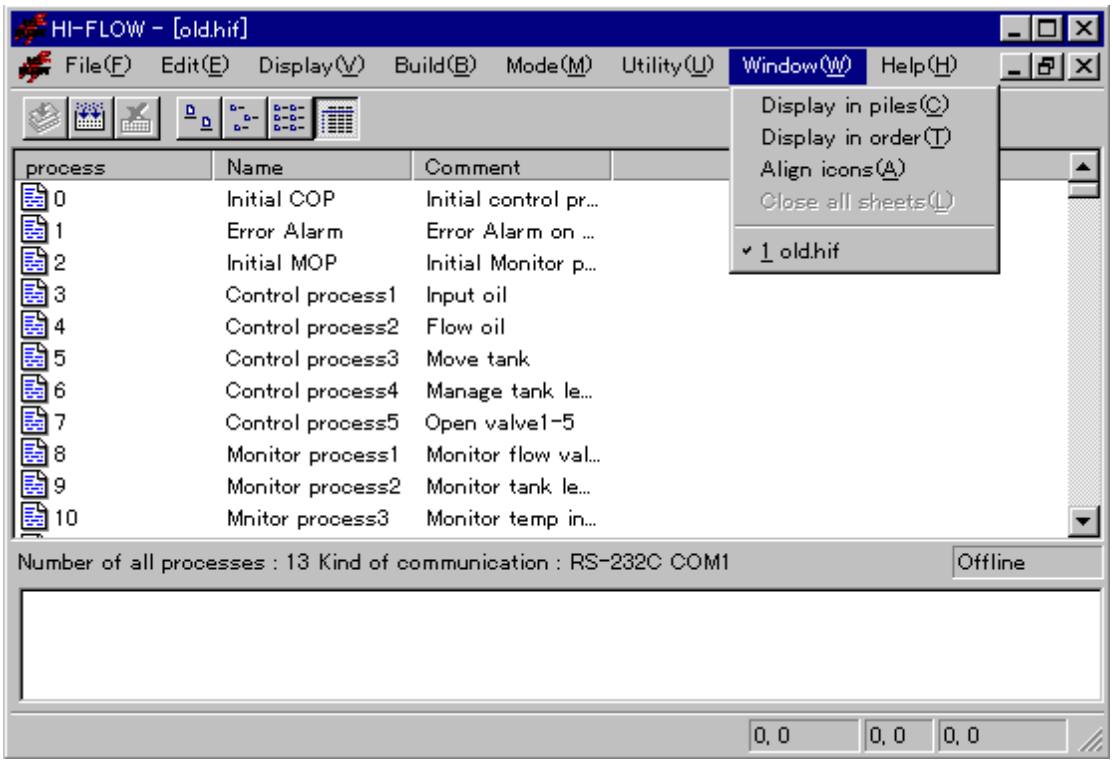
Free forced occupancy is related to the network-compatible function described in "5.6 HI-FLOW Process Sheet Mode Functions." If the HI-FLOW system becomes disconnected for some reason from the PCs being locked by it, the PCs may be left locked and, as a result, may no longer be connected to any personal computer. In such a case, use the free forced occupancy function to forcibly release the PCs from the locked state.

NOTE

The free forced occupancy function can be executed even when another user is keeping the PCs locked. If it is executed in such a situation, the other user who has been keeping the PCs locked is not notified of the fact. This may cause multiple simultaneous accesses to the same PC in some operation. To prevent this, check for any warning message indicating that another user is keeping the PCs locked, before using the free forced occupancy function.

5.8 HI-FLOW Process Sheet Window Functions

The HI-FLOW process sheet window functions are selectable from a pull-down menu.



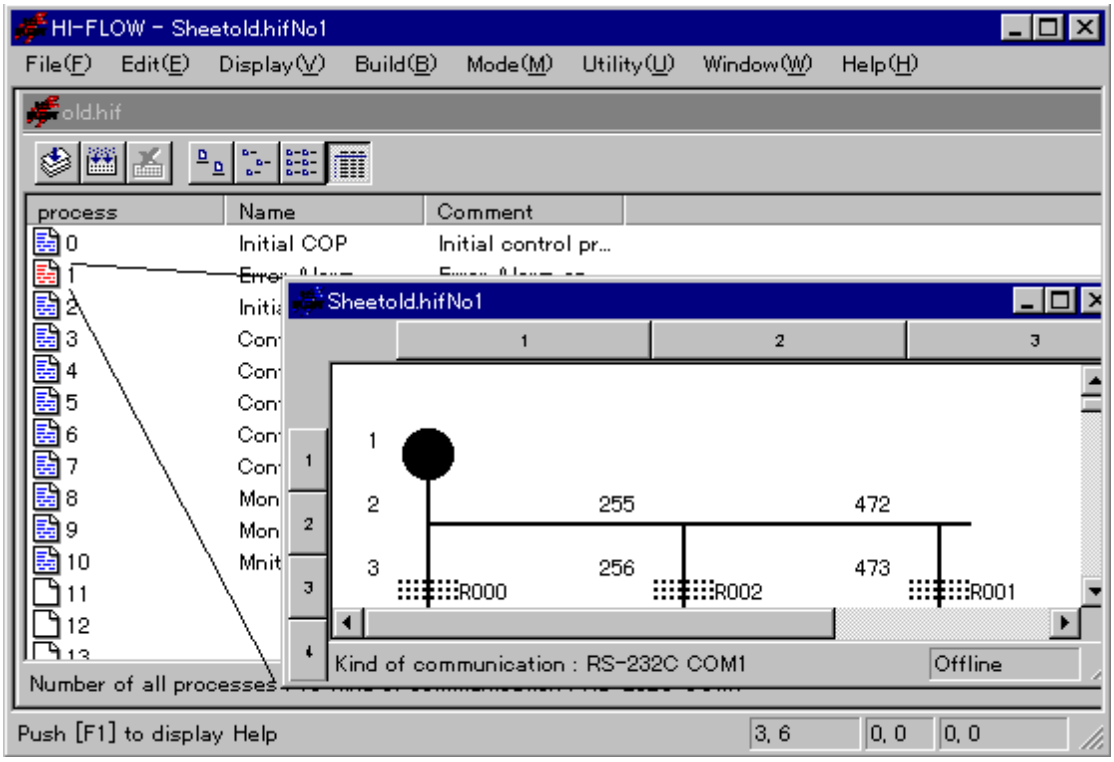
The window functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Window	Display in piles		Cascades windows.
2		Display in order		Tiles windows.
3		Align icons		Arranges icons.
4		Close all sheets		Closes all process detail sheets that are currently open.
5		File name 1, ...		Selects the active window.

5.9 Creating HI-FLOW Sheets

HI-FLOW sheets for 256 processes are available. They are opened from HI-FLOW process sheets. To open a HI-FLOW sheet, double-click the sheet icon on the HI-FLOW process sheet. Write a HI-FLOW program on the HI-FLOW sheet and save it. The HI-FLOW sheet will then be registered on the HI-FLOW process sheet.

<HI-FLOW process sheet and HI-FLOW sheet>



<HI-FLOW symbol bar>

The HI-FLOW symbol bar contains the following symbols, which are listed as arranged on the bar from left to right.

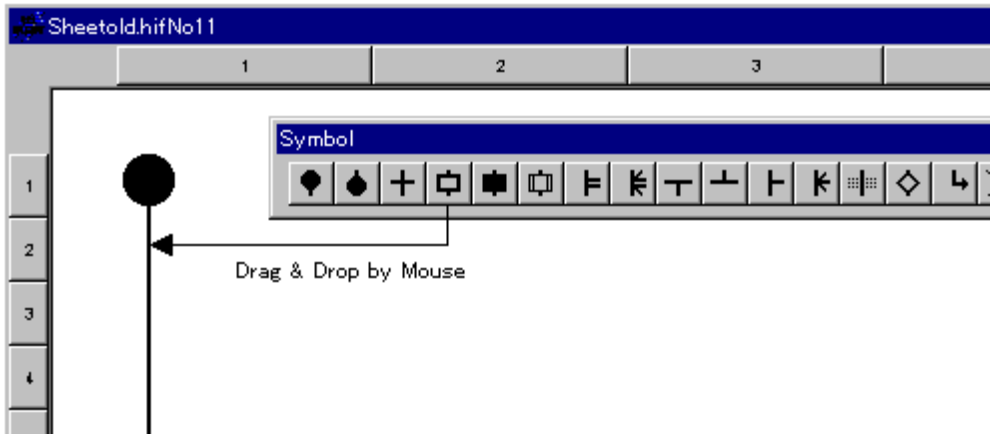
- Start process
- Terminate process
- Wait
- Box
- Control box
- Call
- Parallel start
- Parallel end
- Start of route
- Termination of route
- Select
- Cell end
- Cell wait
- If
- Jump
- Escape
- Start of repeat
- Termination of repeat
- Function
- Clear wait

5.9.1 Pasting HI-FLOW symbols

There are several methods of pasting HI-FLOW symbols to sheets. Select the desired method from among those listed below.

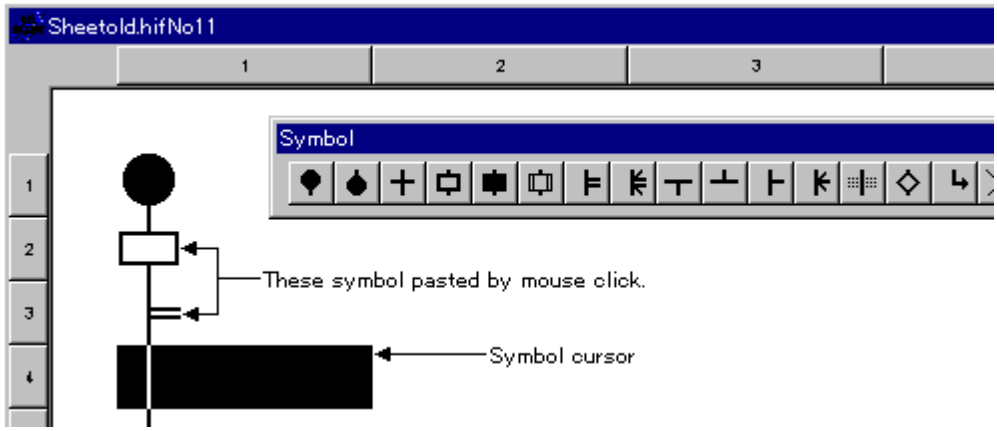
(1) Drag-and-drop with the mouse

Drag the desired symbol from the symbol bar to the position where to paste the symbol, and drop the symbol.



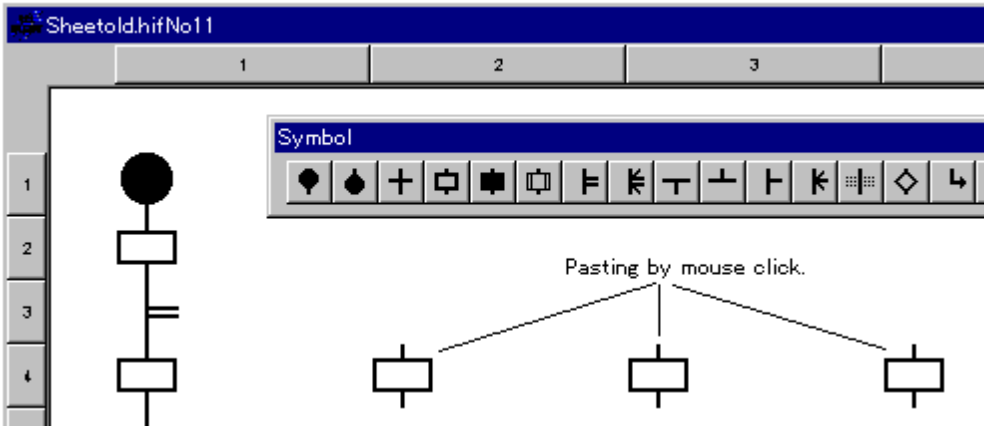
(2) Pasting at the input cursor position with the mouse

Click the desired symbol on the symbol bar. The symbol will then be pasted at the symbol cursor position.



(3) Repetitive inputs of a specified symbol with the mouse

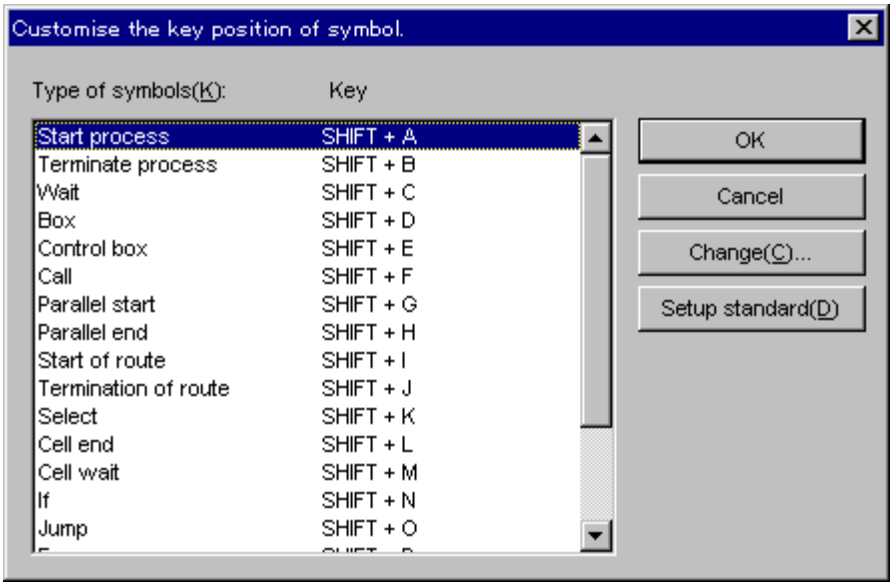
Select (repetitive) from the edit bar. The specified symbol can then be input repeatedly. Click the position on the sheet into which to paste the symbol. The symbol will then be pasted into that position. To cancel repetitive inputs, select (repetitive) again from the edit bar.



(4) Pasting with keys

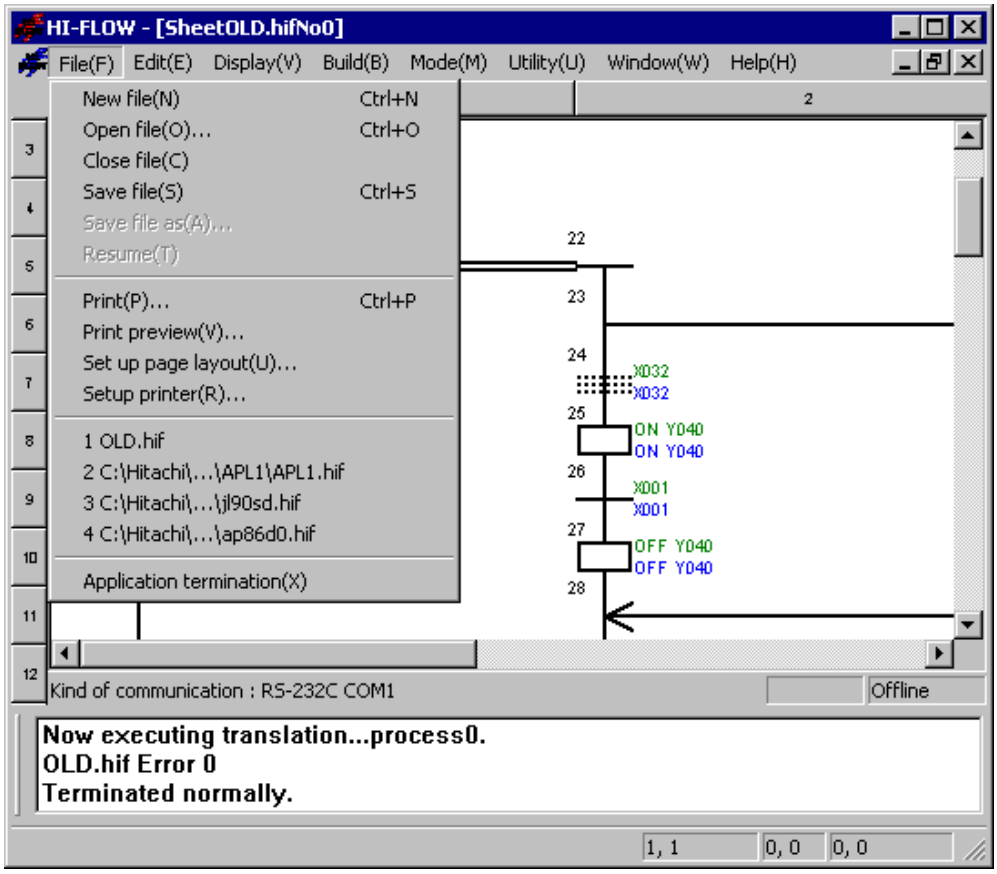
A symbol can be pasted by a specified combination of key strokes at the symbol cursor position on the sheet. To move the symbol cursor, use the [←], [→], [↑], and [↓] arrow keys. Key strokes can be customized by selecting [Utility] menu – [Keyboard].

<[Customize the key position of symbol.] window>



5.10 HI-FLOW Sheet File Functions

The file functions for HI-FLOW sheets are selectable from a pull-down menu.

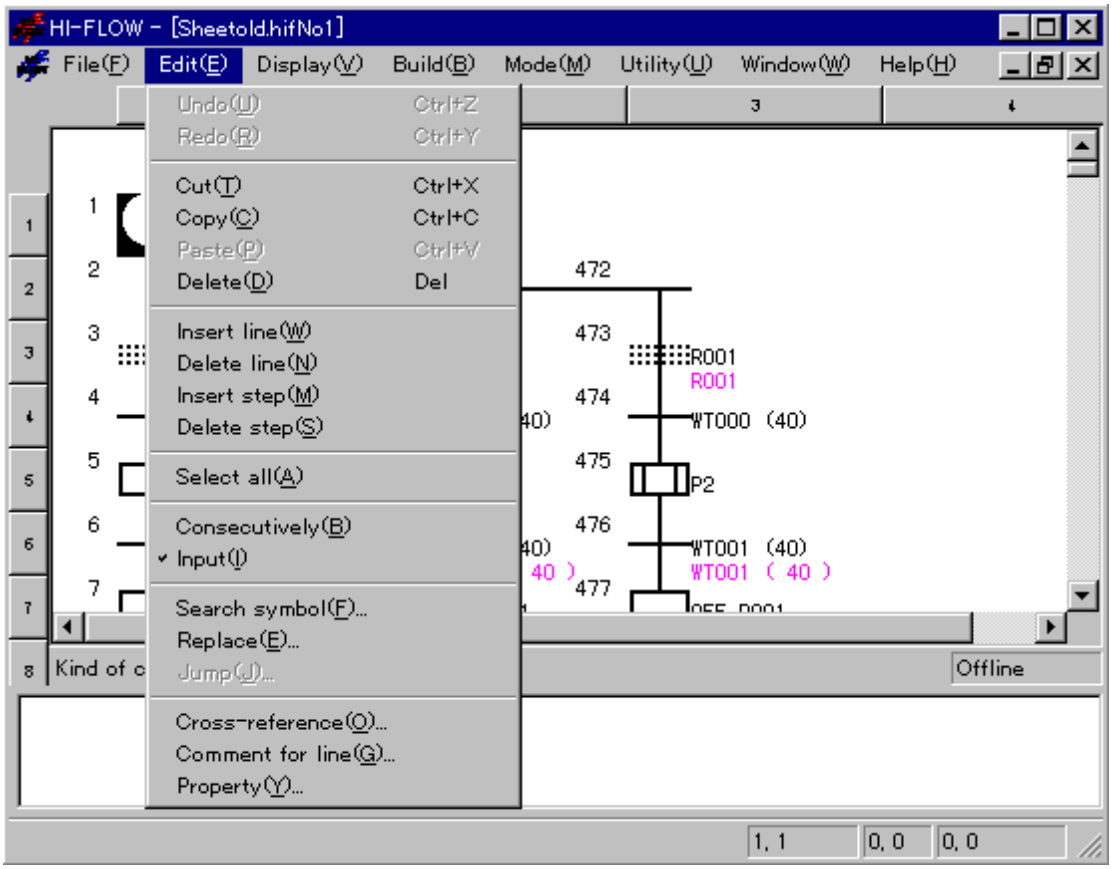


The file functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	File	New file		Opens a window to create a new program.
2		Open file		Reads a specified program file.
3		Close file		Closes the window currently active.
4		Save file		Overwrites and saves program data and comment data in the window currently active.
5		Save file as		Saves program data in the window currently active as a different name.
6		Resume		Restores a window to the state that existed when it was opened.
7		Print		Sets a range of image data to be printed, a printer, and other parameters, and then prints the image data.
8		Print preview		Displays a print image on the screen.
9		Set up page layout		Sets a page layout.
10		Setup printer		Sets up a printer.
11		File names 1, 2, 3, 4, ...		Displays the names of files that were used before.
12		Application termination		Terminates the HI-FLOW system.

5.11 HI-FLOW Sheet Edit Functions

The HI-FLOW sheet edit functions are selectable from a pull-down menu. The edit functions described in this section apply to HI-FLOW programs. Steps, lines, symbols, and structures can be copied or deleted on HI-FLOW sheets.



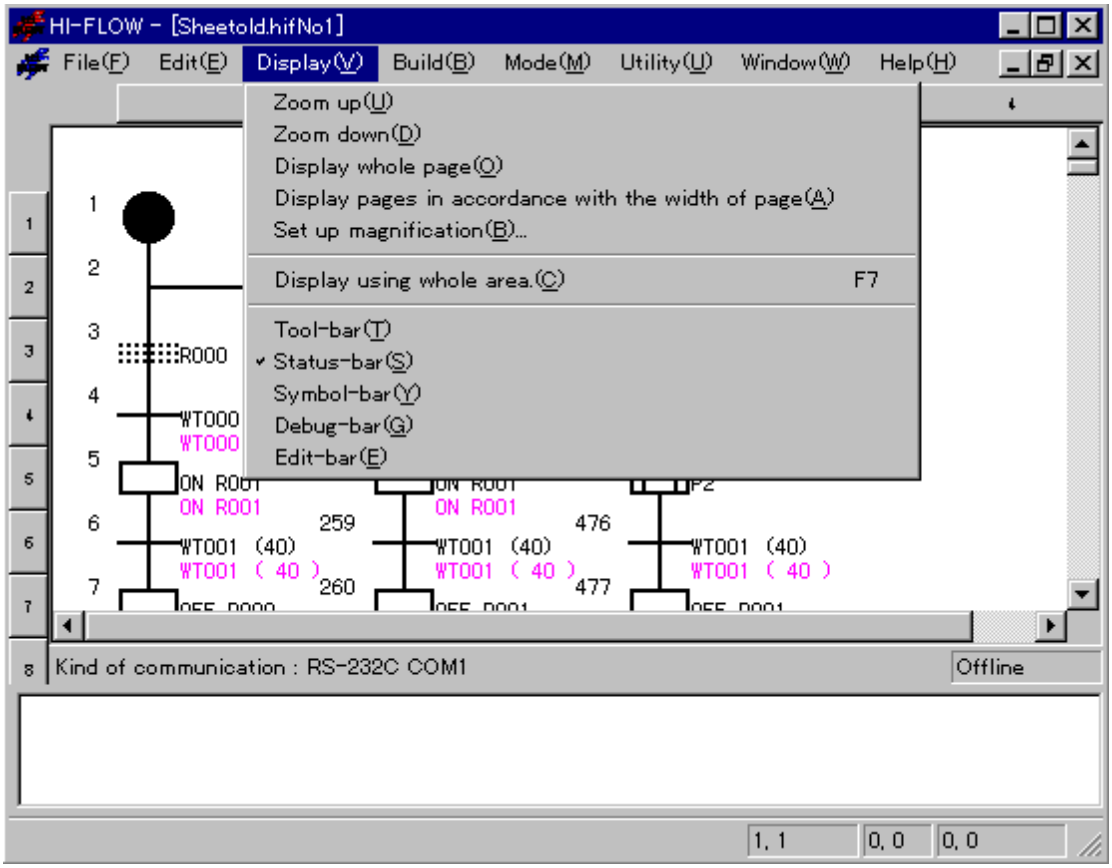
The edit functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Edit	Undo		Reverses the last action.
2		Redo		Reexecutes the action canceled by [Undo].
3		Cut		Removes the data in a specified range and copies it to the clipboard.
4		Copy		Copies the data in a specified range to the clipboard.
5		Paste		Copies data from the clipboard to a specified position.
6		Delete		Clears the data in a specified range.
7		Insert line		Inserts a line on the sheet.
8		Delete line		Deletes a specified line.
9		Insert step		Inserts one step on the sheet.
10		Delete step		Deletes a specified step.
11		Select all		Selects all items.
12		Consecutively		Draws a specified symbol repeatedly.
13		Input		Opens a input window when a symbol is accepted.
14		Search symbol		Moves the cursor to a specified symbol.

No.	Level 1	Level 2	Level 3	Description
15	Edit (continued from the previous page)	Replace		Replaces a specified structure.
16		Jump		Moves the cursor to a specified step.
17		Cross-reference		Searches for symbol information of a specified process.
18		Comment for line		Copies a symbol structure to a comment.
19		Property		Sets sheet properties.

5.12 HI-FLOW Sheet Display Functions

The HI-FLOW sheet display functions are selectable from a pull-down menu.

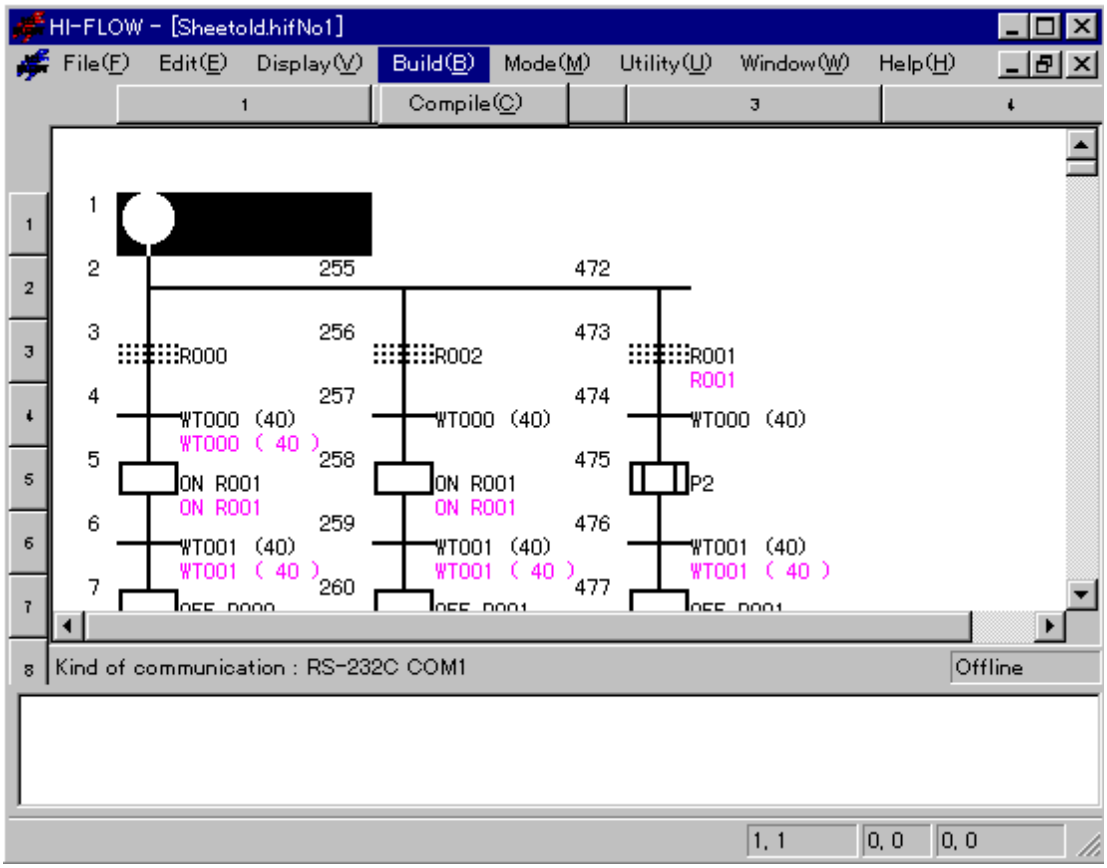


The display functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Display	Zoom up		Enlarges a page.
2		Zoom down		Contracts a page.
3		Display whole page		Displays an entire page.
4		Display pages in accordance with the width of page		Displays a page according to the page width.
5		Set up magnification		Sets a percentage of actual size.
6		Display using whole area		Displays a page using the entire screen.
7		Tool-bar		Displays or hides the toolbar.
8		Status-bar		Displays or hides the status bar.
9		Symbol-bar		Displays or hides the symbol bar.
10		Debug-bar		Displays or hides the debug bar.
11		Edit-bar		Displays or hides the edit bar.

5.13 HI-FLOW Sheet Build Functions

The HI-FLOW sheet build functions is selectable from a pull-down menu.

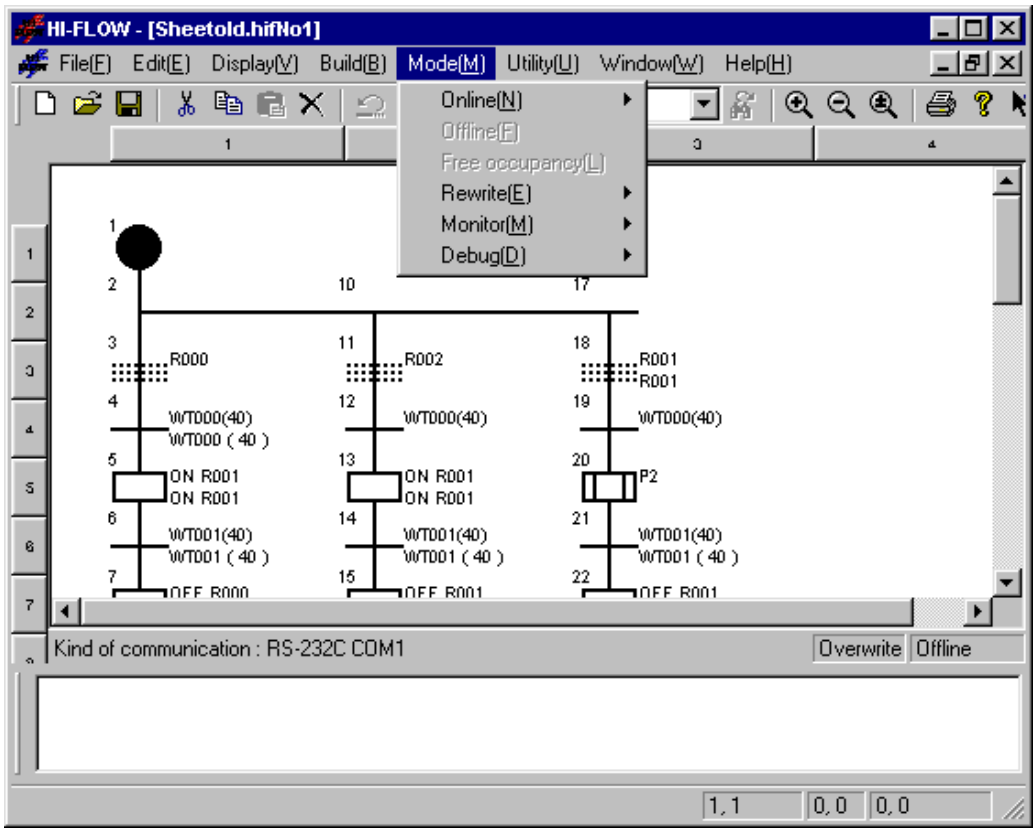


The build functions is described below.

No.	Level 1	Level 2	Level 3	Description
1	Build	Compile		Performs compilation.

5.14 HI-FLOW Sheet Mode Functions

The HI-FLOW sheet mode functions are selectable from a pull-down menu.



The mode functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Mode	Online	Send (PC -> S10)	Transmits a process to the PCs and enables online mode.
2			Receive (S10 -> PC)	Receives a process from the PCs and enables online mode.
3			Unconditional	Always enables online mode.
4		Offline		Switches to offline mode.
5		Free occupancy		Releases the lock set by the local personal computer.
6		Rewrite	Step	Rewrites the program contents stored in the PCs (the syntax/comments in a step are the target).
7			Process	Rewrites the program contents stored in the PCs (all items within a process are the target).
8		Monitoring	Start monitoring	Starts monitoring.
9			Stop monitoring	Stops monitoring.
10			Step	Monitors the passing from step to step.
11			Token	Monitors tokens.
12			I/O	Monitors the setting and resetting of bits.
13			Clear	Initializes the maintained trace of execution.

No.	Level 1	Level 2	Level 3	Description
14	Mode (continued from the previous page)	Debug	Trace	Traces and displays the operation of a process, starting when a given start condition is met and ending when a given end condition is met.
15			Time monitor	Monitors time elapse from the time when a given start condition is met until when a given end condition is met.
16			Breakpoint	Sets or removes breakpoints.
17			Execution point	Moves the cursor to an execution point.

Any HI-FLOW system on a network has a lock function compatible with that network. This is to prevent multiple such HI-FLOW systems from accessing the same PC simultaneously. When online mode is specified, the connected PCs are locked. The locked PCs are unlocked when the user selects the free occupancy menu.
Online mode may not be specified for the PCs that are already locked by the HI-FLOW system on another personal computer. If this happens, an error message is displayed and the specified online mode is invalidated.

5.14.1 Overview of a rewrite during a run

In marked contrast to the other functions, the run-time rewrite function can seriously affect the plant facilities, depending on its use. Therefore, this function is particularly explained below in detail.

⚠ CAUTION

The run-time rewrite function for a HI-FLOW program can seriously affect the plant facilities depending on its use. If you are not familiar with the HI-FLOW program processes, do not attempt to rewrite during a run but rewrite while the CPU is stopped.

(1) Functionality

This function enables you to rewrite a HI-FLOW program during a run (i.e., during an on-line condition) . This run-time rewrite function offers three functions: step rewrite, process rewrite, and register value rewrite.

(2) Run-time rewrite function overview

- Step rewrite

  If the [Rewrite] – [Step] is selected from the [Mode] menu, it will be in a step rewriting state. Again, if the [Rewrite] – [Step] is selected from the [Mode] menu, a step rewriting state will be canceled.

  The step rewrite function allows you to rewrite the syntax used in a step. However, it does not enable you to rewrite the syntax in such a manner as to increase its size or the size of comments.

- Process rewrite

  If the [Rewrite] – [Process] is selected from the [Mode] menu, it will be in a process rewriting state. Again, if the [Rewrite] – [Process] is selected from the [Mode] menu, a process rewriting state will be canceled.

  The process rewrite function is newly offered by Version 7. It offers all the editing functions that can be exercised in an off-line condition, such as step size increase, step addition, and step deletion.

- Register value rewrite

  This function permits you to change a register value within a HI-FLOW program in an on-line condition. If a symbol is double-clicked at the time of online, the list of the registers currently used as the applicable symbol is displayed, and the value of a register can be changed.

(3) Limitations

- Step rewrite

  The step rewrite function does not perform a rewrite in such a manner as to increase the size of the syntax or comments within a step.

- Process rewrite
  - When the process rewrite function is exercised, no limitations are imposed on editing within a process detail window. However, you cannot change the right of interaction with a detail window or a list window.
  - Version 7 does not allow you to set the run-time rewrite mode during the monitoring or debugging state.

- Register value rewrite

  Register values cannot be rewritten in an off-line condition or process rewrite mode.

(4) Program execution state synchronization in process rewrite mode

When the following conditions are met, the process rewrite mode achieves synchronization with the HI-FLOW program status prevailing before a rewrite.

If the conditions are not met, process initialization takes place (by clearing the process execution state and then executing from the beginning of the process [in the same manner as for a process restart]).

<Synchronization conditions>

- No symbolic figure for a program is added, deleted, or changed.
- No label (label or free label) is added, deleted, or changed (jump source changes are allowable).
- No addition, deletion, or change is made to the route structure.

CAUTION

- No monitoring or debugging process can be performed in the run-time rewrite mode for a HI-FLOW program.
- Even if a rewrite is performed during a run, the PI/O register status remains unchanged. Therefore, do not perform a run-time rewrite until you have given adequate consideration to resulting program operations.
- If one or more calling processes exist in a process rewritten in the process rewrite mode, they (nesting processes included) reset.

(5) Timer/loop counter processing after a process rewrite

Timer/loop counter processing after a process rewrite is described below. Timer/loop counter processing is performed as described below no matter whether the synchronization conditions stated in (4) above are met.

- A parallel timer (PTXXX) or wait timer (WTXXX) used within a rewritten process resets (i.e., the elapse value reaches 0 and invokes a timer stop) without regard to the process startup conditions (TUP, TRS, or unspecified). The status of a specified PI/O register for a parallel timer remains the same as before a rewrite. When control stays at a wait timer and the synchronization conditions are met, a counting sequence starts again from 0.
- If a loop counter (CNXXX) is already running within a rewritten process, it unconditionally resets. (i.e., the elapse value is automatically set equal to its set final value.) As a result, it exits the loop when a loop check is conducted after a rewrite. It means that the loop comes to an end when the synchronization conditions are met upon a process rewrite in situations where control stays between the loop start and loop end.
- If a box symbol is used in an ON statement within a rewritten process with MRST selected as a process startup condition, the register(s) used in the ON statement are cleared except when no such registers are specified.
- If the CALL symbol is used within a rewritten process, the called process is executed starting from its beginning after a rewrite. Timers and loop counters at the call destination and register(s) in the ON statement are processed in accordance with CALL startup conditions. A parallel timer within the called process is retained if the call specifies nothing. Therefore, a wait state continues until an unrewritten timer is freed. To avert such a wait state, it is necessary to place a call with TRS or TUP specified. The elapse value of a wait timer or loop counter is retained if the call specifies nothing. However, a counting sequence starts from 0 upon reexecution.

Example:

Process name	Processing	Description
P0	ACT P1, MRST, TUP	The P0 performs a master reset/timeout startup of the P1.
P1	ON MFF0 CALL P2	The P1 issues a master reset call to the P2.
P2	ON Y000	(Execution in progress)

<User operation>

Rewriting the P1 process, compiling it, and transmitting it. (See "(7) Procedures for performing a rewrite during a run.")

<Internal process>

- Since the P1 is started in MRST mode, the MFF0 of the P1 resets. (i.e., it is cleared to 0.) However, the Y000 of the P2 remains unchanged.
- When a timer is used by the P1, a timer reset process is performed without regard to the TUP selection for the P0 (caller's route process). When a timer is used by the P2, a reset process is not performed.

The list below shows the possible timer, loop counter, and PI/O register states prevailing after a process rewrite.

<List of the possible timer and loop counter states prevailing after a process rewrite>

	Process startup condition	Timer/loop counter state
Process rewritten	Unspecified	An unconditional reset is performed. (The parallel timer stops. The wait timer restarts counting from 0. The elapse value of the loop counter is set equal to its set final value so as to exit the loop.)
	TUP	
	TRS	
Called process	Unspecified	The elapse value remains unchanged. The following occurs upon re-execution. Parallel timer : Maintains a wait state until the unrewritten timer times out. Wait timer : Starts counting again from 0. Loop counter : Starts counting again from 0.
	TUP	Times out.
	TRS	Resets.

<List of the possible PI/O register states prevailing after a process rewrite>

	Process startup condition	PI/O register state
Process rewritten	Unspecified	Retains the state that prevailed before a rewrite.
	MRST	Cleared to 0.
Called process	Unspecified	Retains the state that prevailed before a rewrite.
	MRST	Cleared to 0.

(6) Breakpoint-setting process in process rewrite mode

Performing a process rewrite deletes all set breakpoints without regard to the selection of the synchronization option or the occurrence of a break.

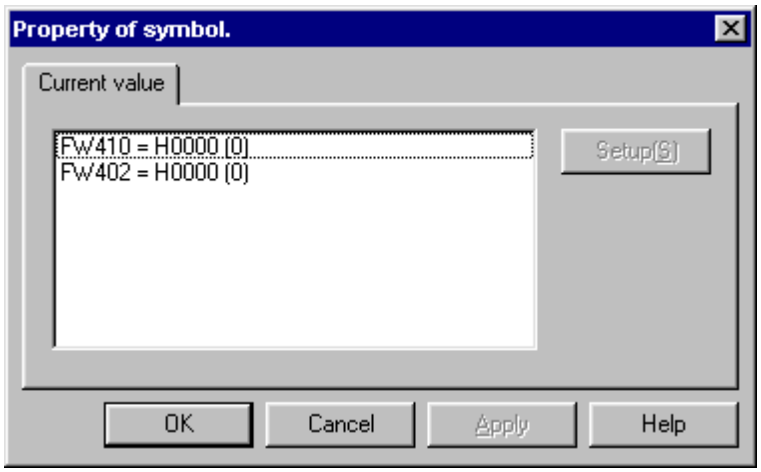
(7) Procedures for performing a rewrite during a run

- Step rewrite
  - ① With the process detail window open in an on-line condition, select [Mode] menu, [Rewrite], and then [Step].
  - ② Select the step to be rewritten.
  - ③ The [Property of symbol.] dialog box is displayed.
  - ④ The [Property of symbol.] dialog box allows you to edit the syntax and comments. Use the same editing procedures as in an off-line condition.
  - ⑤ After completion of a rewrite, click the OK button in the dialog box. The system then automatically performs compilation and transmission processes.
- Process rewrite
  - ① With the process detail window open in an on-line condition, select [Mode] menu, [Rewrite], and then [Process].
  - ② You can rewrite a target symbolic figure or syntax (see NOTE below). Use the same procedure as in an off-line condition.
  - ③ After completion of a rewrite, select [Build] menu – [Compile].
  - ④ Select [Mode] menu – [Online] – [Send].

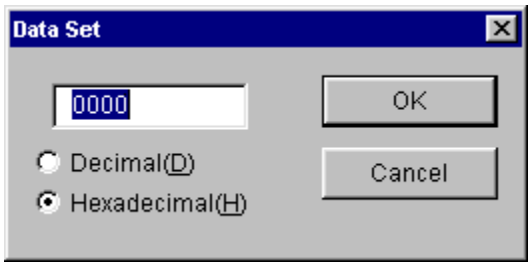
NOTE
The process rewrite procedure differs from the step rewrite procedure. Exercise due care not to perform an incorrect procedure.

- Register value rewrite

① Double-click a symbol in an on-line condition. The system then displays the [Property of symbol.] dialog box in the on-line condition.



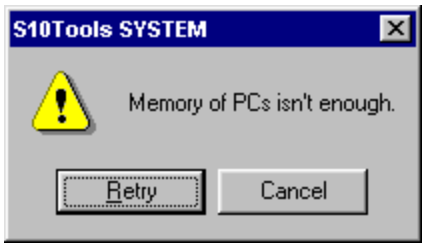
② Double-click the register whose value is to be rewritten. The [Data Set] dialog box is displayed.



③ Enter a value and then click the OK button.

(8) Remedies for memory insufficiency during a run-time rewrite

An unoccupied HI-FLOW user program area on the PCs side is used to perform a rewrite while a HI-FLOW program is running. (The user program area is an area that is specified from [System edition], which can be accessed by selecting [PCs] from [Utility].) Therefore, if an attempt is made to perform a run-time rewrite repeatedly, the following message may be displayed to indicate memory insufficiency.



When the above message is displayed, you can achieve recovery from memory insufficiency by sending all processes to the PCs as directed below. To achieve recovery, however, you must stop the PCs.

① Stop the PCs.
② Place the PCs and HI-FLOW system in an off-line condition (by selecting [Mode] menu and then [Offline]).
③ Send all processes to the PCs (by selecting [Mode] menu, [Online], [Send], and then [All processes]).
④ Start the PCs.

If you do not want to stop the PCs, you should define an extra-large user program area beforehand from [System edition].

If the above procedure does not remedy the memory insufficiency problem on the PCs side, you must extend the user program area or add extended memory.

5.14.2 Process execution after a run-time rewrite

A synchronization process is performed in some run-time rewrite operations and not in the others. This section explains about risks in various run-time rewrite operations.

(1) Synchronization process execution

The synchronization process is performed when all the following conditions are met.

<Synchronization conditions>

- No symbolic figure of a program is added, deleted, or changed.
- No label (label or free label) is added, deleted, or changed.
- No addition, deletion, or change is made to the route structure.

The synchronization process is significant when control stays in the process to be rewritten during a run. More specifically, it means that the location (step) at which control stays in an unrewritten process is retained even after the process is rewritten. Therefore, it involves the following risks.

- The stop conditions can be rewritten. Therefore, a previously unexecuted process may be executed, in which case there may occur a facility malfunction or, in a worse case, an accident.
- The stop conditions can be rewritten. Therefore, a previously executed process may be left unexecuted, in which case there may occur a facility synchronization failure.
- The control process numbers, which are the ACT, RST, STP, and CLR parameters for the control box, can be changed. Therefore, there may occur a facility malfunction or, in a worse case, an accident.
- A process to be called in the control box can be changed. Therefore, there may occur a facility malfunction or, in a worse case, an accident.

(2) Initialization process execution

The initialization process is executed when any of the following conditions is met.

<Initialization conditions>

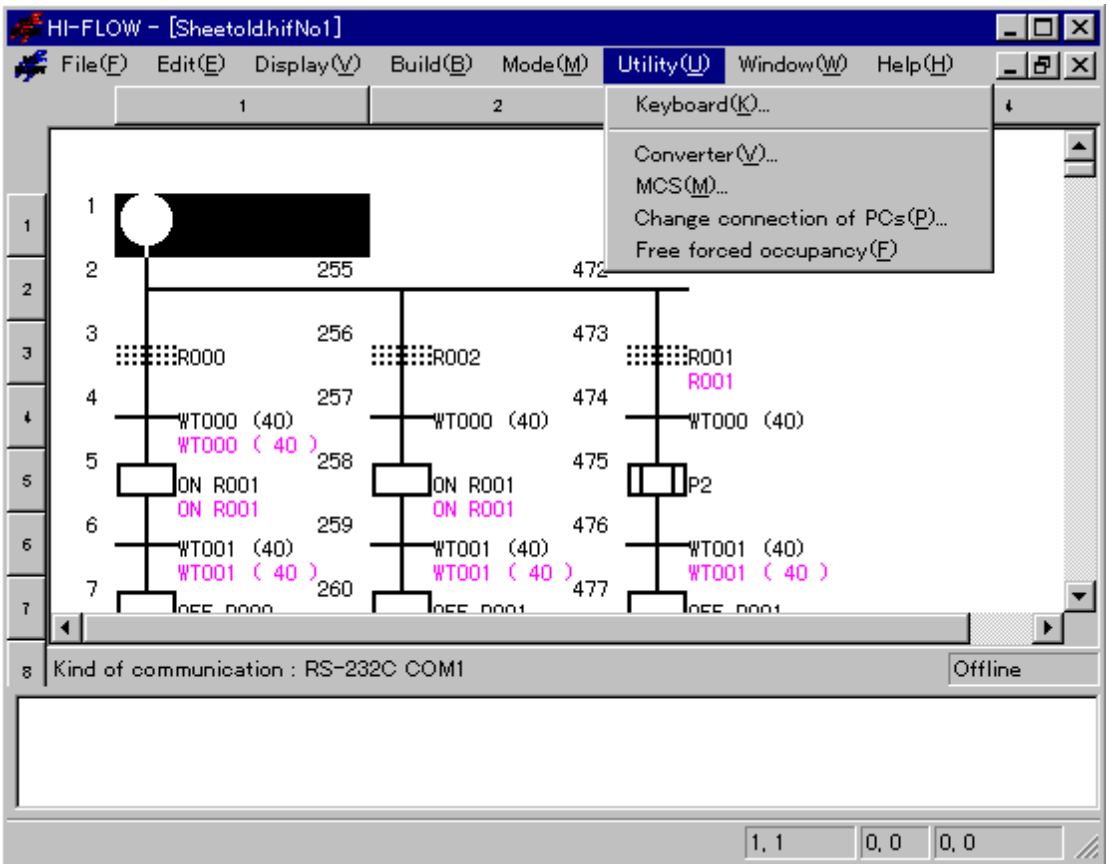
- A symbolic figure of a program is added, deleted, or changed.
- A label (label or free label) is added, deleted, or changed.
- An addition, deletion, or change is made to the route structure.

The initialization process is significant when control stays in the process to be rewritten during a run. More specifically, it means that execution starts from the beginning of a rewritten process without regard to the location (step) at which control stays in an unrewritten process. Therefore, it involves the following risk.

- Since execution starts from the beginning of a process, a synchronization failure may occur with respect to another process, resulting in an accident.

5.15 HI-FLOW Sheet Utility Functions

The HI-FLOW sheet utility functions are selectable from a pull-down menu.



The utility functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Utility	Keyboard		Assigns short-cut keys for symbol entry from the keyboard.
2		Converter		Converts the source code created by a DOS version of the HI-FLOW system.
3		MCS		Reads or writes memory.
4		Change connection of PCs		Sets a type of communication with the PCs.
5		Free forced occupancy		Forcibly unlocks the PCs.

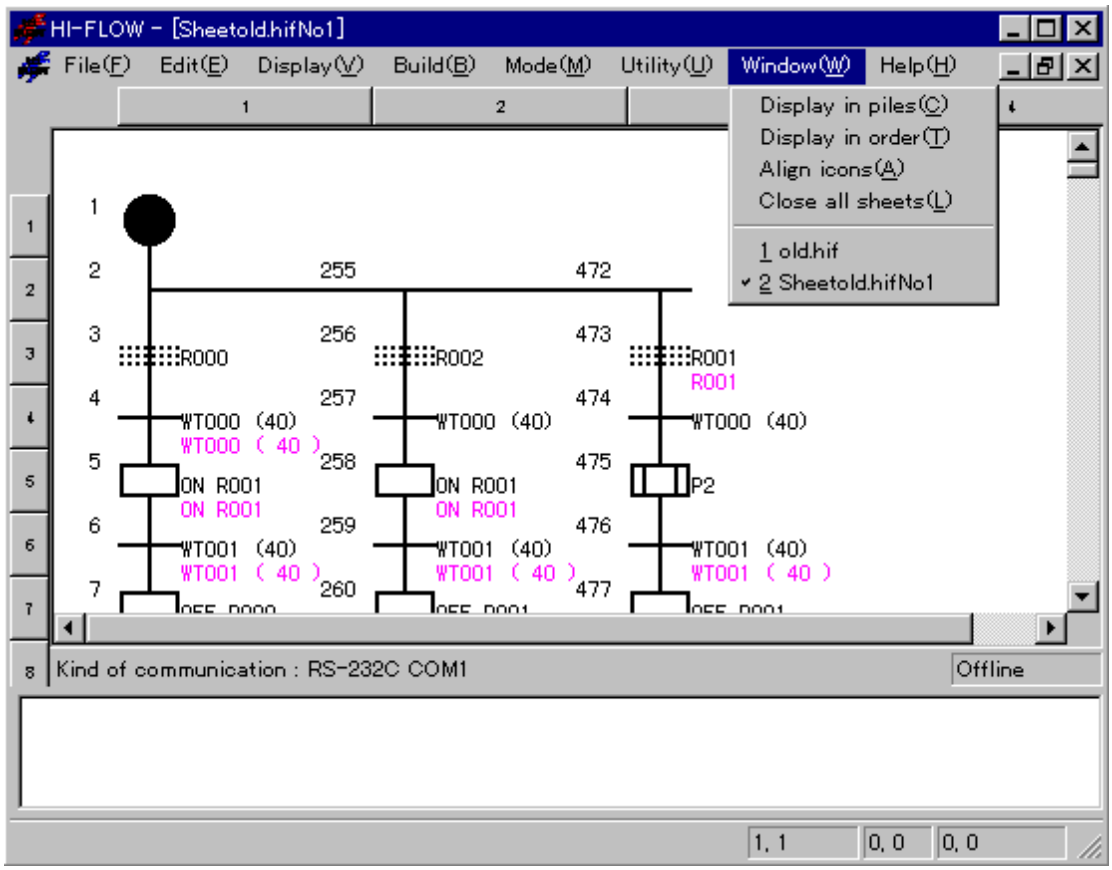
Free forced occupancy is related to the network-compatible functions described in “5.14 HI-FLOW Sheet Mode Functions.” If the HI-FLOW system becomes disconnected for some reason from the PCs being locked by it, the PCs may be left locked and, as a result, may no longer be connected to any personal computer. In such a case, use the free forced occupancy function to forcibly release the PCs from the locked state.

NOTE

The free forced occupancy function can be executed even when another user is keeping the PCs locked. If it is executed in such a situation, the other user who has been keeping the PCs locked is not notified of the fact. This may cause multiple simultaneous accesses to the same PC in some operation. To prevent this, check for any warning message indicating that another user is keeping the PCs locked, before using the free forced occupancy function.

5.16 HI-FLOW Sheet Window Functions

The HI-FLOW sheet window functions are selectable from a pull-down menu.



The window functions are described below.

No.	Level 1	Level 2	Level 3	Description
1	Window	Display in piles		Cascades windows.
2		Display in order		Tiles windows.
3		Align icons		Arranges icons.
4		Close all sheets		Closes all process detail sheets that are currently open.
5		File names 1, 2, ...		Selects the active window.